HIGH STREET HORNSEY

ENERGY STATEMENT

MAY 2023

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DOCUMENT CONTROL SHEET

Report Reference	**S2059/HSH/ES/202304-NR**
Revision	**B update to comments**
Issue Purpose	**Initial Issue**
Report Prepared for:	**Chapman Developments Ltd**
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Approved By	**Ryan Thrower**
Date of Issue	**16th May 2023**

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1. EXECUTIVE SUMMARY

1.1 NRG Consulting have been appointed to undertake an Energy Statement on a proposed development at 23-23A High Street, Hornsey in the London Borough of Haringey.

1.2 Planning Ref: HGY/2020/0590

Demolition of existing building and construction of a mixed-use scheme at part two and part three storeys in height (with accommodation in the roof space) providing retail floorspace (Class A1) at ground floor level, together with 7 residential flats (Class C3) and 2 residential houses (Class C3), with associated cycle parking, landscaping and ancillary works.

1.3 This document is written to satisfy Planning Condition 19 which states:

Prior to the commencement of construction works on site, a further energy statement demonstrating that carbon savings have been maximised, taking into account the limitations of the building, in line with policy 5.4 of the London Plan shall be submitted to and approved in writing by the Local Planning Authority. The development hereby permitted shall be built in accordance with the approved energy statement and the energy provisions shall thereafter be permanently retained unless otherwise agreed in writing with the Local Planning Authority.

1.4 This document illustrates a reduction in excess of 68% in CO_2 emissions over that of the baseline of Part L2021 achieved via:

Energy Efficient Measures (*Be Lean*) – *Residential*

- High levels of thermal insulation to achieve U-Values lower than the Part L 2021 notional building specification.
- LED Lighting with high luminous efficacy (85lm/W)
- Air Permeability target of 3 m3/(hm2) @50Pa
- MVHR to flats

Energy Efficient Measures (*Be Lean*) – *Commercial*

- High levels of thermal insulation to achieve U-Values lower than the Part L 2021 notional building specification.
- LED Lighting with high luminous efficacy (105lm/W)
- Air Permeability target of 3 m3/(hm2) @50Pa

Decentralised Energy *(Be Clean)*

Due to the small size and heat demand of the scheme and the distance from the scheme to any proposed district heating networks, no connection to nor provision for a future connection has been allowed for. The residential units are also already being powered by ASHPs, and a VRF system is being used for the commercial units.

Renewable Technologies *(Be Green)* – *Residential*

The following is proposed the residential units:

- Individual Air Source Heat Pumps
- PV to Block A

Renewable Technologies *(Be Green)* – *Commercial*

The following is proposed for the commercial units:

- A VRF System to each unit

1.5 Following the energy hierarchy for the scheme, the final CO_2 emissions are summarised below:

	CO_2 Emissions (Tonnes per Annum)		
	Domestic	Non-Domestic	
Baseline: Part L 2021	8.3	0.4	
Be Lean: Use Less Energy	8.0	0.4	
Be Clean: Supply Energy Efficiently	8.0	0.4	
Be Green: Renewable Energy (DER)	1.4	0.3	
Regulated CO_2 Savings at 'Be Green' over Part L 2021	83%	21%	

Table: Carbon Emissions Table

2. POLICY FRAMEWORK

2.1 The proposed development falls within the Government's **"minor"** category of planning applications.

NATIONAL POLICY – NPPF (2021)

The delivery of sustainable development is at the foundation of the NPPF, which defines it as "meeting the needs of the present without compromising the ability of future generations to meet their own needs.

REGIONAL POLICY

The London Plan - March 2021	
The London Plan sets out high-end goals for the whole of London based on the Energy Hierarchy. It also states that its overarching goal is for London to become a zero-carbon city. This will require reduction of all greenhouse gases, of which carbon dioxide is the most prominent. Local Boroughs should ensure that all developments maximise opportunities for on-site electricity and heat production and reduce carbon emissions in-line with the stages of the Energy Hierarchy. In-line with the Zero Carbon Policy, all CO_2 emissions should be offset via a mixture of on-site and off-site measures.	
Policy SI2	Minimising greenhouse gas emissions
Policy SI3	Energy Infrastructure
Policy SI 4	Managing heat risk
Energy Assessment Guidance: Greater London Authority Guidance on preparing energy assessments as part of planning applications (June 2022)	

GLA – Energy Assessment Guidance (June 2022);

On 15th June 2022, with the implementation of Part L of the Building Regulations (2021) and SAP 10.2 a new GLA guidance note was released to supersede the April 2020 guidance.

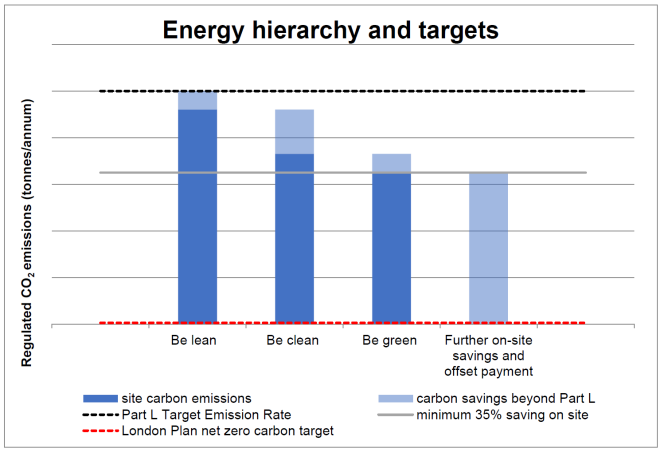
The main clarification of the June 2022 guidance was to confirm that the minimum expected carbon reduction on-site was to remain at 35% better than Part L 2021; the same target as the previous Building Regulation version. A new benchmark target of 50% better than Part L 2021 has been introduced for residential developments also. The cover note for the new version states:

Background

On 15 June 2022, national building regulations were updated to enhance energy performance standards for new buildings through Part L 2021. A new Part O 2021 was also introduced, updating requirements to tackle overheating.

The Mayor's Energy Assessment Guidance has been updated to explain how London Plan policy should be applied now that these regulations have taken effect. This note summarises the key updates.

Part L 2021 is a stepping-stone towards the Future Homes Standard and Future Buildings Standard which the Government is expected to consult on in 2023 and introduce in 2025.



LOCAL POLICIES

2.2 The following Planning Policies from the local authority are relevant to this report:

London Borough of Haringey

- Local Policy SP4 – Working towards a low carbon Haringey
- Local Policy DM21 – Sustainable Design, Layout and Construction.
- Local Policy DM22 – Decentralised Energy

Policy SP4 – Working towards a low carbon Haringey

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

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.

The Council will promote low-carbon energy 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;
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.

Policy DM21 – Sustainable Design, Layout and Construction

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.

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.

Policy DM22 – Decentralised Energy

Subject to other policy requirements, proposals that contribute to the provision and use of Decentralised Energy network infrastructure will be supported.

Communal energy systems

All development that incorporates site-wide communal energy systems should examine opportunities for extending such systems, irrespective of whether it is connected to a DE network.

All development that incorporates site-wide communal energy systems should optimise opportunities for extending such systems beyond the site boundary to supply energy to neighbouring existing and planned future developments.

Existing and planned future DE networks

All development proposals should prioritise connection to existing or planned future DE networks.All major development located within 500 metres of an existing DE Network, and minor new-build development located within 25 metres, will be expected to secure connection to that network subject to demonstration of technical feasibility and financial viability.

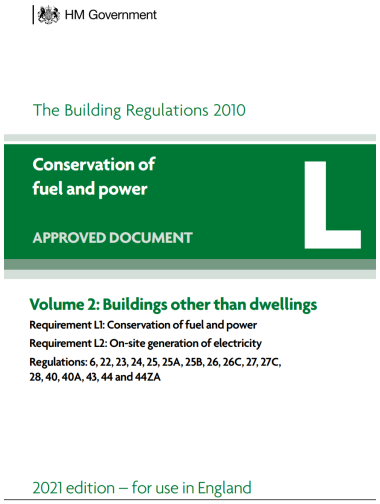
BUILDING REGULATIONS (PART L 2021 & FUTURE HOMES STANDARD)

2.3 On 24th July 2018 the Department for Business Energy & Industrial Strategy (BEIS) published their update to SAP 9.92 (Part L 2013), called SAP 10.

In October 2019, the Ministry of Housing, Communities and Local Government (MHCLG) then issued consultation on changes to Part L of the Building Regulations. Dubbed *The Future Homes Standard*, it is an aspiration to ensure all new homes will have low carbon heating and "world-leading levels of energy efficiency" by 2025 and is intended to be the primary driver in achieving the Governments desire to reduce carbon emissions in the creation of new-build housing stock.

On the June 15th 2022, Part L 2021 of the Building Regulations came into force. As per the requirements, all new homes must produce 31% less CO_2 emissions than that of Part L 2013 in-order to achieve Building Regulation compliance.

2.4 The major change in the regulations is the change in carbon factor of electricity to represent the decarbonisation of the National Grid and the push towards net-zero



Fuel	SAP 2012 CO_2 ($kgCO_2/kWh$)	SAP 10 CO_2 ($kgCO_2/kWh$)	Part L 2021 CO_2 ($kgCO_2/kWh$)	Percentage Reduction
Main Gas	0.216	0.210	0.210	2.75%
Electricity	0.519	0.233	0.136	73.8%

***Table**: Change in Carbon Factors from Part L 2013 to Part L 2021*

3.0 ENERGY CALCULATIONS - *"Be Lean"*

3.1 In order to estimate the CO_2 emissions for the residential element of the site, SAP Calculations have been carried out by a licensed and accredited OCDEA Domestic Energy Assessor using Design SAP 10's online platform and a NDEA (SBEM) Assessor for the two Commercial units (under a shell and core scenario) using IES Dynamic Thermal Modelling. Therefore all heated areas of the development have been covered by heat loss calculations. Areas such as communal corridors and bin stores are not subject to heating and therefore CO2 emissions so are excluded.

3.2 The baseline CO_2 emissions covered by Part L 2021 of the Building Regulations will be expressed as the Target Emissions Rate (TER). This covers regulated carbon emissions from:

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

3.3 Passive Design

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

- High levels of insulation have been proposed in excess of the Part L 2021 notional values.
- Through good design and careful construction, air infiltration will be minimised and thus a low Air Permeability target has been sort..
- Maximising thermal mass where possible to reduce internal temperature variation.
- Thermal Bridging will be considered to minimise junction heat loss

ELEMENT	PART L2a LIMITING FABRIC PARAMETERS	PROPOSED U-VALUES (W/m²K)
Walls		
External Wall - Masonry	*0.26 W/m²K*	**0.13 W/m²K**
External Wall – Timber Frame	*0.26 W/m²K*	**0.18 W/m²K**
Sheltered Wall – Flats to corridors	*0.26 W/m²K*	**0.18 W/m²K**
Floors		
Ground Floor	*0.18 W/m²K*	**0.10 W/m²K**
Exposed Upper Floors	*0.18 W/m²K*	**0.13 W/m²K**
Roof		
Roof - Flat	*0.16 W/m²K*	**0.11 W/m²K**
Roof - Pitched	*0.16 W/m²K*	**0.11 W/m²K**
Openings		
Doors	*1.6 W/m²K*	**1.0 W/m²K**
Windows	*1.6 W/m²K*	**0.85 W/m²K**
Air Permeability		
3 m³/(hm²) @50Pa		

***Table**: Proposed Fabric Specification*

Be Lean Inputs

It should be noted that the Notional Dwelling for Part L 2021 contains **both** PV and Waste-Water Heat Recovery thus skewing the target at *Be Lean* stage to include technologies like PV which were previously allowed for at *Be Green* stage. Consequently, the GLA Spreadsheet removes the PV from this part of the notional calculation to present a fairer assessment of the *Be Lean* scenario which is displayed in the table below.

Furthermore, the *Be Lean* scenario is based on an 89.5% Gas Combi Boiler, thus an outdated scenario where current best-practice and policy drivers are in favour of electric heating. Should the Gas Boiler be switched out for Electric Panel Heaters, the *Be Lean* improvement would increase further.

The Be Lean savings currently show a shortfall in the desired target. However, the scheme contains the following:

- A zero-NOx heating system
- High performing LEDs
- A very low air permeability target
- Fabric and thermal performance considerably lower than Part L targets

And thus, has made all efforts to comply with the Be Lean target despite the shortfall that the results display.

Total Space Heating Demand and EUI

5.10 Energy Use Intensity (EUI) is a measure of the total energy consumed in a building annually.
It includes both regulated (fixed systems for lighting, heating, hot water, air conditioning and mechanical ventilation) and unregulated (cooking and all electrical appliances, and other small power) energy.
It does not include energy use from electric vehicle charging or any reduction in EUI due to renewable energy generation on-site.
For these figures, illustrated below, the *Be Seen* methodology has been used in their calculation

	EUI Residential (kWh/m²/year)	Space Heating Demand (kWh/m²/year)
Benchmark	*35*	*15*
Proposed Scheme – Residential	***26.12***	***13.22***

Table: *EUI and Space Heating Demand*

	EUI Non - Residential (kWh/m²/year)	Space Heating Demand (kWh/m²/year)
Benchmark	*55*	*15*
Proposed Scheme – Non-Residential	***64.14***	***4.57***

Table: *EUI and Space Heating Demand*

4. DECENTRALISED ENERGY – *Be Clean*

4.1 There are no local heat networks to currently connect up to. Due to the small size and nature of the development and distance from the proposed future network no potential connection is being allowed for as it is not economically viable.

4.2 The LETI Climate Emergency Decision Tree[1] has also been followed.

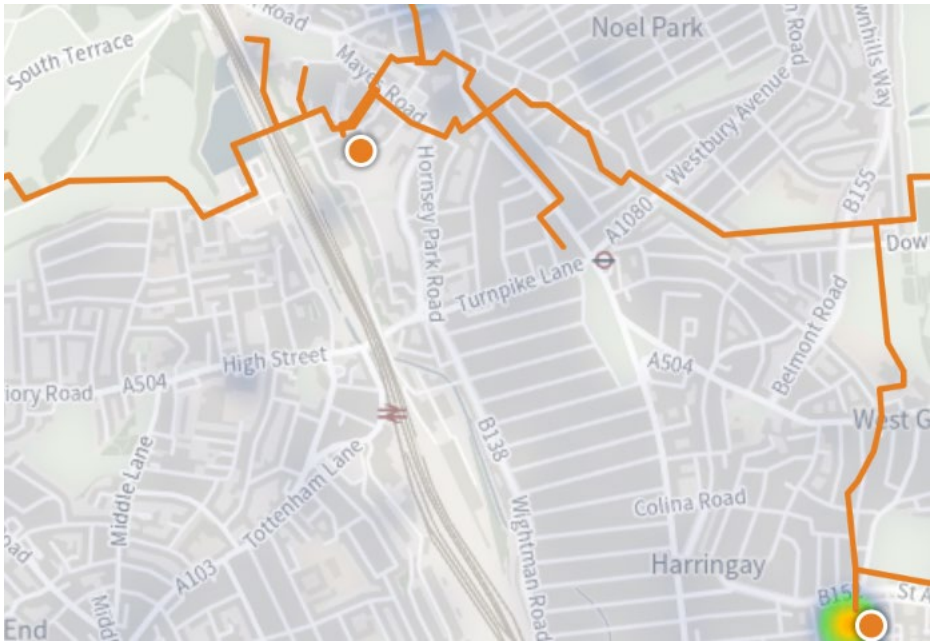


Figure: *Mayor of London Heat Map*

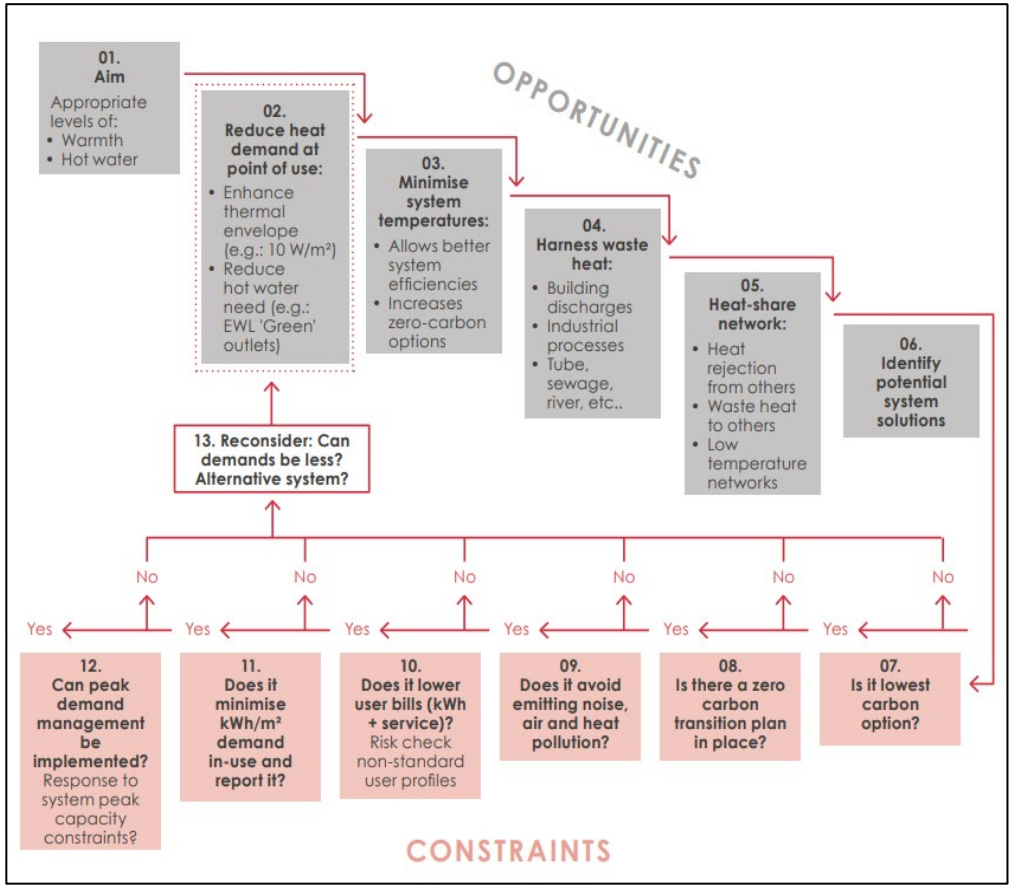


Figure: *LETI Decision Tree*

1 https://www.levittbernstein.co.uk/site/assets/files/3494/leti-climate-emergency-design-guide.pdf

5. RENEWABLE ENERGY – *Be Green*

5.1 Renewable energy sources are defined as:

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

The high-target goal is to maximise all possible avenues for renewable energy on site.

5.2 Based on recent legislation such as the Clean Air Act as well as the location of the proposed development, the following technologies have been discounted:

- Wind Turbines
- Biomass
- Hydropower / Wave Technology
- Biogas / Biofuel

5.3 The feasibility of remaining renewable and low carbon technologies is highlighted in the table opposite.

5.4 Following a review of the available technologies, the following have been chosen to be integrated into the scheme:

- Air Source Heat Pumps (Residential)
- PV to Block A
- VRF (Commercial)

5.5 It should be noted that solar PV has been given consideration. However this is restricted by the roof configuration.

Roof A

This is above the flats and can therefore accommodate PV

Roof B

This is a terrace roof for communal use and therefore not practical to combine PV panels and recreational use

Roof C

This relates to the house. However this roof is a designated green roof, and therefore PV above the green roof will have a detrimental effect to the plant life. Furthermore the roofs are adjacent to and overlook a conservation area.

5.5 Active Design (Residential)

The development will incorporate efficient building services to limit carbon emissions, including:

- A zero-NOx heating system
- LED Lighting

ELEMENT	PROPOSED DETAILS
Ventilation	**System 1, Intermittent Extract Fans to houses System 4 – MVHR to flats**
Heating – Be Lean	***Mains gas 89.5% efficient***
Heating – Be Green	**Individual Air Source Heat Pumps**
Heating Controls	**Programmer / Thermostat / Bypass**
Heat Emitters	**Radiators**
Hot Water	**Hot Water Cylinder**
Lighting	**LED (85 lm/W)**

Table: *Proposed Mechanical and Electrical Specification - Residential*

FEASIBILITY

Technology	Considerations					Overall Feasibility
	Cost	Noise	Land Use	Tariffs	CO_2 Offset	
Photovoltaic Panels (PV)	PV by producing electric for use within the dwelling, helps offset the running costs, particularly important during the current surge in energy costs. PV however, does not offset Carbon in large quantities like in previous years, due to the decarbonisation of the National Grid and other solutions are now more cost effective in this pursuit On this development, as explained in section 5.5 the roofs are also a limiting factor					**Part**
Air Source Heat Pumps (ASHP/VRF)	ASHPs provide a heating system at high efficiency Due to the continued decarbonisation of the National Grid, the associated CO_2 offset will continually increase compared to gas					**Yes**
Ground Source Heat Pumps (GSHP)	GSHPs are like ASHPs but operate at slightly higher efficiencies due to drawing heat from the ground, a source that is warmer than the outside air, especially in Winter. However, the technology is more expensive than Air Source and requires either significant horizontal space for a *slinky* style system or deep boreholes as part of a vertical system. As this is not proposed here, ASHPs are more suited to the scheme.					**No**

Table: Renewable Energy Feasibility

PV Details

5.6 It is proposed that PV will be installed to Block A. This is to maximise on-site renewable energy generation.

1. **Substantial energy savings**: A 1kWp PV panel system can generate a significant amount of electricity, estimated at around 937.5 kWh annually (based on average UK solar irradiance).
2. **Clean and renewable energy**: By installing a PV system, the development actively contributes to the UK's renewable energy targets and reduces its carbon footprint, helping to combat climate change and aligning with the UK's commitment to reach net-zero emissions by 2050.
3. **Financial incentives and revenue generation:** By installing a PV system, the development can take advantage of government incentives such as the Smart Export Guarantee (SEG). Under the SEG, a monetary payment can be earned per kWh by exporting surplus solar energy generated back to the grid, especially during the summer months where-by there will be high generation and low demand.

PV System Details	
PV Proposed	10.4 (Landlords Supply)
Module Output	400 watts
Number of Panels	Approx 26
Tilt of Collectors	Horizontal
Table: Proposed PV Specification – Domestic	



Figure: *PV roof plan*

Air Source Heat Pump Details

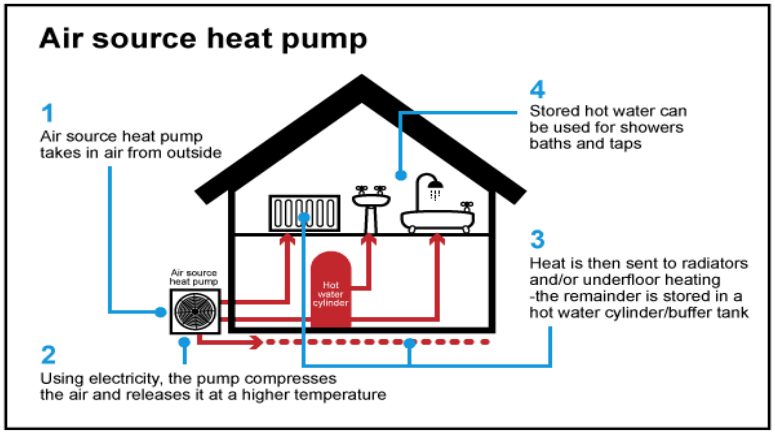
5.7 An Air Source Heat Pump has been proposed to provide the heating and hot water for each dwelling within the scheme. The technology has been chosen because:

- It is a highly efficient system (300%+) and will provide both the space heating and hot water for each proposed dwelling.
- Requires less capital cost, space, and is simpler to install than Ground Source Heat Pumps
- It is simple to install when compared to other renewable technologies

5.8 At this early stage, a specific Air Source Heat Pump make has not been modelled.

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

100% of the heating and hot water will be met by the demand will be met by the heat pumps. It is not proposed that there would be additional heating methods



5.9 Active Design (Commercial)

The development will incorporate efficient building services to limit carbon emissions, including:

- A zero-NOx heating system
- LED Lighting

ELEMENT	M&E SPECIFICATIONS AND DETAILS
Ventilation	**Natural**
Heating	**VRF – COP 4.5**
Cooling	**VRF – SEER 5.5**
Hot Water	**Direct Hot Water – Electric Instantaneous**
Heating Control	**Central Timer, Local Thermostats (BMS)**
Lighting (all areas)	**105 lm/w (efficacy) 1.0 LOR**
Lighting Controls	**Auto on / off**

Table: *Proposed M&E Specification – (Non-Domestic)*

5.10 VRF is considered a suitable technology for the following reasons:

- Quiet operation.
- Energy efficient
- Heat & cool simultaneously.
- Zoned heating & cooling.
- State-of-the-art controls.

5.11 At this early stage, a specific VRF make and model has not been specified and design parameters have been used based on similar projects and systems.

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



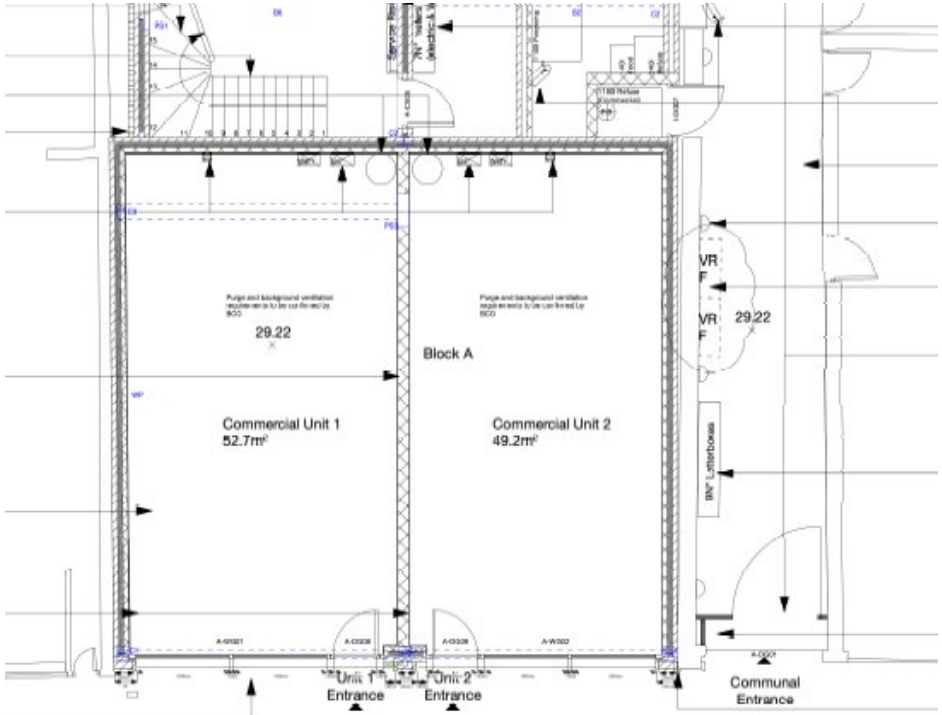


Figure: *VRF outdoor unit position – Marked VR*

Overheating

5.12 This development will be Part O of the Building Regulations compliant (to be caried out at full design stage) but has been designed to avoid Overheating with the early stages of the cooling hierarchy prioritised and with the lack of communal heat distribution and the provision of openable windows being major factors in mitigating any potential risks. Furthermore the flats will be provided with MVHR to aid night time overheating.

5.13 The table below shows the percentage glazed of each unit. As can be seen, all units are below the maximum 25% glazed area to floor area ratio, therefore reducing the overheating risk.

Plot No	Floor Area m²	Glazed Area m²	% Glazed
House 1	79	16.57	20.9
House 2	79	14.40	18.2
Flat 1	64.6	9.74	15
Flat 2	64.6	10.37	16
Flat 3	46.4	3	6.4
Flat 4	62	3	11.9
Flat 5	46.4	3	6.4
Flat 6	62	3	11.90
Flat 7	86.6	7.48	8.6

Cooling Hierarchy	Measures Undertaken
Reduce the amount of heat entering the building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure.	High albedo materials will be prioritised where possible. Insulation levels in excess of the notional U-Values have been proposed.
Minimise internal heat generation through energy efficient design:	As the dwellings will be heated by individual Heat Pumps, there will be no communal heat infrastructure in the building requiring mitigation. LED lighting will reduce internal heat gains.
Manage the heat within the building through exposed internal thermal mass and high ceilings:	Level of thermal mass has been maximised where possible, but it is likely that studwork will be used for internal partitions. The Floor to Ceiling Height complies with National Space Standards.
Provide Passive Ventilation	Openable Windows are proposed to all dwellings which will allow for night time purge ventilation. Cross-Ventilation to be provided wherever possible.
Provide Mechanical Ventilation	Mechanical Ventilation with Heat Recovery is proposed for the flats

6. CONCLUSION

6.1 A full energy strategy in-line with the energy hierarchy has been undertaken and this document illustrates a reduction in CO_2 emissions over the baseline of Part L 2021 via:

Energy Efficient Measures *(Be Lean)*

- High levels of thermal insulation to achieve U-Values lower than the Part L 2021 notional building specification.
- Air Permeability target of 3 m3/(hm2) @50Pa

Renewable and Low Carbon Technologies *(Be Green)*

Air Source Heat Pumps, PV and VRF's will be provided for maximum efficiency and carbon savings.

6.2 A final carbon emission reduction table is shown on the opposite side of the page illustrating the savings at each stage of the energy hierarchy.

	CO_2 Emissions (Tonnes per Annum)		
	Domestic	Non-Domestic	
Baseline: Part L 2021 of the Building Regulations (TER)	**8.3**	**0.4**	
Be Lean: Energy Demand Reduction	**8.0**	**0.4**	
Be Clean: Supply Energy Efficiently	**8.0**	**0.4**	
Be Green: Renewable Energy (DER)	**1.4**	**0.3**	
Regulated CO_2 Savings at 'Be Green' over Part L 2021	**83%**	21%	

Table: Carbon Emissions Table

Appendix 1



Residential

Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for residential building

	Carbon Dioxide Emissions for residential buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	8.3	1.8
After energy demand reduction (be lean)	8.0	1.8
After heat network connection (be clean)	8.0	1.8
After renewable energy (be green)	1.4	1.8

Table 2: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for residential building

	Regulated residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	0.4	4%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	6.6	79%
Cumulative on site savings	**6.9**	**83%**
Annual savings from off-set payment	1.4	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**42**	-
Cash in-lieu contribution (£)	**4,036**	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development Information' tab

Non-residential

Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for non-residential building

	Carbon Dioxide Emissions for non-residential buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	0.4	
After energy demand reduction (be lean)	0.4	
After heat network connection (be clean)	0.4	
After renewable energy (be green)	0.3	

Table 4: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for non-residential building

	Regulated non-residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	0.0	8%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.1	13%
Total Cumulative Savings	**0.1**	**21%**
Annual savings from off-set payment	0.3	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**9**	-
Cash in-lieu contribution (£)	**873**	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development Information' tab

Appendix 2



Full SAP Calculation Printout

Property Reference	Flat 1 Block B	**Issued on Date**	13/03/2024
Assessment Reference	Be Lean	**Prop Type Ref**	
Property	Flat 7 Block C, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	83 B	**DER**	15.02	**TER**	13.43
Environmental	89 B	**% DER < TER**			-11.84
CO_2 Emissions (t/year)	0.87	**DFEE**	35.83	**TFEE**	38.54
Compliance Check	See BREL	**% DFEE < TFEE**			7.03
% DPER < TPER	-21.84	**DPER**	85.81	**TPER**	70.43

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client	KGH, Kurt Gander - Howe		

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	64.2000	(1b)	x 2.5900	(2b) =	166.2780	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	166.2780	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(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) =		81.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448	(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	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			10.6300	1.1450	12.1718			(27)
Heatloss Floor 1			64.2000	0.1000	6.4200	75.0000	4815.0000	(28a)
External Wall 1	43.4900	10.6300	32.8600	0.1300	4.2718	70.0000	2300.2000	(29a)
sheltered	15.4800	2.1000	13.3800	0.1300	1.7394	70.0000	936.6000	(29a)
Total net area of external elements Aum(A, m2)			123.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.5430			(33)
Party Wall 1			27.3200	0.0000	0.0000	180.0000	4917.6000	(32)
Party Floor 1			64.1600			30.0000	1924.8000	(32d)
Party Ceiling 1			64.2000			20.0000	1284.0000	(32b)
Internal Wall 1			104.0000			9.0000	936.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17114.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		266.5763 (35)
List of Thermal Bridges		

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.9200	0.0600	0.4152
E3 Sill	5.9200	0.0400	0.2368
E4 Jamb	25.3200	0.0200	0.5064
E5 Ground floor (normal)	17.0000	0.1300	2.2100
E5 Ground floor (normal)	5.9000	0.3200	1.8880
E7 Party floor between dwellings (in blocks of flats)	17.0000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	5.9000	0.2800	1.6520
E16 Corner (normal)	7.8000	0.0500	0.3900
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0600	-0.1560
P1 Party wall - Ground floor	10.6000	0.3200	3.3920
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.6000	0.0000	0.0000
E18 Party wall between dwellings	2.6000	0.2400	0.6240
E18 Party wall between dwellings	2.6000	0.2400	0.6240

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.7824 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.3254 (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	14.1329	13.9580	13.7831	12.9086	12.7337	11.8592	11.8592	11.6843	12.2090	12.7337	13.0835	13.4333	(38)
Heat transfer coeff	53.4583	53.2834	53.1085	52.2339	52.0590	51.1845	51.1845	51.0096	51.5343	52.0590	52.4088	52.7586	(39)

Average = Sum(39)m / 12 = 52.1902

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8327	0.8300	0.8272	0.8136	0.8109	0.7973	0.7973	0.7945	0.8027	0.8109	0.8163	0.8218	(40)
HLP (average)												0.8129	
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 2.0976 (42)

Hot water usage for mixer showers

89.0832	87.7444	85.7936	82.0611	79.3066	76.2347	74.4887	76.4248	78.5471	81.8452	85.6580	88.7419	(42a)

Hot water usage for baths

25.6623	25.2812	24.7445	23.7550	23.0140	22.1923	21.7485	22.2815	22.8618	23.7409	24.7509	25.5756	(42b)

Hot water usage for other uses

36.1111	34.7980	33.4848	32.1717	30.8586	29.5455	29.5455	30.8586	32.1717	33.4848	34.7980	36.1111	(42c)

Average daily hot water use (litres/day) 138.7530 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.8566	147.8236	144.0230	137.9877	133.1791	127.9725	125.7827	129.5648	133.5805	139.0710	145.2068	150.4286	(44)
Energy conte	238.9200	210.4989	221.3580	188.8983	179.2847	157.3572	152.1233	160.4283	164.7181	188.7181	206.8737	235.5348	(45)

Energy content (annual) Total = Sum(45)m = 2304.7134

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

35.8380	31.5748	33.2037	28.3347	26.8927	23.6036	22.8185	24.0643	24.7077	28.3077	31.0311	35.3302	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)

Primary loss, Combi loss

Total heat required for water heating calculated for each month

289.8789	256.5263	272.3169	238.2134	230.2436	206.6722	203.0822	211.3872	214.0332	239.6770	256.1888	286.4937	(62)
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)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS, PV diverter, Solar input, FGHRS

Output from w/h

289.8789	256.5263	272.3169	238.2134	230.2436	206.6722	203.0822	211.3872	214.0332	239.6770	256.1888	286.4937	(64)

Total per year (kWh/year) = Sum(64)m = 2904.7134 (64)

12Total per year (kWh/year) 2905 (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

92.1806	81.4977	86.3413	75.1375	72.3519	64.6500	63.3207	66.0821	67.0976	75.4885	81.1143	91.0550	(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	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	95.8725	106.1446	95.8725	99.0683	95.8725	99.0683	95.8725	95.8725	99.0683	95.8725	99.0683	95.8725	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	183.4018	185.3050	180.5091	170.2993	157.4113	145.2984	137.2062	135.3031	140.0989	150.3087	163.1967	175.3096	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	(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)	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	(71)
Water heating gains (Table 5)	123.8987	121.2764	116.0501	104.3576	97.2472	89.7917	85.1085	88.8201	93.1910	101.4630	112.6587	122.3858	(72)
Total internal gains	460.6364	470.1893	449.8951	431.1886	407.9944	388.6217	372.6506	374.4591	386.8216	405.1076	432.3871	451.0314	(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	4.5900	10.6334	0.7200	0.7000	0.7700	17.0470	(74)
East	6.0400	19.6403	0.7200	0.7000	0.7700	41.4332	(76)

Solar gains	58.4802	113.6298	188.8387	283.5927	358.3618	372.4591	352.2351	294.7097	221.8018	134.9546	72.6920	48.2838	(83)

Total gains	519.1166	583.8191	638.7338	714.7812	766.3562	761.0808	724.8857	669.1688	608.6234	540.0622	505.0791	499.3152	(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	88.9282	89.2201	89.5139	91.0126	91.3183	92.8786	92.8786	93.1970	92.2481	91.3183	90.7088	90.1074	
alpha	6.9285	6.9480	6.9676	7.0675	7.0879	7.1919	7.1919	7.2131	7.1499	7.0879	7.0473	7.0072	
util living area													
	0.9901	0.9769	0.9402	0.8161	0.6226	0.4298	0.3106	0.3505	0.5790	0.8775	0.9755	0.9921	(86)
MIT	20.3641	20.5170	20.7151	20.9179	20.9881	20.9993	20.9999	20.9999	20.9946	20.8862	20.6030	20.3423	(87)
Th 2	20.2251	20.2274	20.2298	20.2416	20.2439	20.2557	20.2557	20.2581	20.2510	20.2439	20.2392	20.2345	(88)
util rest of house													
	0.9871	0.9703	0.9244	0.7806	0.5752	0.3801	0.2581	0.2941	0.5185	0.8421	0.9673	0.9897	(89)
MIT 2	19.6561	19.8071	19.9966	20.1835	20.2372	20.2554	20.2557	20.2580	20.2486	20.1643	19.9024	19.6427	(90)
Living area fraction										fLA = Living area / (4) =		0.4737	(91)
MIT	19.9915	20.1434	20.3369	20.5314	20.5929	20.6078	20.6082	20.6094	20.6019	20.5062	20.2342	19.9741	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.8415	19.9934	20.1869	20.3814	20.4429	20.4578	20.4582	20.4594	20.4519	20.3562	20.0842	19.8241	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9852	0.9679	0.9234	0.7874	0.5878	0.3937	0.2724	0.3094	0.5349	0.8478	0.9653	0.9880	(94)
Useful gains	511.4437	565.0638	589.7961	562.8440	450.4749	299.6026	197.4688	207.0392	325.5360	457.8896	487.5566	493.3377	(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													
	830.8205	804.2270	726.8926	599.7162	455.1457	299.8265	197.4813	207.0694	327.3423	507.8991	680.4886	824.3064	(97)
Space heating kWh													
	237.6164	160.7177	101.9998	26.5480	3.4751	0.0000	0.0000	0.0000	0.0000	37.2071	138.9110	246.2407	(98a)
Space heating requirement - total per year (kWh/year)												952.7158	
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													
	237.6164	160.7177	101.9998	26.5480	3.4751	0.0000	0.0000	0.0000	0.0000	37.2071	138.9110	246.2407	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												952.7158	
Space heating per m2											(98c) / (4) =	14.8398	(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 %)												89.5000	(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													
	237.6164	160.7177	101.9998	26.5480	3.4751	0.0000	0.0000	0.0000	0.0000	37.2071	138.9110	246.2407	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	265.4932	179.5729	113.9662	29.6626	3.8828	0.0000	0.0000	0.0000	0.0000	41.5722	155.2078	275.1292	(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													
	289.8789	256.5263	272.3169	238.2134	230.2436	206.6722	203.0822	211.3872	214.0332	239.6770	256.1888	286.4937	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	323.8871	286.6216	304.2647	266.1602	257.2554	230.9187	226.9075	236.1869	239.1433	267.7955	286.2445	320.1047	(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	17.7277	16.0121	17.7277	17.1559	17.7277	17.1559	17.7277	17.7277	17.1559	17.7277	17.1559	17.7277	(231)
Lighting	26.0929	20.9327	18.8476	13.8086	10.6661	8.7143	9.7300	12.6474	16.4278	21.5541	24.3453	26.8181	(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												1064.4869	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												3245.4899	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)													
mechanical ventilation fans (SFP = 0.6050)												122.7298	(230a)
central heating pump												41.0000	(230c)

main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	208.7298	(231)
Electricity for lighting (calculated in Appendix L)	210.5850	(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	4729.2916	(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	1064.4869	0.2100	223.5422	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3245.4899	0.2100	681.5529	(264)
Space and water heating			905.0951	(265)
Pumps, fans and electric keep-hot	208.7298	0.1387	28.9534	(267)
Energy for lighting	210.5850	0.1443	30.3939	(268)
Total CO2, kg/year			964.4424	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			15.0200	(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	1064.4869	1.1300	1202.8702	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3245.4899	1.1300	3667.4036	(278)
Space and water heating			4870.2737	(279)
Pumps, fans and electric keep-hot	208.7298	1.5128	315.7664	(281)
Energy for lighting	210.5850	1.5338	323.0023	(282)
Total Primary energy kWh/year			5509.0425	(286)
Dwelling Primary energy Rate (DPER)			85.8100	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.2000 (1b)	x	2.5900 (2b)	=	166.2780	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 64.2000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	166.2780	(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) =	0.1203 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3703 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3147 (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	0.4013	0.3934	0.3856	0.3462	0.3383	0.2990	0.2990	0.2911	0.3147	0.3383	0.3541	0.3698	(22b)
Effective ac	0.5805	0.5774	0.5743	0.5599	0.5572	0.5447	0.5447	0.5424	0.5495	0.5572	0.5627	0.5684	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			10.6300	1.1450	12.1718			(27)
Heatloss Floor 1			64.2000	0.1300	8.3460			(28a)
External Wall 1	43.4900	10.6300	32.8600	0.1800	5.9148			(29a)
sheltered	15.4800	2.1000	13.3800	0.1800	2.4084			(29a)
Total net area of external elements Aum(A, m2)			123.1700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.9410			(33)
Party Wall 1			27.3200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 276.5763 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.9200	0.0500	0.3460
E3 Sill	5.9200	0.0500	0.2960
E4 Jamb	25.3200	0.0500	1.2660
E5 Ground floor (normal)	17.0000	0.1600	2.7200
E5 Ground floor (normal)	5.9000	0.1600	0.9440
E7 Party floor between dwellings (in blocks of flats)	17.0000	0.0700	1.1900
E7 Party floor between dwellings (in blocks of flats)	5.9000	0.0700	0.4130
E16 Corner (normal)	7.8000	0.0900	0.7020
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340
P1 Party wall - Ground floor	10.6000	0.0800	0.8480
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.6000	0.0000	0.0000
E18 Party wall between dwellings	2.6000	0.0600	0.1560
E18 Party wall between dwellings	2.6000	0.0600	0.1560

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.8030 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 39.7440 (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	31.8540	31.6824	31.5143	30.7244	30.5766	29.8887	29.8887	29.7613	30.1537	30.5766	30.8756	31.1881	(38)
Heat transfer coeff	71.5980	71.4264	71.2582	70.4684	70.3206	69.6326	69.6326	69.5052	69.8976	70.3206	70.6195	70.9321	(39)
Average = Sum(39)m / 12 =												70.4677	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1152	1.1126	1.1099	1.0976	1.0953	1.0846	1.0846	1.0826	1.0887	1.0953	1.1000	1.1049	(40)
HLP (average)												1.0976	
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 2.0976 (42)

Hot water usage for mixer showers

59.3888	58.4963	57.1957	54.7074	52.8710	50.8232	49.6592	50.9499	52.3647	54.5635	57.1053	59.1612	(42a)

Hot water usage for baths

25.6623	25.2812	24.7445	23.7550	23.0140	22.1923	21.7485	22.2815	22.8618	23.7409	24.7509	25.5756	(42b)

Hot water usage for other uses

36.1111	34.7980	33.4848	32.1717	30.8586	29.5455	29.5455	30.8586	32.1717	33.4848	34.7980	36.1111	(42c)

Average daily hot water use (litres/day) 111.3758 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	121.1622	118.5755	115.4251	110.6341	106.7436	102.5610	100.9531	104.0899	107.3982	111.7893	116.6542	120.8479	(44)
Energy conte	191.8914	168.8499	177.4041	151.4525	143.6974	126.1107	122.0941	128.8851	132.4327	151.6970	166.1953	189.2187	(45)
Energy content (annual)										Total = Sum(45)m =		1849.9287	
Distribution loss (46)m = 0.15 x (45)m	28.7837	25.3275	26.6106	22.7179	21.5546	18.9166	18.3141	19.3328	19.8649	22.7545	24.9293	28.3828	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	242.8503	214.8773	228.3630	200.7676	194.6563	175.4257	173.0530	179.8440	181.7478	202.6559	215.5103	240.1776	(62)
WWHRS	-27.1501	-24.0117	-25.1437	-20.8200	-19.4035	-16.6037	-15.5633	-16.5500	-17.1788	-20.2519	-22.9430	-26.6473	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	215.7002	190.8656	203.2193	179.9476	175.2528	158.8220	157.4896	163.2939	164.5689	182.4040	192.5673	213.5303	(64)
										Total per year (kWh/year) = Sum(64)m =		2197.6615	(64)
12Total per year (kWh/year)												2198	(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	76.5436	67.6494	71.7266	62.6867	60.5191	54.2606	53.3360	55.5940	56.3626	63.1790	67.5887	75.6549	(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	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	95.8725	106.1446	95.8725	99.0683	95.8725	99.0683	95.8725	95.8725	99.0683	95.8725	99.0683	95.8725	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	183.4018	185.3050	180.5091	170.2993	157.4113	145.2984	137.2062	135.3031	140.0989	150.3087	163.1967	175.3096	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	(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)	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	(71)
Water heating gains (Table 5)	102.8812	100.6688	96.4067	87.0649	81.3429	75.3619	71.6882	74.7231	78.2814	84.9180	93.8732	101.6867	(72)
Total internal gains	439.6189	449.5817	430.2517	413.8959	392.0901	374.1919	359.2303	360.3621	371.9120	388.5626	413.6016	430.3323	(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	4.5900	10.6334	0.6300	0.7000	0.7700	14.9161	(74)
East	6.0400	19.6403	0.6300	0.7000	0.7700	36.2540	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	51.1701	99.4260	165.2338	248.1436	313.5666	325.9017	308.2057	257.8710	194.0766	118.0853	63.6055	42.2484	(83)
Total gains	490.7891	549.0078	595.4856	662.0395	705.6567	700.0936	667.4360	618.2331	565.9886	506.6479	477.2070	472.5807	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.8885	69.0540	69.2170	69.9928	70.1399	70.8328	70.8328	70.9627	70.5643	70.1399	69.8430	69.5352	
alpha	5.5926	5.6036	5.6145	5.6662	5.6760	5.7222	5.7222	5.7308	5.7043	5.6760	5.6562	5.6357	
util living area	0.9959	0.9916	0.9803	0.9346	0.8161	0.6182	0.4561	0.5114	0.7753	0.9581	0.9912	0.9967	(86)
MIT	19.9048	20.0614	20.3029	20.6365	20.8786	20.9800	20.9970	20.9944	20.9323	20.6177	20.2100	19.8815	(87)
Th 2	19.9884	19.9906	19.9927	20.0028	20.0046	20.0134	20.0134	20.0150	20.0100	20.0046	20.0008	19.9969	(88)
util rest of house	0.9945	0.9887	0.9730	0.9111	0.7596	0.5311	0.3555	0.4050	0.6926	0.9380	0.9875	0.9955	(89)
MIT 2	18.7256	18.9263	19.2325	19.6454	19.9090	20.0032	20.0126	20.0133	19.9680	19.6334	19.1242	18.7023	(90)
Living area fraction									fLA = Living area / (4) =			0.4737	(91)
MIT	19.2842	19.4640	19.7395	20.1149	20.3683	20.4659	20.4789	20.4781	20.4247	20.0996	19.6385	19.2609	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2842	19.4640	19.7395	20.1149	20.3683	20.4659	20.4789	20.4781	20.4247	20.0996	19.6385	19.2609	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9931	0.9867	0.9708	0.9141	0.7816	0.5720	0.4033	0.4556	0.7295	0.9403	0.9858	0.9944	(94)
Useful gains	487.4132	541.6824	578.0714	605.1845	551.5740	400.4489	269.1859	281.6783	412.8662	476.3942	470.4286	469.9106	(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	1072.8355	1040.2520	943.4265	790.2929	609.5567	408.4574	270.0960	283.4462	442.0843	668.0208	885.4657	1068.2977	(97)
Space heating kWh	435.5541	335.0388	271.8242	133.2780	43.1392	0.0000	0.0000	0.0000	0.0000	142.5701	298.8267	445.2000	(98a)
Space heating requirement - total per year (kWh/year)												2105.4312	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	435.5541	335.0388	271.8242	133.2780	43.1392	0.0000	0.0000	0.0000	0.0000	142.5701	298.8267	445.2000	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2105.4312	
Space heating per m2										(98c) / (4) =		32.7949	(99)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	435.5541	335.0388	271.8242	133.2780	43.1392	0.0000	0.0000	0.0000	0.0000	142.5701	298.8267	445.2000	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	471.3789	362.5961	294.1820	144.2403	46.6874	0.0000	0.0000	0.0000	0.0000	154.2967	323.4056	481.8182	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	215.7002	190.8656	203.2193	179.9476	175.2528	158.8220	157.4896	163.2939	164.5689	182.4040	192.5673	213.5303	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.8546	85.5738	85.0054	83.7472	81.8643	80.3000	80.3000	80.3000	80.3000	83.8590	85.3192	85.9173	(217)
Fuel for water heating, kWh/month	251.2390	223.0420	239.0663	214.8699	214.0772	197.7858	196.1266	203.3548	204.9426	217.5127	225.7023	248.5301	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	19.9204	15.9809	14.3890	10.5420	8.1430	6.6529	7.4283	9.6556	12.5416	16.4553	18.5862	20.4741	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-30.2873	-42.8302	-61.7623	-69.6930	-75.3878	-70.4802	-69.6359	-65.6378	-58.5951	-49.1151	-33.3540	-26.1720	(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	-16.7134	-35.2064	-70.0528	-105.3172	-139.3402	-140.0101	-138.3364	-117.0684	-85.7452	-50.3524	-22.3188	-13.2109	(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	2278.6052	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2636.2493	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	160.7692	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1586.6229	(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	3575.0007	(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	2278.6052	0.2100	478.5071	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2636.2493	0.2100	553.6124	(264)
Space and water heating			1032.1194	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	160.7692	0.1443	23.2040	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-652.9506	0.1345	-87.8260	
PV Unit electricity exported	-933.6723	0.1259	-117.5231	
Total			-205.3491	(269)
Total CO2, kg/year			861.9036	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.4300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2278.6052	1.1300	2574.8238	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2636.2493	1.1300	2978.9618	(278)
Space and water heating			5553.7856	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	160.7692	1.5338	246.5931	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-652.9506	1.4971	-977.5375	
PV Unit electricity exported	-933.6723	0.4620	-431.3901	
Total			-1408.9276	(283)
Total Primary energy kWh/year			4521.5519	(286)
Target Primary Energy Rate (TPER)			70.4300	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		64.2000 (1b)	x	2.5900 (2b)	=	166.2780	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.2000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	166.2780	(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	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) =	0.1203	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2703	(18)

Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2297 (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	0.2929	0.2872	0.2814	0.2527	0.2470	0.2183	0.2183	0.2125	0.2297	0.2470	0.2585	0.2699	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5429	0.5412	0.5396	0.5319	0.5305	0.5238	0.5238	0.5226	0.5264	0.5305	0.5334	0.5364	(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	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			10.6300	1.1450	12.1718			(27)
Heatloss Floor 1			64.2000	0.1000	6.4200	75.0000	4815.0000	(28a)
External Wall 1	43.4900	10.6300	32.8600	0.1300	4.2718	70.0000	2300.2000	(29a)
sheltered	15.4800	2.1000	13.3800	0.1300	1.7394	70.0000	936.6000	(29a)
Total net area of external elements Aum(A, m2)			123.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.5430			(33)
Party Wall 1			27.3200	0.0000	0.0000	180.0000	4917.6000	(32)
Party Floor 1			64.1600			30.0000	1924.8000	(32d)
Party Ceiling 1			64.2000			30.0000	1926.0000	(32b)
Internal Wall 1			104.0000			9.0000	936.0000	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17756.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 276.5763 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.9200	0.0600	0.4152
E3 Sill	5.9200	0.0400	0.2368
E4 Jamb	25.3200	0.0200	0.5064
E5 Ground floor (normal)	17.0000	0.1300	2.2100
E5 Ground floor (normal)	5.9000	0.3200	1.8880
E7 Party floor between dwellings (in blocks of flats)	17.0000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	5.9000	0.2800	1.6520
E16 Corner (normal)	7.8000	0.0500	0.3900
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0600	-0.1560
P1 Party wall - Ground floor	10.6000	0.3200	3.3920
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.6000	0.0000	0.0000
E18 Party wall between dwellings	2.6000	0.2400	0.6240
E18 Party wall between dwellings	2.6000	0.2400	0.6240

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.7824 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.3254 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.7899	29.6985	29.6089	29.1880	29.1093	28.7427	28.7427	28.6749	28.8839	29.1093	29.2686	29.4351	(38)
Heat transfer coeff	69.1152	69.0238	68.9342	68.5134	68.4346	68.0681	68.0681	68.0002	68.2093	68.4346	68.5939	68.7605	(39)

Average = Sum(39)m / 12 = 68.5130

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0766	1.0751	1.0737	1.0672	1.0660	1.0603	1.0603	1.0592	1.0624	1.0660	1.0684	1.0710	(40)
HLP (average)												1.0672	
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 2.0976 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

25.6623	25.2812	24.7445	23.7550	23.0140	22.1923	21.7485	22.2815	22.8618	23.7409	24.7509	25.5756	(42b)

Hot water usage for other uses

36.1111	34.7980	33.4848	32.1717	30.8586	29.5455	29.5455	30.8586	32.1717	33.4848	34.7980	36.1111	(42c)

Average daily hot water use (litres/day) 56.6213 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	61.7735	60.0792	58.2294	55.9267	53.8726	51.7378	51.2940	53.1401	55.0335	57.2258	59.5489	61.6867	(44)
Energy conte	97.8341	85.5520	89.4964	76.5608	72.5228	63.6176	62.0356	65.7985	67.8618	77.6548	84.8383	96.5865	(45)

Energy content (annual) Total = Sum(45)m = 940.3592

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

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 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

83.1590	72.7192	76.0719	65.0767	61.6444	54.0750	52.7303	55.9287	57.6825	66.0066	72.1125	82.0985	(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

83.1590	72.7192	76.0719	65.0767	61.6444	54.0750	52.7303	55.9287	57.6825	66.0066	72.1125	82.0985	(64)

Total per year (kWh/year) = Sum(64)m = 799.3053 (64)
12Total per year (kWh/year) 799 (64)
Electric shower(s)

47.5605	42.3768	46.2739	44.1586	44.9872	42.9134	44.3439	44.9872	44.1586	46.2739	45.4037	47.5605	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 540.9981 (64a)

Heat gains from water heating, kWh/month

32.6799	28.7740	30.5864	27.3088	26.6579	24.2471	24.2685	25.2290	25.4603	28.0701	29.3791	32.4148	(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	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	95.8725	106.1446	95.8725	99.0683	95.8725	99.0683	95.8725	95.8725	99.0683	95.8725	99.0683	95.8725	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	183.4018	185.3050	180.5091	170.2993	157.4113	145.2984	137.2062	135.3031	140.0989	150.3087	163.1967	175.3096	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	(71)
Water heating gains (Table 5)													
	43.9246	42.8185	41.1108	37.9289	35.8305	33.6765	32.6190	33.9099	35.3615	37.7287	40.8043	43.5682	(72)
Total internal gains													
	377.6623	388.7314	371.9558	361.7599	343.5777	332.5066	320.1611	319.5489	328.9921	338.3733	357.5326	369.2138	(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	4.5900	10.6334	0.7200	0.7000	0.7700	17.0470	(74)
East	6.0400	19.6403	0.7200	0.7000	0.7700	41.4332	(76)

Solar gains	58.4802	113.6298	188.8387	283.5927	358.3618	372.4591	352.2351	294.7097	221.8018	134.9546	72.6920	48.2838	(83)
Total gains	436.1424	502.3611	560.7945	645.3526	701.9396	704.9656	672.3963	614.2586	550.7938	473.3279	430.2246	417.4976	(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	71.3631	71.4576	71.5505	71.9900	72.0728	72.4609	72.4609	72.5333	72.3109	72.0728	71.9055	71.7313	
alpha	5.7575	5.7638	5.7700	5.7993	5.8049	5.8307	5.8307	5.8356	5.8207	5.8049	5.7937	5.7821	
util living area													
	0.9977	0.9943	0.9840	0.9366	0.8082	0.6031	0.4432	0.5043	0.7788	0.9665	0.9945	0.9982	(86)
MIT	19.8786	20.0457	20.3015	20.6492	20.8920	20.9837	20.9977	20.9953	20.9348	20.6028	20.1792	19.8473	(87)
Th 2	20.0200	20.0212	20.0223	20.0277	20.0287	20.0334	20.0334	20.0343	20.0316	20.0287	20.0267	20.0246	(88)
util rest of house													
	0.9969	0.9923	0.9781	0.9139	0.7518	0.5188	0.3471	0.4011	0.6977	0.9498	0.9921	0.9976	(89)
MIT 2	19.0036	19.1707	19.4237	19.7581	19.9628	20.0270	20.0329	20.0332	19.9999	19.7230	19.3085	18.9762	(90)
Living area fraction									fLA = Living area / (4) =			0.4737	(91)
MIT	19.4181	19.5851	19.8395	20.1802	20.4029	20.4801	20.4899	20.4889	20.4427	20.1397	19.7210	19.3888	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4181	19.5851	19.8395	20.1802	20.4029	20.4801	20.4899	20.4889	20.4427	20.1397	19.7210	19.3888	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9962	0.9911	0.9767	0.9179	0.7749	0.5585	0.3927	0.4502	0.7343	0.9521	0.9912	0.9970	(94)
Useful gains	434.4770	497.8902	547.7227	592.3821	543.9270	393.7352	264.0760	276.5474	404.4426	450.6573	426.4260	416.2463	(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													
	1044.8891	1013.6247	919.5470	772.8435	595.5812	400.2490	264.7780	278.0454	432.6341	652.8487	865.7205	1044.3893	(97)
Space heating kWh													
	454.1466	346.5735	276.6373	129.9322	38.4307	0.0000	0.0000	0.0000	0.0000	150.4304	316.2921	467.3384	(98a)
Space heating requirement - total per year (kWh/year)												2179.7813	
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													
	454.1466	346.5735	276.6373	129.9322	38.4307	0.0000	0.0000	0.0000	0.0000	150.4304	316.2921	467.3384	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2179.7813	
Space heating per m2											(98c) / (4) =	33.9530	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	639.8401	503.7039	516.8017	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9257	0.9655	0.9441	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	592.3169	486.3011	487.8994	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	785.9042	749.8060	683.7366	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	139.3828	196.0476	145.7029	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	34.8457	49.0119	36.4257	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												120.2833	(107)
Energy for space heating												33.9530	(99)
Energy for space cooling												1.8736	(108)
Total												35.8266	(109)
Fabric Energy Efficiency (DFEE)												35.8	(109)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.2000	(1b)	x 2.5900	(2b) =	166.2780	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		166.2780	(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) =	0.1203	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3703	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3147	(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	0.4013	0.3934	0.3856	0.3462	0.3383	0.2990	0.2990	0.2911	0.3147	0.3383	0.3541	0.3698	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5805	0.5774	0.5743	0.5599	0.5572	0.5447	0.5447	0.5424	0.5495	0.5572	0.5627	0.5684	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			10.6300	1.1450	12.1718			(27)
Heatloss Floor 1			64.2000	0.1300	8.3460			(28a)
External Wall 1	43.4900	10.6300	32.8600	0.1800	5.9148			(29a)
sheltered	15.4800	2.1000	13.3800	0.1800	2.4084			(29a)
Total net area of external elements Aum(A, m2)			123.1700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.9410			(33)
Party Wall 1			27.3200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 276.5763 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	6.9200	0.0500	0.3460
E3	Sill	5.9200	0.0500	0.2960
E4	Jamb	25.3200	0.0500	1.2660
E5	Ground floor (normal)	17.0000	0.1600	2.7200
E5	Ground floor (normal)	5.9000	0.1600	0.9440
E7	Party floor between dwellings (in blocks of flats)	17.0000	0.0700	1.1900
E7	Party floor between dwellings (in blocks of flats)	5.9000	0.0700	0.4130
E16	Corner (normal)	7.8000	0.0900	0.7020
E17	Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340
P1	Party wall - Ground floor	10.6000	0.0800	0.8480
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	10.6000	0.0000	0.0000
E18	Party wall between dwellings	2.6000	0.0600	0.1560
E18	Party wall between dwellings	2.6000	0.0600	0.1560

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.8030 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 39.7440 (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	31.8540	31.6824	31.5143	30.7244	30.5766	29.8887	29.8887	29.7613	30.1537	30.5766	30.8756	31.1881	(38)
Heat transfer coeff	71.5980	71.4264	71.2582	70.4684	70.3206	69.6326	69.6326	69.5052	69.8976	70.3206	70.6195	70.9321	(39)
Average = Sum(39)m / 12 =												70.4677	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1152	1.1126	1.1099	1.0976	1.0953	1.0846	1.0846	1.0826	1.0887	1.0953	1.1000	1.1049	(40)
HLP (average)												1.0976	
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 2.0976 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

25.6623	25.2812	24.7445	23.7550	23.0140	22.1923	21.7485	22.2815	22.8618	23.7409	24.7509	25.5756	(42b)

Hot water usage for other uses

36.1111	34.7980	33.4848	32.1717	30.8586	29.5455	29.5455	30.8586	32.1717	33.4848	34.7980	36.1111	(42c)

Average daily hot water use (litres/day) 56.6213 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	61.7735	60.0792	58.2294	55.9267	53.8726	51.7378	51.2940	53.1401	55.0335	57.2258	59.5489	61.6867	(44)
Energy conte	97.8341	85.5520	89.4964	76.5608	72.5228	63.6176	62.0356	65.7985	67.8618	77.6548	84.8383	96.5865	(45)
Energy content (annual)											Total = Sum(45)m =	940.3592	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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													
	83.1590	72.7192	76.0719	65.0767	61.6444	54.0750	52.7303	55.9287	57.6825	66.0066	72.1125	82.0985	(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													
	83.1590	72.7192	76.0719	65.0767	61.6444	54.0750	52.7303	55.9287	57.6825	66.0066	72.1125	82.0985	(64)
											Total per year (kWh/year) = Sum(64)m =	799.3053	(64)
12Total per year (kWh/year)												799	(64)
Electric shower(s)													
	47.5605	42.3768	46.2739	44.1586	44.9872	42.9134	44.3439	44.9872	44.1586	46.2739	45.4037	47.5605	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 540.9981 (64a)

Heat gains from water heating, kWh/month

32.6799	28.7740	30.5864	27.3088	26.6579	24.2471	24.2685	25.2290	25.4603	28.0701	29.3791	32.4148	(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	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	95.8725	106.1446	95.8725	99.0683	95.8725	99.0683	95.8725	95.8725	99.0683	95.8725	99.0683	95.8725	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	183.4018	185.3050	180.5091	170.2993	157.4113	145.2984	137.2062	135.3031	140.0989	150.3087	163.1967	175.3096	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	(71)
Water heating gains (Table 5)													
	43.9246	42.8185	41.1108	37.9289	35.8305	33.6765	32.6190	33.9099	35.3615	37.7287	40.8043	43.5682	(72)
Total internal gains													
	377.6623	388.7314	371.9558	361.7599	343.5777	332.5066	320.1611	319.5489	328.9921	338.3733	357.5326	369.2138	(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	4.5900	10.6334	0.6300	0.7000	0.7700	14.9161	(74)
East	6.0400	19.6403	0.6300	0.7000	0.7700	36.2540	(76)

Solar gains	51.1701	99.4260	165.2338	248.1436	313.5666	325.9017	308.2057	257.8710	194.0766	118.0853	63.6055	42.2484	(83)
Total gains	428.8324	488.1574	537.1897	609.9035	657.1443	658.4083	628.3669	577.4199	523.0686	456.4585	421.1381	411.4621	(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	68.8885	69.0540	69.2170	69.9928	70.1399	70.8328	70.8328	70.9627	70.5643	70.1399	69.8430	69.5352	
alpha	5.5926	5.6036	5.6145	5.6662	5.6760	5.7222	5.7222	5.7308	5.7043	5.6760	5.6562	5.6357	
util living area													
	0.9979	0.9953	0.9876	0.9522	0.8482	0.6516	0.4835	0.5452	0.8142	0.9730	0.9952	0.9984	(86)
MIT	19.8105	19.9706	20.2205	20.5775	20.8498	20.9741	20.9960	20.9923	20.9122	20.5535	20.1263	19.7880	(87)
Th 2	19.9884	19.9906	19.9927	20.0028	20.0046	20.0134	20.0134	20.0150	20.0100	20.0046	20.0008	19.9969	(88)
util rest of house													
	0.9972	0.9935	0.9828	0.9336	0.7958	0.5622	0.3774	0.4331	0.7354	0.9588	0.9931	0.9978	(89)
MIT 2	18.9106	19.0716	19.3205	19.6718	19.9098	20.0028	20.0125	20.0132	19.9658	19.6569	19.2353	18.8950	(90)
Living area fraction										fLA = Living area / (4) =		0.4737	(91)
MIT	19.3369	19.4974	19.7468	20.1008	20.3550	20.4629	20.4784	20.4770	20.4141	20.0816	19.6573	19.3180	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3369	19.4974	19.7468	20.1008	20.3550	20.4629	20.4784	20.4770	20.4141	20.0816	19.6573	19.3180	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9965	0.9924	0.9814	0.9358	0.8158	0.6041	0.4278	0.4865	0.7702	0.9601	0.9922	0.9972	(94)
Useful gains	427.3296	484.4385	527.1769	570.7181	536.0709	397.7602	268.8288	280.9090	402.8571	438.2501	417.8380	410.3129	(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													
	1076.6095	1042.6414	943.9419	789.3026	608.6275	408.2491	270.0601	283.3710	441.3399	666.7506	886.7941	1072.3506	(97)
Space heating kWh													
	483.0642	375.1123	310.0732	157.3808	53.9821	0.0000	0.0000	0.0000	0.0000	170.0043	337.6484	492.5560	(98a)
Space heating requirement - total per year (kWh/year)												2379.8214	
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													
	483.0642	375.1123	310.0732	157.3808	53.9821	0.0000	0.0000	0.0000	0.0000	170.0043	337.6484	492.5560	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2379.8214	
Space heating per m2											(98c) / (4) =	37.0689	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	654.5469	515.2816	528.2399	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8942	0.9471	0.9201	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	585.2827	488.0312	486.0532	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	731.4864	698.3430	640.6784	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	105.2667	156.4720	115.0412	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	26.3167	39.1180	28.7603	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												94.1949	(107)
Energy for space heating												37.0689	(99)
Energy for space cooling												1.4672	(108)
Total												38.5361	(109)
Fabric Energy Efficiency (TFEE)												38.5	(109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.2000	(1b)	x 2.5900	(2b) =	166.2780	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		166.2780	(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		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (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													
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(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) =												81.0000	(23c)
Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448	(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	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			10.6300	1.1450	12.1718			(27)
Heatloss Floor 1			64.2000	0.1000	6.4200	75.0000	4815.0000	(28a)
External Wall 1	43.4900	10.6300	32.8600	0.1300	4.2718	70.0000	2300.2000	(29a)
sheltered	15.4800	2.1000	13.3800	0.1300	1.7394	70.0000	936.6000	(29a)
Total net area of external elements Aum(A, m2)			123.1700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.5430			(33)
Party Wall 1			27.3200	0.0000	0.0000	180.0000	4917.6000	(32)
Party Floor 1			64.1600			30.0000	1924.8000	(32d)
Party Ceiling 1			64.2000			30.0000	1926.0000	(32b)
Internal Wall 1			104.0000			9.0000	936.0000	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17756.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 276.5763 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.9200	0.0600	0.4152
E3 Sill	5.9200	0.0400	0.2368
E4 Jamb	25.3200	0.0200	0.5064
E5 Ground floor (normal)	17.0000	0.1300	2.2100
E5 Ground floor (normal)	5.9000	0.3200	1.8880
E7 Party floor between dwellings (in blocks of flats)	17.0000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	5.9000	0.2800	1.6520
E16 Corner (normal)	7.8000	0.0500	0.3900
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0600	-0.1560
P1 Party wall - Ground floor	10.6000	0.3200	3.3920
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.6000	0.0000	0.0000
E18 Party wall between dwellings	2.6000	0.2400	0.6240
E18 Party wall between dwellings	2.6000	0.2400	0.6240

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.7824 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.3254 (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	14.1329	13.9580	13.7831	12.9086	12.7337	11.8592	11.8592	11.6843	12.2090	12.7337	13.0835	13.4333	(38)
Heat transfer coeff	53.4583	53.2834	53.1085	52.2339	52.0590	51.1845	51.1845	51.0096	51.5343	52.0590	52.4088	52.7586	(39)
Average = Sum(39)m / 12 =												52.1902	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8327	0.8300	0.8272	0.8136	0.8109	0.7973	0.7973	0.7945	0.8027	0.8109	0.8163	0.8218	(40)
HLP (average)												0.8129	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0976 (42)
Hot water usage for mixer showers
89.0832 87.7444 85.7936 82.0611 79.3066 76.2347 74.4887 76.4248 78.5471 81.8452 85.6580 88.7419 (42a)
Hot water usage for baths
25.6623 25.2812 24.7445 23.7550 23.0140 22.1923 21.7485 22.2815 22.8618 23.7409 24.7509 25.5756 (42b)
Hot water usage for other uses
36.1111 34.7980 33.4848 32.1717 30.8586 29.5455 29.5455 30.8586 32.1717 33.4848 34.7980 36.1111 (42c)
Average daily hot water use (litres/day) 138.7530 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.8566	147.8236	144.0230	137.9877	133.1791	127.9725	125.7827	129.5648	133.5805	139.0710	145.2068	150.4286	(44)
Energy conte	238.9200	210.4989	221.3580	188.8983	179.2847	157.3572	152.1233	160.4283	164.7181	188.7181	206.8737	235.5348	(45)
Energy content (annual)										Total = Sum(45)m =		2304.7134	
Distribution loss (46)m = 0.15 x (45)m	35.8380	31.5748	33.2037	28.3347	26.8927	23.6036	22.8185	24.0643	24.7077	28.3077	31.0311	35.3302	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	289.8789	256.5263	272.3169	238.2134	230.2436	206.6722	203.0822	211.3872	214.0332	239.6770	256.1888	286.4937	(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	289.8789	256.5263	272.3169	238.2134	230.2436	206.6722	203.0822	211.3872	214.0332	239.6770	256.1888	286.4937	(64)
										Total per year (kWh/year) = Sum(64)m =		2904.7134	(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	92.1806	81.4977	86.3413	75.1375	72.3519	64.6500	63.3207	66.0821	67.0976	75.4885	81.1143	91.0550	(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	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.8105	26.4774	21.5329	16.3018	12.1858	10.2877	11.1163	14.4493	19.3939	24.6250	28.7410	30.6390	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	273.7341	276.5746	269.4166	254.1781	234.9423	216.8633	204.7854	201.9449	209.1029	224.3414	243.5772	261.6562	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	(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)	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	(71)
Water heating gains (Table 5)	123.8987	121.2764	116.0501	104.3576	97.2472	89.7917	85.1085	88.8201	93.1910	101.4630	112.6587	122.3858	(72)

Total internal gains	522.0774	518.9625	501.6336	469.4716	439.0093	408.5768	392.6443	396.8484	413.3219	445.0635	479.6110	509.3151	(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	4.5900	10.6334	0.7200	0.7000	0.7700	17.0470	(74)
East	6.0400	19.6403	0.7200	0.7000	0.7700	41.4332	(76)

Solar gains	58.4802	113.6298	188.8387	283.5927	358.3618	372.4591	352.2351	294.7097	221.8018	134.9546	72.6920	48.2838	(83)
Total gains	580.5575	632.5922	690.4723	753.0642	797.3711	781.0359	744.8794	691.5582	635.1237	580.0181	552.3030	557.5990	(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	92.2641	92.5670	92.8718	94.4267	94.7439	96.3627	96.3627	96.6931	95.7086	94.7439	94.1116	93.4876	
alpha	7.1509	7.1711	7.1915	7.2951	7.3163	7.4242	7.4242	7.4462	7.3806	7.3163	7.2741	7.2325	
util living area	0.9834	0.9678	0.9202	0.7902	0.6009	0.4190	0.3023	0.3392	0.5564	0.8474	0.9641	0.9867	(86)
MIT	20.4764	20.6001	20.7806	20.9397	20.9918	20.9995	21.0000	20.9999	20.9964	20.9184	20.6802	20.4520	(87)
Th 2	20.2251	20.2274	20.2298	20.2416	20.2439	20.2557	20.2557	20.2581	20.2510	20.2439	20.2392	20.2345	(88)
util rest of house	0.9785	0.9588	0.9005	0.7529	0.5543	0.3705	0.2512	0.2846	0.4976	0.8077	0.9526	0.9827	(89)
MIT 2	19.7642	19.8853	20.0549	20.2000	20.2394	20.2555	20.2557	20.2580	20.2494	20.1891	19.9740	19.7487	(90)
Living area fraction									fLA = Living area / (4) =			0.4737	(91)
MIT	20.1015	20.2239	20.3986	20.5504	20.5958	20.6079	20.6082	20.6095	20.6033	20.5346	20.3085	20.0818	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.9515	20.0739	20.2486	20.4004	20.4458	20.4579	20.4582	20.4595	20.4533	20.3846	20.1585	19.9318	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9764	0.9567	0.9010	0.7610	0.5669	0.3837	0.2651	0.2994	0.5136	0.8156	0.9511	0.9808	(94)
Useful gains	566.8367	605.2154	622.1186	573.1152	452.0285	299.6838	197.4744	207.0528	326.2142	473.0523	525.3211	546.8895	(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	836.7034	808.5163	730.1681	600.7115	455.2970	299.8351	197.4820	207.0711	327.4115	509.3743	684.3809	829.9907	(97)
Space heating kWh	200.7808	136.6182	80.3889	19.8693	2.4318	0.0000	0.0000	0.0000	0.0000	27.0236	114.5230	210.6272	(98a)
Space heating requirement - total per year (kWh/year)												792.2629	
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	200.7808	136.6182	80.3889	19.8693	2.4318	0.0000	0.0000	0.0000	0.0000	27.0236	114.5230	210.6272	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												792.2629	
Space heating per m2										(98c) / (4) =		12.3405	(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 %)	89.5000	(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	200.7808	136.6182	80.3889	19.8693	2.4318	0.0000	0.0000	0.0000	0.0000	27.0236	114.5230	210.6272	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	224.3361	152.6461	89.8200	22.2004	2.7171	0.0000	0.0000	0.0000	0.0000	30.1940	127.9587	235.3377	(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	289.8789	256.5263	272.3169	238.2134	230.2436	206.6722	203.0822	211.3872	214.0332	239.6770	256.1888	286.4937	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	323.8871	286.6216	304.2647	266.1602	257.2554	230.9187	226.9075	236.1869	239.1433	267.7955	286.2445	320.1047	(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	17.7277	16.0121	17.7277	17.1559	17.7277	17.1559	17.7277	17.7277	17.1559	17.7277	17.1559	17.7277	(231)
Lighting	26.0929	20.9327	18.8476	13.8086	10.6661	8.7143	9.7300	12.6474	16.4278	21.5541	24.3453	26.8181	(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	885.2100	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	3245.4899	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)		
mechanical ventilation fans (SFP = 0.6050)	122.7298	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	208.7298	(231)
Electricity for lighting (calculated in Appendix L)	210.5850	(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	4550.0147	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	885.2100	3.6400	32.2216	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3245.4899	3.6400	118.1358	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	208.7298	16.4900	34.4195	(249)
Energy for lighting	210.5850	16.4900	34.7255	(250)
Additional standing charges			92.0000	(251)
Total energy cost			311.5025	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0269	(257)
SAP value		83.3534	
SAP rating (Section 12)		83	(258)
SAP band		B	

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	885.2100	0.2100	185.8941	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3245.4899	0.2100	681.5529	(264)
Space and water heating			867.4470	(265)
Pumps, fans and electric keep-hot	208.7298	0.1387	28.9534	(267)
Energy for lighting	210.5850	0.1443	30.3939	(268)
Total CO2, kg/year			926.7943	(272)
CO2 emissions per m2			14.4400	(273)
EI value			88.6272	
EI rating			89	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		64.2000	(1b)	x 2.5900	(2b) =	166.2780	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.2000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		166.2780	(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		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000	(22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750	(22a)
Adj infilt rate	0.1466	0.1371	0.1403	0.1275	0.1275	0.1116	0.1148	0.1211	0.1179	0.1243	0.1243	0.1371	(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) =	81.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2416	0.2321	0.2352	0.2225	0.2225	0.2066	0.2097	0.2161	0.2129	0.2193	0.2193	0.2321	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			10.6300	1.1450	12.1718			(27)
Heatloss Floor 1			64.2000	0.1000	6.4200	75.0000	4815.0000	(28a)
External Wall 1	43.4900	10.6300	32.8600	0.1300	4.2718	70.0000	2300.2000	(29a)
sheltered	15.4800	2.1000	13.3800	0.1300	1.7394	70.0000	936.6000	(29a)
Total net area of external elements Aum(A, m2)			123.1700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.5430			(33)
Party Wall 1			27.3200	0.0000	0.0000	180.0000	4917.6000	(32)
Party Floor 1			64.1600			30.0000	1924.8000	(32d)
Party Ceiling 1			64.2000			30.0000	1926.0000	(32b)
Internal Wall 1			104.0000			9.0000	936.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17756.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		276.5763 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.9200	0.0600	0.4152
E3 Sill	5.9200	0.0400	0.2368
E4 Jamb	25.3200	0.0200	0.5064
E5 Ground floor (normal)	17.0000	0.1300	2.2100
E5 Ground floor (normal)	5.9000	0.3200	1.8880
E7 Party floor between dwellings (in blocks of flats)	17.0000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	5.9000	0.2800	1.6520
E16 Corner (normal)	7.8000	0.0500	0.3900
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0600	-0.1560
P1 Party wall - Ground floor	10.6000	0.3200	3.3920
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.6000	0.0000	0.0000
E18 Party wall between dwellings	2.6000	0.2400	0.6240
E18 Party wall between dwellings	2.6000	0.2400	0.6240

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		11.7824 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	39.3254 (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	13.2584	12.7337	12.9086	12.2090	12.2090	11.3344	11.5093	11.8592	11.6843	12.0341	12.0341	12.7337	(38)
Heat transfer coeff	52.5837	52.0590	52.2339	51.5343	51.5343	50.6598	50.8347	51.1845	51.0096	51.3594	51.3594	52.0590	(39)
Average = Sum(39)m / 12 =												51.5343	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8191	0.8109	0.8136	0.8027	0.8027	0.7891	0.7918	0.7973	0.7945	0.8000	0.8000	0.8109	(40)
HLP (average)												0.8027	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.0976 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	89.0832	87.7444	85.7936	82.0611	79.3066	76.2347	74.4887	76.4248	78.5471	81.8452	85.6580	88.7419	(42a)
Hot water usage for baths	25.6623	25.2812	24.7445	23.7550	23.0140	22.1923	21.7485	22.2815	22.8618	23.7409	24.7509	25.5756	(42b)
Hot water usage for other uses	36.1111	34.7980	33.4848	32.1717	30.8586	29.5455	29.5455	30.8586	32.1717	33.4848	34.7980	36.1111	(42c)
Average daily hot water use (litres/day)												138.7530	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.8566	147.8236	144.0230	137.9877	133.1791	127.9725	125.7827	129.5648	133.5805	139.0710	145.2068	150.4286	(44)
Energy conte	238.9200	210.4989	221.3580	188.8983	179.2847	157.3572	152.1233	160.4283	164.7181	188.7181	206.8737	235.5348	(45)
Energy content (annual)										Total = Sum(45)m =		2304.7134	
Distribution loss (46)m = 0.15 x (45)m	35.8380	31.5748	33.2037	28.3347	26.8927	23.6036	22.8185	24.0643	24.7077	28.3077	31.0311	35.3302	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)

Total heat required for water heating calculated for each month

	289.8789	256.5263	272.3169	238.2134	230.2436	206.6722	203.0822	211.3872	214.0332	239.6770	256.1888	286.4937	(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

	289.8789	256.5263	272.3169	238.2134	230.2436	206.6722	203.0822	211.3872	214.0332	239.6770	256.1888	286.4937	(64)

Total per year (kWh/year) = Sum(64)m = 2904.7134 (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

	92.1806	81.4977	86.3413	75.1375	72.3519	64.6500	63.3207	66.0821	67.0976	75.4885	81.1143	91.0550	(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	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	(66)

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

	29.8105	26.4774	21.5329	16.3018	12.1858	10.2877	11.1163	14.4493	19.3939	24.6250	28.7410	30.6390	(67)

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

	273.7341	276.5746	269.4166	254.1781	234.9423	216.8633	204.7854	201.9449	209.1029	224.3414	243.5772	261.6562	(68)

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

	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	(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)

	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	(71)

Water heating gains (Table 5)

	123.8987	121.2764	116.0501	104.3576	97.2472	89.7917	85.1085	88.8201	93.1910	101.4630	112.6587	122.3858	(72)

Total internal gains

	522.0774	518.9625	501.6336	469.4716	439.0093	408.5768	392.6443	396.8484	413.3219	445.0635	479.6110	509.3151	(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	4.5900	11.5821	0.7200	0.7000	0.7700	18.5679	(74)
East	6.0400	21.5869	0.7200	0.7000	0.7700	45.5399	(76)

Solar gains	64.1077	112.0713	187.2226	291.9276	356.0541	396.5076	376.1837	322.0395	243.3578	145.4874	82.3484	54.1842	(83)
Total gains	586.1851	631.0338	688.8563	761.3992	795.0634	805.0844	768.8279	718.8880	656.6797	590.5509	561.9594	563.4994	(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	93.7985	94.7439	94.4267	95.7086	95.7086	97.3608	97.0258	96.3627	96.6931	96.0345	96.0345	94.7439	
alpha	7.2532	7.3163	7.2951	7.3806	7.3806	7.4907	7.4684	7.4242	7.4462	7.4023	7.4023	7.3163	
util living area													
	0.9734	0.9544	0.8798	0.7044	0.4913	0.2894	0.1653	0.1922	0.4191	0.7443	0.9357	0.9778	(86)
MIT	20.5927	20.6912	20.8638	20.9754	20.9982	21.0000	21.0000	21.0000	20.9996	20.9713	20.7930	20.5735	(87)
Th 2	20.2368	20.2439	20.2416	20.2510	20.2510	20.2628	20.2604	20.2557	20.2581	20.2533	20.2533	20.2439	(88)
util rest of house													
	0.9655	0.9419	0.8523	0.6612	0.4434	0.2431	0.1164	0.1392	0.3617	0.6919	0.9161	0.9710	(89)
MIT 2	19.8874	19.9865	20.1391	20.2356	20.2502	20.2628	20.2604	20.2557	20.2579	20.2368	20.0912	19.8755	(90)
Living area fraction									fLA = Living area / (4) =			0.4737	(91)
MIT	20.2215	20.3203	20.4824	20.5860	20.6045	20.6120	20.6107	20.6083	20.6092	20.5847	20.4236	20.2061	(92)
Temperature adjustment												-0.1500	
adjusted MIT	20.0715	20.1703	20.3324	20.4360	20.4545	20.4620	20.4607	20.4583	20.4592	20.4347	20.2736	20.0561	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9635	0.9405	0.8559	0.6721	0.4565	0.2556	0.1296	0.1537	0.3773	0.7051	0.9167	0.9690	(94)
Useful gains	564.7642	593.4832	589.5712	511.7384	362.9367	205.7733	99.6739	110.4693	247.7590	416.4045	515.1580	546.0522	(95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000	(96)
Heat loss rate W													
	771.4830	748.1048	654.6169	522.3524	363.5499	205.7789	99.6740	110.4694	247.8680	428.0648	614.9587	762.9824	(97)
Space heating kWh													
	153.7988	103.9057	48.3940	7.6421	0.4562	0.0000	0.0000	0.0000	0.0000	8.6753	71.8565	161.3961	(98a)

Space heating requirement - total per year (kWh/year) 556.1246

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

	153.7988	103.9057	48.3940	7.6421	0.4562	0.0000	0.0000	0.0000	0.0000	8.6753	71.8565	161.3961	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 556.1246

Space heating per m2 (98c) / (4) = 8.6624 (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 %)	89.5000	(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													
	153.7988	103.9057	48.3940	7.6421	0.4562	0.0000	0.0000	0.0000	0.0000	8.6753	71.8565	161.3961	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	171.8423	116.0958	54.0715	8.5386	0.5097	0.0000	0.0000	0.0000	0.0000	9.6931	80.2866	180.3308	(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													
	289.8789	256.5263	272.3169	238.2134	230.2436	206.6722	203.0822	211.3872	214.0332	239.6770	256.1888	286.4937	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	323.8871	286.6216	304.2647	266.1602	257.2554	230.9187	226.9075	236.1869	239.1433	267.7955	286.2445	320.1047	(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	17.7277	16.0121	17.7277	17.1559	17.7277	17.1559	17.7277	17.7277	17.1559	17.7277	17.1559	17.7277	(231)
Lighting	26.0929	20.9327	18.8476	13.8086	10.6661	8.7143	9.7300	12.6474	16.4278	21.5541	24.3453	26.8181	(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	621.3683	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	3245.4899	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)		
mechanical ventilation fans (SFP = 0.6050)	122.7298	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	208.7298	(231)
Electricity for lighting (calculated in Appendix L)	210.5850	(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	4286.1730	(238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	621.3683	6.1900	38.4627	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3245.4899	6.1900	200.8958	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	208.7298	25.1600	52.5164	(249)
Energy for lighting	210.5850	25.1600	52.9832	(250)
Additional standing charges			102.0000	(251)
Total energy cost			446.8581	(255)

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	621.3683	0.2100	130.4873	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3245.4899	0.2100	681.5529	(264)
Space and water heating			812.0402	(265)
Pumps, fans and electric keep-hot	208.7298	0.1387	28.9534	(267)
Energy for lighting	210.5850	0.1443	30.3939	(268)
Total CO2, kg/year			871.3875	(272)

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	621.3683	1.1300	702.1462	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3245.4899	1.1300	3667.4036	(278)
Space and water heating			4369.5497	(279)
Pumps, fans and electric keep-hot	208.7298	1.5128	315.7664	(281)

Energy for lighting	210.5850	1.5338	323.0023 (282)
Total Primary energy kWh/year			5008.3185 (286)

SAP 10 EPC IMPROVEMENTS

Be Lean

Current energy efficiency rating: B 83
Current environmental impact rating: B 89

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 83
Potential environmental impact rating: B 89

Fuel prices for cost data on this page from database revision number 538 TEST (29 Feb 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£105	£105	£0
Mains gas	£341	£341	£0
Space heating	£193	£193	£0
Water heating	£201	£201	£0
Lighting	£53	£53	£0
Total cost of fuels	£446	£446	£0
Total cost of uses	£447	£447	£0
Delivered energy	67 kWh/m²	67 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m²	14 kg/m²	14 kg/m²	0 kg/m²
Primary energy	78 kWh/m²	78 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.2000 (1b)	x	2.5900 (2b)	=	166.2780	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	166.2780	(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		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(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) =												81.0000	(23c)
Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			10.6300	1.1450	12.1718			(27)
Heatloss Floor 1			64.2000	0.1000	6.4200	75.0000	4815.0000	(28a)
External Wall 1	43.4900	10.6300	32.8600	0.1300	4.2718	70.0000	2300.2000	(29a)
sheltered	15.4800	2.1000	13.3800	0.1300	1.7394	70.0000	936.6000	(29a)
Total net area of external elements Aum(A, m2)			123.1700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.5430			(33)
Party Wall 1			27.3200	0.0000	0.0000	180.0000	4917.6000	(32)
Party Floor 1			64.1600			30.0000	1924.8000	(32d)
Party Ceiling 1			64.2000			30.0000	1926.0000	(32b)
Internal Wall 1			104.0000			9.0000	936.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17756.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		276.5763 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.9200	0.0600	0.4152
E3 Sill	5.9200	0.0400	0.2368
E4 Jamb	25.3200	0.0200	0.5064
E5 Ground floor (normal)	17.0000	0.1300	2.2100
E5 Ground floor (normal)	5.9000	0.3200	1.8880
E7 Party floor between dwellings (in blocks of flats)	17.0000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	5.9000	0.2800	1.6520
E16 Corner (normal)	7.8000	0.0500	0.3900
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0600	-0.1560
P1 Party wall - Ground floor	10.6000	0.3200	3.3920
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.6000	0.0000	0.0000
E18 Party wall between dwellings	2.6000	0.2400	0.6240
E18 Party wall between dwellings	2.6000	0.2400	0.6240

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		11.7824 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	39.3254 (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	14.1329	13.9580	13.7831	12.9086	12.7337	11.8592	11.8592	11.6843	12.2090	12.7337	13.0835	13.4333	(38)
Heat transfer coeff	53.4583	53.2834	53.1085	52.2339	52.0590	51.1845	51.1845	51.0096	51.5343	52.0590	52.4088	52.7586	(39)
Average = Sum(39)m / 12 =												52.1902	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8327	0.8300	0.8272	0.8136	0.8109	0.7973	0.7973	0.7945	0.8027	0.8109	0.8163	0.8218	(40)
HLP (average)												0.8129	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.0976 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
89.0832	87.7444	85.7936	82.0611	79.3066	76.2347	74.4887	76.4248	78.5471	81.8452	85.6580	88.7419	(42a)

Hot water usage for baths

25.6623	25.2812	24.7445	23.7550	23.0140	22.1923	21.7485	22.2815	22.8618	23.7409	24.7509	25.5756	(42b)

Hot water usage for other uses

36.1111	34.7980	33.4848	32.1717	30.8586	29.5455	29.5455	30.8586	32.1717	33.4848	34.7980	36.1111	(42c)
Average daily hot water use (litres/day)												138.7530	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.8566	147.8236	144.0230	137.9877	133.1791	127.9725	125.7827	129.5648	133.5805	139.0710	145.2068	150.4286	(44)
Energy conte	238.9200	210.4989	221.3580	188.8983	179.2847	157.3572	152.1233	160.4283	164.7181	188.7181	206.8737	235.5348	(45)
Energy content (annual)										Total = Sum(45)m =		2304.7134	
Distribution loss (46)m = 0.15 x (45)m	35.8380	31.5748	33.2037	28.3347	26.8927	23.6036	22.8185	24.0643	24.7077	28.3077	31.0311	35.3302	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	289.8789	256.5263	272.3169	238.2134	230.2436	206.6722	203.0822	211.3872	214.0332	239.6770	256.1888	286.4937	(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	289.8789	256.5263	272.3169	238.2134	230.2436	206.6722	203.0822	211.3872	214.0332	239.6770	256.1888	286.4937	(64)
										Total per year (kWh/year) = Sum(64)m =		2904.7134	(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	92.1806	81.4977	86.3413	75.1375	72.3519	64.6500	63.3207	66.0821	67.0976	75.4885	81.1143	91.0550	(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	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.8105	26.4774	21.5329	16.3018	12.1858	10.2877	11.1163	14.4493	19.3939	24.6250	28.7410	30.6390	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	273.7341	276.5746	269.4166	254.1781	234.9423	216.8633	204.7854	201.9449	209.1029	224.3414	243.5772	261.6562	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	(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)													
	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	(71)
Water heating gains (Table 5)													
	123.8987	121.2764	116.0501	104.3576	97.2472	89.7917	85.1085	88.8201	93.1910	101.4630	112.6587	122.3858	(72)
Total internal gains													
	522.0774	518.9625	501.6336	469.4716	439.0093	408.5768	392.6443	396.8484	413.3219	445.0635	479.6110	509.3151	(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	4.5900	10.6334	0.7200	0.7000	0.7700	17.0470	(74)
East	6.0400	19.6403	0.7200	0.7000	0.7700	41.4332	(76)

Solar gains	58.4802	113.6298	188.8387	283.5927	358.3618	372.4591	352.2351	294.7097	221.8018	134.9546	72.6920	48.2838	(83)
Total gains	580.5575	632.5922	690.4723	753.0642	797.3711	781.0359	744.8794	691.5582	635.1237	580.0181	552.3030	557.5990	(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	92.2641	92.5670	92.8718	94.4267	94.7439	96.3627	96.3627	96.6931	95.7086	94.7439	94.1116	93.4876	
alpha	7.1509	7.1711	7.1915	7.2951	7.3163	7.4242	7.4242	7.4462	7.3806	7.3163	7.2741	7.2325	
util living area													
	0.9834	0.9678	0.9202	0.7902	0.6009	0.4190	0.3023	0.3392	0.5564	0.8474	0.9641	0.9867	(86)
MIT	20.4764	20.6001	20.7806	20.9397	20.9918	20.9995	21.0000	20.9999	20.9964	20.9184	20.6802	20.4520	(87)
Th 2	20.2251	20.2274	20.2298	20.2416	20.2439	20.2557	20.2557	20.2581	20.2510	20.2439	20.2392	20.2345	(88)
util rest of house													
	0.9785	0.9588	0.9005	0.7529	0.5543	0.3705	0.2512	0.2846	0.4976	0.8077	0.9526	0.9827	(89)
MIT 2	19.7642	19.8853	20.0549	20.2000	20.2394	20.2555	20.2557	20.2580	20.2494	20.1891	19.9740	19.7487	(90)
Living area fraction									fLA = Living area / (4) =			0.4737	(91)
MIT	20.1015	20.2239	20.3986	20.5504	20.5958	20.6079	20.6082	20.6095	20.6033	20.5346	20.3085	20.0818	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.9515	20.0739	20.2486	20.4004	20.4458	20.4579	20.4582	20.4595	20.4533	20.3846	20.1585	19.9318	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9764	0.9567	0.9010	0.7610	0.5669	0.3837	0.2651	0.2994	0.5136	0.8156	0.9511	0.9808	(94)
Useful gains	566.8367	605.2154	622.1186	573.1152	452.0285	299.6838	197.4744	207.0528	326.2142	473.0523	525.3211	546.8895	(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													
	836.7034	808.5163	730.1681	600.7115	455.2970	299.8351	197.4820	207.0711	327.4115	509.3743	684.3809	829.9907	(97)
Space heating kWh													
	200.7808	136.6182	80.3889	19.8693	2.4318	0.0000	0.0000	0.0000	0.0000	27.0236	114.5230	210.6272	(98a)
Space heating requirement - total per year (kWh/year)												792.2629	
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													
	200.7808	136.6182	80.3889	19.8693	2.4318	0.0000	0.0000	0.0000	0.0000	27.0236	114.5230	210.6272	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												792.2629	
Space heating per m2											(98c) / (4) =	12.3405	(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 %)												89.5000	(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													
	200.7808	136.6182	80.3889	19.8693	2.4318	0.0000	0.0000	0.0000	0.0000	27.0236	114.5230	210.6272	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	224.3361	152.6461	89.8200	22.2004	2.7171	0.0000	0.0000	0.0000	0.0000	30.1940	127.9587	235.3377	(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													
	289.8789	256.5263	272.3169	238.2134	230.2436	206.6722	203.0822	211.3872	214.0332	239.6770	256.1888	286.4937	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	323.8871	286.6216	304.2647	266.1602	257.2554	230.9187	226.9075	236.1869	239.1433	267.7955	286.2445	320.1047	(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	17.7277	16.0121	17.7277	17.1559	17.7277	17.1559	17.7277	17.7277	17.1559	17.7277	17.1559	17.7277	(231)

Lighting	26.0929	20.9327	18.8476	13.8086	10.6661	8.7143	9.7300	12.6474	16.4278	21.5541	24.3453	26.8181 (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	885.2100 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	89.5000
Water heating fuel used	3245.4899 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)	
mechanical ventilation fans (SFP = 0.6050)	122.7298 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	208.7298 (231)
Electricity for lighting (calculated in Appendix L)	210.5850 (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	4550.0147 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	885.2100	3.6400	32.2216	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3245.4899	3.6400	118.1358	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	208.7298	16.4900	34.4195	(249)
Energy for lighting	210.5850	16.4900	34.7255	(250)
Additional standing charges			92.0000	(251)
Total energy cost			311.5025	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0269	(257)
SAP value		83.3534	
SAP rating (Section 12)		83	(258)
SAP band		B	

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	885.2100	0.2100	185.8941	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3245.4899	0.2100	681.5529	(264)
Space and water heating			867.4470	(265)
Pumps, fans and electric keep-hot	208.7298	0.1387	28.9534	(267)
Energy for lighting	210.5850	0.1443	30.3939	(268)
Total CO2, kg/year			926.7943	(272)
CO2 emissions per m2			14.4400	(273)
EI value			88.6272	
EI rating			89	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		64.2000 (1b)	x	2.5900 (2b)	=	166.2780	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.2000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		166.2780	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000	(22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750	(22a)
Adj infilt rate	0.1466	0.1371	0.1403	0.1275	0.1275	0.1116	0.1148	0.1211	0.1179	0.1243	0.1243	0.1371	(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) =	81.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2416	0.2321	0.2352	0.2225	0.2225	0.2066	0.2097	0.2161	0.2129	0.2193	0.2193	0.2321	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			10.6300	1.1450	12.1718			(27)
Heatloss Floor 1			64.2000	0.1000	6.4200	75.0000	4815.0000	(28a)
External Wall 1	43.4900	10.6300	32.8600	0.1300	4.2718	70.0000	2300.2000	(29a)
sheltered	15.4800	2.1000	13.3800	0.1300	1.7394	70.0000	936.6000	(29a)
Total net area of external elements Aum(A, m2)			123.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.5430			(33)
Party Wall 1			27.3200	0.0000	0.0000	180.0000	4917.6000	(32)
Party Floor 1			64.1600			30.0000	1924.8000	(32d)
Party Ceiling 1			64.2000			30.0000	1926.0000	(32b)
Internal Wall 1			104.0000			9.0000	936.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17756.2000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	276.5763	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.9200	0.0600	0.4152
E3 Sill	5.9200	0.0400	0.2368
E4 Jamb	25.3200	0.0200	0.5064
E5 Ground floor (normal)	17.0000	0.1300	2.2100
E5 Ground floor (normal)	5.9000	0.3200	1.8880
E7 Party floor between dwellings (in blocks of flats)	17.0000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	5.9000	0.2800	1.6520
E16 Corner (normal)	7.8000	0.0500	0.3900
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0600	-0.1560
P1 Party wall - Ground floor	10.6000	0.3200	3.3920
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.6000	0.0000	0.0000
E18 Party wall between dwellings	2.6000	0.2400	0.6240
E18 Party wall between dwellings	2.6000	0.2400	0.6240

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	11.7824	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	39.3254	(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	13.2584	12.7337	12.9086	12.2090	12.2090	11.3344	11.5093	11.8592	11.6843	12.0341	12.0341	12.7337	(38)
Heat transfer coeff	52.5837	52.0590	52.2339	51.5343	51.5343	50.6598	50.8347	51.1845	51.0096	51.3594	51.3594	52.0590	(39)
Average = Sum(39)m / 12 =												51.5343	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8191	0.8109	0.8136	0.8027	0.8027	0.7891	0.7918	0.7973	0.7945	0.8000	0.8000	0.8109	(40)
HLP (average)												0.8027	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0976	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
89.0832	87.7444	85.7936	82.0611	79.3066	76.2347	74.4887	76.4248	78.5471	81.8452	85.6580	88.7419	(42a)

Hot water usage for baths

25.6623	25.2812	24.7445	23.7550	23.0140	22.1923	21.7485	22.2815	22.8618	23.7409	24.7509	25.5756	(42b)

Hot water usage for other uses

36.1111	34.7980	33.4848	32.1717	30.8586	29.5455	29.5455	30.8586	32.1717	33.4848	34.7980	36.1111	(42c)
Average daily hot water use (litres/day)												138.7530	(43)

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

Daily hot water use

	150.8566	147.8236	144.0230	137.9877	133.1791	127.9725	125.7827	129.5648	133.5805	139.0710	145.2068	150.4286	(44)
Energy conte	238.9200	210.4989	221.3580	188.8983	179.2847	157.3572	152.1233	160.4283	164.7181	188.7181	206.8737	235.5348	(45)
Energy content (annual)										Total = Sum(45)m =		2304.7134	
Distribution loss (46)m = 0.15 x (45)m													
	35.8380	31.5748	33.2037	28.3347	26.8927	23.6036	22.8185	24.0643	24.7077	28.3077	31.0311	35.3302	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	289.8789	256.5263	272.3169	238.2134	230.2436	206.6722	203.0822	211.3872	214.0332	239.6770	256.1888	286.4937	(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													
	289.8789	256.5263	272.3169	238.2134	230.2436	206.6722	203.0822	211.3872	214.0332	239.6770	256.1888	286.4937	(64)
										Total per year (kWh/year) = Sum(64)m =		2904.7134	(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													
	92.1806	81.4977	86.3413	75.1375	72.3519	64.6500	63.3207	66.0821	67.0976	75.4885	81.1143	91.0550	(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	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	125.8536	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.8105	26.4774	21.5329	16.3018	12.1858	10.2877	11.1163	14.4493	19.3939	24.6250	28.7410	30.6390	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	273.7341	276.5746	269.4166	254.1781	234.9423	216.8633	204.7854	201.9449	209.1029	224.3414	243.5772	261.6562	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	49.6829	(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)													
	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	(71)
Water heating gains (Table 5)													
	123.8987	121.2764	116.0501	104.3576	97.2472	89.7917	85.1085	88.8201	93.1910	101.4630	112.6587	122.3858	(72)
Total internal gains													
	522.0774	518.9625	501.6336	469.4716	439.0093	408.5768	392.6443	396.8484	413.3219	445.0635	479.6110	509.3151	(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	4.5900	11.5821	0.7200	0.7000	0.7700	18.5679	(74)
East	6.0400	21.5869	0.7200	0.7000	0.7700	45.5399	(76)

Solar gains	64.1077	112.0713	187.2226	291.9276	356.0541	396.5076	376.1837	322.0395	243.3578	145.4874	82.3484	54.1842	(83)
Total gains	586.1851	631.0338	688.8563	761.3992	795.0634	805.0844	768.8279	718.8880	656.6797	590.5509	561.9594	563.4994	(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	93.7985	94.7439	94.4267	95.7086	95.7086	97.3608	97.0258	96.3627	96.6931	96.0345	96.0345	94.7439	
alpha	7.2532	7.3163	7.2951	7.3806	7.3806	7.4907	7.4684	7.4242	7.4462	7.4023	7.4023	7.3163	
util living area													
	0.9734	0.9544	0.8798	0.7044	0.4913	0.2894	0.1653	0.1922	0.4191	0.7443	0.9357	0.9778	(86)
MIT	20.5927	20.6912	20.8638	20.9754	20.9982	21.0000	21.0000	21.0000	20.9996	20.9713	20.7930	20.5735	(87)
Th 2	20.2368	20.2439	20.2416	20.2510	20.2510	20.2628	20.2604	20.2557	20.2581	20.2533	20.2533	20.2439	(88)
util rest of house													
	0.9655	0.9419	0.8523	0.6612	0.4434	0.2431	0.1164	0.1392	0.3617	0.6919	0.9161	0.9710	(89)
MIT 2	19.8874	19.9865	20.1391	20.2356	20.2502	20.2628	20.2604	20.2557	20.2579	20.2368	20.0912	19.8755	(90)
Living area fraction									fLA = Living area / (4) =			0.4737	(91)
MIT	20.2215	20.3203	20.4824	20.5860	20.6045	20.6120	20.6107	20.6083	20.6092	20.5847	20.4236	20.2061	(92)
Temperature adjustment												-0.1500	
adjusted MIT	20.0715	20.1703	20.3324	20.4360	20.4545	20.4620	20.4607	20.4583	20.4592	20.4347	20.2736	20.0561	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9635	0.9405	0.8559	0.6721	0.4565	0.2556	0.1296	0.1537	0.3773	0.7051	0.9167	0.9690	(94)
Useful gains	564.7642	593.4832	589.5712	511.7384	362.9367	205.7733	99.6739	110.4693	247.7590	416.4045	515.1580	546.0522	(95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000	(96)
Heat loss rate W													
	771.4830	748.1048	654.6169	522.3524	363.5499	205.7789	99.6740	110.4694	247.8680	428.0648	614.9587	762.9824	(97)
Space heating kWh													
	153.7988	103.9057	48.3940	7.6421	0.4562	0.0000	0.0000	0.0000	0.0000	8.6753	71.8565	161.3961	(98a)
Space heating requirement - total per year (kWh/year)												556.1246	
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													
	153.7988	103.9057	48.3940	7.6421	0.4562	0.0000	0.0000	0.0000	0.0000	8.6753	71.8565	161.3961	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												556.1246	
Space heating per m2											(98c) / (4) =	8.6624	(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 %)												89.5000	(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													
	153.7988	103.9057	48.3940	7.6421	0.4562	0.0000	0.0000	0.0000	0.0000	8.6753	71.8565	161.3961	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	171.8423	116.0958	54.0715	8.5386	0.5097	0.0000	0.0000	0.0000	0.0000	9.6931	80.2866	180.3308	(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													
	289.8789	256.5263	272.3169	238.2134	230.2436	206.6722	203.0822	211.3872	214.0332	239.6770	256.1888	286.4937	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	323.8871	286.6216	304.2647	266.1602	257.2554	230.9187	226.9075	236.1869	239.1433	267.7955	286.2445	320.1047	(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	17.7277	16.0121	17.7277	17.1559	17.7277	17.1559	17.7277	17.7277	17.1559	17.7277	17.1559	17.7277	(231)
Lighting	26.0929	20.9327	18.8476	13.8086	10.6661	8.7143	9.7300	12.6474	16.4278	21.5541	24.3453	26.8181	(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												621.3683	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												3245.4899	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)													
mechanical ventilation fans (SFP = 0.6050)												122.7298	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												208.7298	(231)
Electricity for lighting (calculated in Appendix L)												210.5850	(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												4286.1730	(238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	621.3683	6.1900	38.4627	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3245.4899	6.1900	200.8958	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	208.7298	25.1600	52.5164	(249)
Energy for lighting	210.5850	25.1600	52.9832	(250)
Additional standing charges			102.0000	(251)
Total energy cost			446.8581	(255)

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	621.3683	0.2100	130.4873	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3245.4899	0.2100	681.5529	(264)
Space and water heating			812.0402	(265)
Pumps, fans and electric keep-hot	208.7298	0.1387	28.9534	(267)
Energy for lighting	210.5850	0.1443	30.3939	(268)
Total CO2, kg/year			871.3875	(272)

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	621.3683	1.1300	702.1462	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3245.4899	1.1300	3667.4036	(278)
Space and water heating			4369.5497	(279)
Pumps, fans and electric keep-hot	208.7298	1.5128	315.7664	(281)
Energy for lighting	210.5850	1.5338	323.0023	(282)
Total Primary energy kWh/year			5008.3185	(286)

Full SAP Calculation Printout

Property Reference	Flat 2 Block B	**Issued on Date**	13/03/2024
Assessment Reference	Be Lean	**Prop Type Ref**	
Property	Flat 7 Block C, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	83 B	**DER**	16.38	**TER**	14.10
Environmental	88 B	**% DER < TER**			-16.17
CO_2 Emissions (t/year)	0.95	**DFEE**	40.27	**TFEE**	42.19
Compliance Check	See BREL	**% DFEE < TFEE**			4.54
% DPER < TPER	-25.46	**DPER**	92.83	**TPER**	73.99

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client	KGH, Kurt Gander - Howe		

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	64.1600	(1b)	x 2.4000	(2b) =	153.9840	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.1600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		153.9840	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(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) =		81.0000 (23c)

Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448	(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	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			10.9000	1.1450	12.4809			(27)
rooflight			1.6800	1.2357	2.0760			(27a)
External Wall 1	40.3200	10.9000	29.4200	0.1300	3.8246	70.0000	2059.4000	(29a)
sheltered	14.1600	2.1000	12.0600	0.1300	1.5678	70.0000	844.2000	(29a)
External Roof 1	64.1600	1.6800	62.4800	0.1100	6.8728	9.0000	562.3200	(30)
Total net area of external elements Aum(A, m2)			118.6400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.7622			(33)
Party Wall 1			25.7700	0.0000	0.0000	180.0000	4638.6000	(32)
Party Floor 1			64.1600			30.0000	1924.8000	(32d)
Internal Wall 1			99.8400			9.0000	898.5600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10927.8800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		170.3223 (35)
List of Thermal Bridges		

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	6.9700	0.0600	0.4182	
E3 Sill	5.9700	0.0400	0.2388	
E4 Jamb	25.6400	0.0200	0.5128	
R11 Upstands or kerbs of rooflights	7.6000	0.2400	1.8240	
E7 Party floor between dwellings (in blocks of flats)	16.9000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	5.8000	0.2800	1.6240	
E15 Flat roof with parapet	16.9000	0.3000	5.0700	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.9000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	10.9000	0.4800	5.2320	
P4 Party wall - Roof (insulation at ceiling level)	5.8000	0.4800	2.7840	
E18 Party wall between dwellings	2.4000	0.2400	0.5760	
E18 Party wall between dwellings	2.4000	0.2400	0.5760	
E16 Corner (normal)	7.2000	0.0500	0.3600	
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0600	-0.1440	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			19.0718	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	48.8340	(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	13.0880	12.9260	12.7640	11.9542	11.7922	10.9823	10.9823	10.8204	11.3063	11.7922	12.1161	12.4401	(38)
Heat transfer coeff	61.9219	61.7600	61.5980	60.7881	60.6262	59.8163	59.8163	59.6543	60.1402	60.6262	60.9501	61.2740	(39)
Average = Sum(39)m / 12 =												60.7476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9651	0.9626	0.9601	0.9474	0.9449	0.9323	0.9323	0.9298	0.9373	0.9449	0.9500	0.9550	(40)
HLP (average)												0.9468	
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											2.0965	(42)
Hot water usage for mixer showers	89.0562	87.7178	85.7676	82.0362	79.2825	76.2116	74.4661	76.4016	78.5232	81.8204	85.6320	88.7149	(42a)
Hot water usage for baths	25.6546	25.2736	24.7371	23.7478	23.0070	22.1856	21.7420	22.2747	22.8549	23.7338	24.7434	25.5679	(42b)
Hot water usage for other uses	36.1001	34.7874	33.4746	32.1619	30.8492	29.5365	29.5365	30.8492	32.1619	33.4746	34.7874	36.1001	(42c)
Average daily hot water use (litres/day)												138.7109	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.8109	147.7788	143.9793	137.9459	133.1387	127.9337	125.7445	129.5255	133.5400	139.0288	145.1628	150.3829	(44)
Energy conte	238.8475	210.4350	221.2908	188.8410	179.2303	157.3094	152.0771	160.3797	164.6682	188.6608	206.8110	235.4633	(45)
Energy content (annual)										Total = Sum(45)m =		2304.0141	
Distribution loss (46)m = 0.15 x (45)m	35.8271	31.5653	33.1936	28.3262	26.8845	23.5964	22.8116	24.0569	24.7002	28.2991	31.0216	35.3195	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	289.8064	256.4624	272.2497	238.1561	230.1892	206.6245	203.0360	211.3386	213.9832	239.6197	256.1260	286.4222	(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	289.8064	256.4624	272.2497	238.1561	230.1892	206.6245	203.0360	211.3386	213.9832	239.6197	256.1260	286.4222	(64)
									Total per year (kWh/year) = Sum(64)m =			2904.0141	(64)
12Total per year (kWh/year)												2904	(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	92.1565	81.4765	86.3189	75.1184	72.3338	64.6341	63.3054	66.0660	67.0809	75.4694	81.0934	91.0313	(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	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	93.0390	103.0075	93.0390	96.1403	93.0390	96.1403	93.0390	93.0390	96.1403	93.0390	96.1403	93.0390	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	183.3037	185.2058	180.4125	170.2082	157.3271	145.2206	137.1328	135.2307	140.0239	150.2283	163.1094	175.2158	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	(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)	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	(71)
Water heating gains (Table 5)	123.8663	121.2448	116.0201	104.3311	97.2228	89.7697	85.0879	88.7983	93.1680	101.4374	112.6297	122.3539	(72)
Total internal gains	457.6563	466.9053	446.9189	428.1269	405.0362	385.5779	369.7069	371.5153	383.7795	402.1520	429.3267	448.0560	(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	4.5900	10.6334	0.7200	0.7000	0.7700	17.0470	(74)
East	6.3100	19.6403	0.7200	0.7000	0.7700	43.2853	(76)
South	1.6800	26.0000	0.7200	0.7000	1.0000	19.8132	(82)

Solar gains	80.1456	158.4035	267.9622	406.6022	515.3401	535.7862	506.6562	423.2795	316.3770	189.5490	100.1490	65.8100	(83)
Total gains	537.8018	625.3089	714.8810	834.7291	920.3763	921.3641	876.3631	794.7948	700.1565	591.7010	529.4757	513.8660	(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	49.0218	49.1503	49.2796	49.9361	50.0695	50.7474	50.7474	50.8852	50.4741	50.0695	49.8034	49.5401	
alpha	4.2681	4.2767	4.2853	4.3291	4.3380	4.3832	4.3832	4.3923	4.3649	4.3380	4.3202	4.3027	
util living area	0.9696	0.9441	0.8889	0.7577	0.5820	0.4103	0.2992	0.3431	0.5665	0.8375	0.9464	0.9742	(86)
MIT	19.8010	20.0546	20.3964	20.7579	20.9339	20.9887	20.9978	20.9960	20.9568	20.6828	20.1874	19.7600	(87)
Th 2	20.1125	20.1146	20.1167	20.1274	20.1295	20.1401	20.1401	20.1423	20.1359	20.1295	20.1252	20.1210	(88)
util rest of house	0.9635	0.9336	0.8694	0.7228	0.5351	0.3571	0.2413	0.2801	0.5038	0.8028	0.9345	0.9690	(89)
MIT 2	19.0344	19.2819	19.6080	19.9415	20.0860	20.1344	20.1394	20.1408	20.1118	19.8880	19.4230	19.0010	(90)
Living area fraction										fLA = Living area / (4) =		0.4749	(91)
MIT	19.3985	19.6488	19.9824	20.3292	20.4887	20.5401	20.5470	20.5470	20.5131	20.2655	19.7860	19.3615	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.2485	19.4988	19.8324	20.1792	20.3387	20.3901	20.3970	20.3970	20.3631	20.1155	19.6360	19.2115	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9562	0.9251	0.8624	0.7250	0.5467	0.3727	0.2587	0.2989	0.5207	0.8022	0.9266	0.9622	(94)
Useful gains	514.2554	578.4478	616.5366	605.2005	503.1543	343.3617	226.6718	237.5920	364.6042	474.6723	490.6223	494.4584	(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	925.6372	901.6228	821.2520	685.6405	523.7282	346.3436	227.1246	238.4362	376.6626	576.8857	764.0715	919.8130	(97)
Space heating kWh	306.0681	217.1736	152.3082	57.9169	15.3069	0.0000	0.0000	0.0000	0.0000	76.0468	196.8834	316.4638	(98a)
Space heating requirement - total per year (kWh/year)												1338.1677	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	306.0681	217.1736	152.3082	57.9169	15.3069	0.0000	0.0000	0.0000	0.0000	76.0468	196.8834	316.4638	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1338.1677	
Space heating per m2											(98c) / (4) =	20.8567	(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 %)												89.5000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	306.0681	217.1736	152.3082	57.9169	15.3069	0.0000	0.0000	0.0000	0.0000	76.0468	196.8834	316.4638	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	341.9755	242.6520	170.1768	64.7116	17.1027	0.0000	0.0000	0.0000	0.0000	84.9685	219.9814	353.5909	(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	289.8064	256.4624	272.2497	238.1561	230.1892	206.6245	203.0360	211.3386	213.9832	239.6197	256.1260	286.4222	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	323.8061	286.5502	304.1896	266.0962	257.1946	230.8653	226.8559	236.1325	239.0874	267.7315	286.1743	320.0248	(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	16.0795	14.5234	16.0795	15.5608	16.0795	15.5608	16.0795	16.0795	15.5608	16.0795	15.5608	16.0795	(231)
Lighting	25.3205	20.3131	18.2897	13.3998	10.3504	8.4563	9.4420	12.2730	15.9414	20.9160	23.6246	26.0242	(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	1495.1594	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	3244.7085	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.0000, SFP = 0.5500)

mechanical ventilation fans (SFP = 0.5500)	103.3233	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	189.3233	(231)
Electricity for lighting (calculated in Appendix L)	204.3510	(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	5133.5422	(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	1495.1594	0.2100	313.9835	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3244.7085	0.2100	681.3888	(264)
Space and water heating			995.3723	(265)
Pumps, fans and electric keep-hot	189.3233	0.1387	26.2615	(267)
Energy for lighting	204.3510	0.1443	29.4942	(268)
Total CO2, kg/year			1051.1279	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			16.3800	(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	1495.1594	1.1300	1689.5301	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3244.7085	1.1300	3666.5206	(278)
Space and water heating			5356.0508	(279)
Pumps, fans and electric keep-hot	189.3233	1.5128	286.4082	(281)
Energy for lighting	204.3510	1.5338	313.4404	(282)
Total Primary energy kWh/year			5955.8994	(286)
Dwelling Primary energy Rate (DPER)			92.8300	(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	64.1600	(1b)	x 2.4000	(2b) =	153.9840	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.1600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		153.9840	(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) = 0.1299	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3799	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3229	(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	0.4117	0.4036	0.3956	0.3552	0.3471	0.3068	0.3068	0.2987	0.3229	0.3471	0.3633	0.3794	(22b)
Effective ac	0.5847	0.5815	0.5782	0.5631	0.5602	0.5470	0.5470	0.5446	0.5521	0.5602	0.5660	0.5720	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			10.9000	1.1450	12.4809			(27)
rooflight			1.6800	2.0221	3.3971			(27a)
External Wall 1	40.3200	10.9000	29.4200	0.1800	5.2956			(29a)
sheltered	14.1600	2.1000	12.0600	0.1800	2.1708			(29a)
External Roof 1	64.1600	1.6800	62.4800	0.1100	6.8728			(30)
Total net area of external elements Aum(A, m2)			118.6400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.3172			(33)
Party Wall 1			25.7700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 170.3223 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.9700	0.0500	0.3485
E3 Sill	5.9700	0.0500	0.2985
E4 Jamb	25.6400	0.0500	1.2820
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080
E7 Party floor between dwellings (in blocks of flats)	16.9000	0.0700	1.1830
E7 Party floor between dwellings (in blocks of flats)	5.8000	0.0700	0.4060
E15 Flat roof with parapet	16.9000	0.5600	9.4640
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.9000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	10.9000	0.1200	1.3080
P4 Party wall - Roof (insulation at ceiling level)	5.8000	0.1200	0.6960
E18 Party wall between dwellings	2.4000	0.0600	0.1440
E18 Party wall between dwellings	2.4000	0.0600	0.1440
E16 Corner (normal)	7.2000	0.0900	0.6480
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0900	-0.2160

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.3140 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 48.6312 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.7138	29.5466	29.3827	28.6128	28.4687	27.7982	27.7982	27.6740	28.0565	28.4687	28.7601	29.0648	(38)
Heat transfer coeff	78.3450	78.1778	78.0138	77.2439	77.0999	76.4293	76.4293	76.3052	76.6876	77.0999	77.3913	77.6960	(39)
Average = Sum(39)m / 12 =												77.2433	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2211	1.2185	1.2159	1.2039	1.2017	1.1912	1.1912	1.1893	1.1953	1.2017	1.2062	1.2110	(40)
HLP (average)												1.2039	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0965 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	59.3708	58.4785	57.1784	54.6908	52.8550	50.8077	49.6441	50.9344	52.3488	54.5469	57.0880	59.1433	(42a)
Hot water usage for baths	25.6546	25.2736	24.7371	23.7478	23.0070	22.1856	21.7420	22.2747	22.8549	23.7338	24.7434	25.5679	(42b)
Hot water usage for other uses	36.1001	34.7874	33.4746	32.1619	30.8492	29.5365	29.5365	30.8492	32.1619	33.4746	34.7874	36.1001	(42c)
Average daily hot water use (litres/day)												111.3420	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	121.1255	118.5395	115.3901	110.6005	106.7112	102.5298	100.9225	104.0583	107.3656	111.7554	116.6188	120.8113	(44)
Energy conte	191.8332	168.7987	177.3503	151.4065	143.6538	126.0724	122.0570	128.8459	132.3925	151.6510	166.1448	189.1613	(45)
Energy content (annual)										Total = Sum(45)m =		1849.3673	
Distribution loss (46)m = 0.15 x (45)m	28.7750	25.3198	26.6025	22.7110	21.5481	18.9109	18.3086	19.3269	19.8589	22.7476	24.9217	28.3742	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	242.7921	214.8261	228.3092	200.7216	194.6127	175.3875	173.0159	179.8048	181.7076	202.6099	215.4599	240.1202	(62)
WWHRS	-27.1418	-24.0045	-25.1361	-20.8137	-19.3976	-16.5987	-15.5586	-16.5450	-17.1736	-20.2458	-22.9360	-26.6392	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	215.6502	190.8216	203.1731	179.9079	175.2151	158.7888	157.4573	163.2598	164.5340	182.3641	192.5239	213.4810	(64)
									Total per year (kWh/year) = Sum(64)m =			2197.1767	(64)
12Total per year (kWh/year)												2197	(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	76.5242	67.6324	71.7087	62.6714	60.5046	54.2478	53.3237	55.5810	56.3493	63.1637	67.5719	75.6358	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	93.0390	103.0075	93.0390	96.1403	93.0390	96.1403	93.0390	93.0390	96.1403	93.0390	96.1403	93.0390	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	183.3037	185.2058	180.4125	170.2082	157.3271	145.2206	137.1328	135.2307	140.0239	150.2283	163.1094	175.2158	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	(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)	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	(71)
Water heating gains (Table 5)	102.8552	100.6435	96.3827	87.0437	81.3234	75.3442	71.6716	74.7056	78.2629	84.8974	93.8499	101.6611	(72)
Total internal gains													

	436.6451	446.3040	427.2815	410.8394	389.1368	371.1524	356.2907	357.4226	368.8744	385.6120	410.5469	427.3632	(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	4.5900	10.6334	0.6300	0.7000	0.7700	14.9161	(74)
East	6.3100	19.6403	0.6300	0.7000	0.7700	37.8746	(76)
South	1.6800	26.0000	0.6300	0.7000	1.0000	17.3366	(82)

Solar gains	70.1274	138.6031	234.4669	355.7769	450.9226	468.8129	443.3241	370.3696	276.8299	165.8554	87.6303	57.5837	(83)
Total gains	506.7725	584.9071	661.7483	766.6164	840.0593	839.9654	799.6148	727.7922	645.7043	551.4673	498.1772	484.9469	(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	38.7456	38.8285	38.9100	39.2979	39.3713	39.7167	39.7167	39.7813	39.5829	39.3713	39.2230	39.0692	
alpha	3.5830	3.5886	3.5940	3.6199	3.6248	3.6478	3.6478	3.6521	3.6389	3.6248	3.6149	3.6046	
util living area	0.9793	0.9647	0.9340	0.8537	0.7179	0.5455	0.4100	0.4643	0.7006	0.9023	0.9658	0.9821	(86)
MIT	19.2170	19.4745	19.8720	20.3823	20.7487	20.9316	20.9814	20.9710	20.8304	20.3289	19.6899	19.1754	(87)
Th 2	19.9032	19.9052	19.9073	19.9169	19.9187	19.9270	19.9270	19.9286	19.9238	19.9187	19.9150	19.9112	(88)
util rest of house	0.9746	0.9570	0.9193	0.8225	0.6628	0.4663	0.3147	0.3637	0.6236	0.8738	0.9569	0.9781	(89)
MIT 2	17.8507	18.1762	18.6728	19.2932	19.7010	19.8831	19.9195	19.9157	19.7992	19.2489	18.4588	17.8034	(90)
Living area fraction									fLA = Living area / (4) =			0.4749	(91)
MIT	18.4996	18.7928	19.2423	19.8104	20.1986	20.3810	20.4238	20.4169	20.2889	19.7618	19.0434	18.4550	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4996	18.7928	19.2423	19.8104	20.1986	20.3810	20.4238	20.4169	20.2889	19.7618	19.0434	18.4550	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9665	0.9468	0.9084	0.8190	0.6779	0.5008	0.3595	0.4106	0.6515	0.8689	0.9476	0.9707	(94)
Useful gains	489.8191	553.8030	601.1555	627.8717	569.4924	420.6665	287.4871	298.8294	420.6496	479.1547	472.0820	470.7409	(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	1112.4649	1086.1080	994.0766	842.7627	655.2388	441.8411	292.2480	306.5075	474.6131	706.3751	924.3180	1107.5532	(97)
Space heating kWh	463.2485	357.7090	292.3332	154.7215	63.7954	0.0000	0.0000	0.0000	0.0000	169.0520	325.6099	473.7884	(98a)
Space heating requirement - total per year (kWh/year)												2300.2579	
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	463.2485	357.7090	292.3332	154.7215	63.7954	0.0000	0.0000	0.0000	0.0000	169.0520	325.6099	473.7884	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2300.2579	
Space heating per m2										(98c) / (4) =		35.8519	(99)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	463.2485	357.7090	292.3332	154.7215	63.7954	0.0000	0.0000	0.0000	0.0000	169.0520	325.6099	473.7884	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	501.3512	387.1309	316.3780	167.4475	69.0426	0.0000	0.0000	0.0000	0.0000	182.9567	352.3917	512.7580	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	215.6502	190.8216	203.1731	179.9079	175.2151	158.7888	157.4573	163.2598	164.5340	182.3641	192.5239	213.4810	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.9752	85.7068	85.1603	84.0599	82.4284	80.3000	80.3000	80.3000	80.3000	84.2193	85.4976	86.0378	(217)
Fuel for water heating, kWh/month	250.8285	222.6446	238.5772	214.0236	212.5665	197.7445	196.0863	203.3124	204.8991	216.5348	225.1803	248.1247	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	19.3317	15.5086	13.9638	10.2304	7.9023	6.4562	7.2087	9.3702	12.1709	15.9689	18.0369	19.8690	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-30.2534	-42.7779	-61.6851	-69.6076	-75.3003	-70.4010	-69.5524	-65.5495	-58.5097	-49.0461	-33.3127	-26.1428	(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	-16.7181	-35.2100	-70.0479	-105.2935	-139.2939	-139.9582	-138.2903	-117.0429	-85.7408	-50.3594	-22.3255	-13.2155	(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	2489.4566	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2630.5225	(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)	156.0176	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1585.6344	(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	3776.3623	(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	2489.4566	0.2100	522.7859	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2630.5225	0.2100	552.4097	(264)
Space and water heating			1075.1956	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	156.0176	0.1443	22.5182	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-652.1384	0.1345	-87.7170	
PV Unit electricity exported	-933.4959	0.1259	-117.5047	
Total			-205.2217	(269)
Total CO2, kg/year			904.4213	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.1000	(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	2489.4566	1.1300	2813.0859	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2630.5225	1.1300	2972.4904	(278)
Space and water heating			5785.5763	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	156.0176	1.5338	239.3051	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-652.1384	1.4971	-976.3228	
PV Unit electricity exported	-933.4959	0.4621	-431.3224	
Total			-1407.6452	(283)
Total Primary energy kWh/year			4747.3370	(286)
Target Primary Energy Rate (TPER)			73.9900	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		64.1600 (1b)	x	2.4000 (2b)	=	153.9840	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.1600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	153.9840	(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	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) =	0.1299	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.2799	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.2379	(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	0.3033	0.2974	0.2914	0.2617	0.2557	0.2260	0.2260	0.2201	0.2379	0.2557	0.2676	0.2795	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5460	0.5442	0.5425	0.5342	0.5327	0.5255	0.5255	0.5242	0.5283	0.5327	0.5358	0.5391	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			10.9000	1.1450	12.4809			(27)
rooflight			1.6800	1.2357	2.0760			(27a)
External Wall 1	40.3200	10.9000	29.4200	0.1300	3.8246	70.0000	2059.4000	(29a)
sheltered	14.1600	2.1000	12.0600	0.1300	1.5678	70.0000	844.2000	(29a)
External Roof 1	64.1600	1.6800	62.4800	0.1100	6.8728	9.0000	562.3200	(30)
Total net area of external elements Aum(A, m2)			118.6400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.7622			(33)
Party Wall 1			25.7700	0.0000	0.0000	180.0000	4638.6000	(32)
Party Floor 1			64.1600			30.0000	1924.8000	(32d)
Internal Wall 1			99.8400			9.0000	898.5600	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	10927.8800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	170.3223	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.9700	0.0600	0.4182
E3 Sill	5.9700	0.0400	0.2388
E4 Jamb	25.6400	0.0200	0.5128
R11 Upstands or kerbs of rooflights	7.6000	0.2400	1.8240
E7 Party floor between dwellings (in blocks of flats)	16.9000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	5.8000	0.2800	1.6240
E15 Flat roof with parapet	16.9000	0.3000	5.0700
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.9000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	10.9000	0.4800	5.2320
P4 Party wall - Roof (insulation at ceiling level)	5.8000	0.4800	2.7840
E18 Party wall between dwellings	2.4000	0.2400	0.5760
E18 Party wall between dwellings	2.4000	0.2400	0.5760
E16 Corner (normal)	7.2000	0.0500	0.3600
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0600	-0.1440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	19.0718	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	48.8340	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.7450	27.6542	27.5652	27.1473	27.0691	26.7051	26.7051	26.6377	26.8453	27.0691	27.2273	27.3927	(38)
Heat transfer coeff	76.5789	76.4882	76.3992	75.9813	75.9031	75.5391	75.5391	75.4717	75.6793	75.9031	76.0613	76.2266	(39)
Average = Sum(39)m / 12 =												75.9809	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1936	1.1921	1.1908	1.1842	1.1830	1.1774	1.1774	1.1763	1.1795	1.1830	1.1855	1.1881	(40)
HLP (average)												1.1842	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0965	(42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	25.6546	25.2736	24.7371	23.7478	23.0070	22.1856	21.7420	22.2747	22.8549	23.7338	24.7434	25.5679	(42b)

Hot water usage for other uses

	36.1001	34.7874	33.4746	32.1619	30.8492	29.5365	29.5365	30.8492	32.1619	33.4746	34.7874	36.1001	(42c)

Average daily hot water use (litres/day)	56.6041	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	61.7547	60.0610	58.2117	55.9097	53.8562	51.7221	51.2784	53.1239	55.0168	57.2084	59.5308	61.6680	(44)
Energy conte	97.8044	85.5260	89.4692	76.5376	72.5008	63.5983	62.0168	65.7785	67.8412	77.6313	84.8125	96.5572	(45)

Energy content (annual) Total = Sum(45)m =	940.0737	
Distribution loss (46)m = 0.15 x (45)m		

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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

	83.1337	72.6971	76.0488	65.0569	61.6257	54.0586	52.7143	55.9117	57.6650	65.9866	72.0906	82.0736	(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	83.1337	72.6971	76.0488	65.0569	61.6257	54.0586	52.7143	55.9117	57.6650	65.9866	72.0906	82.0736	(64)

Total per year (kWh/year) = Sum(64)m =	799.0627	(64)

12Total per year (kWh/year) 799 (64)
Electric shower(s)

	47.5461	42.3640	46.2598	44.1452	44.9736	42.9004	44.3304	44.9736	44.1452	46.2598	45.3900	47.5461 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 540.8340 (64a)
Heat gains from water heating, kWh/month

	32.6700	28.7653	30.5772	27.3005	26.6498	24.2397	24.2612	25.2213	25.4525	28.0616	29.3702	32.4049 (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	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	(66)

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

	93.0390	103.0075	93.0390	96.1403	93.0390	96.1403	93.0390	93.0390	96.1403	93.0390	96.1403	93.0390	(67)

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

	183.3037	185.2058	180.4125	170.2082	157.3271	145.2206	137.1328	135.2307	140.0239	150.2283	163.1094	175.2158	(68)

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

	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

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

	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	(71)

Water heating gains (Table 5)

	43.9112	42.8055	41.0983	37.9174	35.8196	33.6663	32.6091	33.8996	35.3508	37.7172	40.7919	43.5550	(72)

Total internal gains

	374.7012	385.4660	368.9971	358.7132	340.6330	329.4745	317.2282	316.6166	325.9623	335.4318	354.4889	366.2571	(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	4.5900	10.6334	0.7200	0.7000	0.7700	17.0470	(74)
East	6.3100	19.6403	0.7200	0.7000	0.7700	43.2853	(76)
South	1.6800	26.0000	0.7200	0.7000	1.0000	19.8132	(82)

Solar gains	80.1456	158.4035	267.9622	406.6022	515.3401	535.7862	506.6562	423.2795	316.3770	189.5490	100.1490	65.8100	(83)
Total gains	454.8467	543.8695	636.9593	765.3154	855.9731	865.2608	823.8843	739.8961	642.3393	524.9807	454.6378	432.0671	(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	39.6391	39.6862	39.7324	39.9509	39.9921	40.1848	40.1848	40.2207	40.1103	39.9921	39.9089	39.8223	
alpha	3.6426	3.6457	3.6488	3.6634	3.6661	3.6790	3.6790	3.6814	3.6740	3.6661	3.6606	3.6548	
util living area													
	0.9850	0.9710	0.9389	0.8511	0.7044	0.5277	0.3948	0.4534	0.6984	0.9118	0.9735	0.9874	(86)
MIT	19.1637	19.4450	19.8727	20.4064	20.7720	20.9405	20.9842	20.9740	20.8368	20.3115	19.6389	19.1102	(87)
Th 2	19.9252	19.9263	19.9274	19.9326	19.9336	19.9382	19.9382	19.9390	19.9364	19.9336	19.9316	19.9296	(88)
util rest of house													
	0.9815	0.9645	0.9252	0.8198	0.6493	0.4506	0.3033	0.3555	0.6220	0.8854	0.9664	0.9845	(89)
MIT 2	18.2673	18.5450	18.9620	19.4655	19.7803	19.9085	19.9332	19.9300	19.8429	19.3938	18.7434	18.2175	(90)
Living area fraction									fLA = Living area / (4) =			0.4749	(91)
MIT	18.6930	18.9724	19.3945	19.9123	20.2513	20.3986	20.4323	20.4258	20.3149	19.8296	19.1687	18.6414	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6930	18.9724	19.3945	19.9123	20.2513	20.3986	20.4323	20.4258	20.3149	19.8296	19.1687	18.6414	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9762	0.9571	0.9171	0.8191	0.6666	0.4849	0.3465	0.4014	0.6509	0.8824	0.9599	0.9798	(94)
Useful gains	444.0391	520.5554	584.1487	626.9002	570.6022	419.5859	285.4537	296.9679	418.0884	463.2226	436.4235	423.3522	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1102.2030	1076.3710	985.1298	836.7319	649.0679	438.0221	289.4880	303.8360	470.3384	700.5560	917.9591	1100.8216	(97)
Space heating kWh													
	489.6740	373.5081	298.3299	151.0788	58.3785	0.0000	0.0000	0.0000	0.0000	176.5760	346.7056	504.0372	(98a)
Space heating requirement - total per year (kWh/year)												2398.2882	
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													
	489.6740	373.5081	298.3299	151.0788	58.3785	0.0000	0.0000	0.0000	0.0000	176.5760	346.7056	504.0372	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2398.2882	
Space heating per m2										(98c) / (4) =		37.3798	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	710.0675	558.9893	573.5849	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8838	0.9275	0.8988	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	627.5887	518.4875	515.5171	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	950.6713	905.5654	813.3182	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	232.6195	287.9860	221.5640	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													

	0.0000	0.0000	0.0000	0.0000	0.0000	58.1549	71.9965	55.3910	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												185.5424 (107)
Energy for space heating												37.3798 (99)
Energy for space cooling												2.8919 (108)
Total												40.2717 (109)
Fabric Energy Efficiency (DFEE)												40.3 (109)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.1600 (1b)	x	2.4000 (2b)	=	153.9840	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.1600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	153.9840	(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) =	0.1299	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3799	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3229	(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	0.4117	0.4036	0.3956	0.3552	0.3471	0.3068	0.3068	0.2987	0.3229	0.3471	0.3633	0.3794	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5847	0.5815	0.5782	0.5631	0.5602	0.5470	0.5470	0.5446	0.5521	0.5602	0.5660	0.5720	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			10.9000	1.1450	12.4809			(27)
rooflight			1.6800	2.0221	3.3971			(27a)
External Wall 1	40.3200	10.9000	29.4200	0.1800	5.2956			(29a)
sheltered	14.1600	2.1000	12.0600	0.1800	2.1708			(29a)
External Roof 1	64.1600	1.6800	62.4800	0.1100	6.8728			(30)
Total net area of external elements Aum(A, m2)			118.6400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.3172			(33)
Party Wall 1			25.7700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 170.3223 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	6.9700	0.0500	0.3485
E2 Other lintels (including other steel lintels)	5.9700	0.0500	0.2985
E3 Sill	25.6400	0.0500	1.2820
E4 Jamb	7.6000	0.0800	0.6080
R11 Upstands or kerbs of rooflights	16.9000	0.0700	1.1830
E7 Party floor between dwellings (in blocks of flats)	5.8000	0.0700	0.4060
E7 Party floor between dwellings (in blocks of flats)	16.9000	0.5600	9.4640
E15 Flat roof with parapet	10.9000	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.9000	0.1200	1.3080
P4 Party wall - Roof (insulation at ceiling level)	5.8000	0.1200	0.6960
P4 Party wall - Roof (insulation at ceiling level)	2.4000	0.0600	0.1440
E18 Party wall between dwellings	2.4000	0.0600	0.1440
E18 Party wall between dwellings	7.2000	0.0900	0.6480
E16 Corner (normal)	2.4000	-0.0900	-0.2160
E17 Corner (inverted - internal area greater than external area)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		16.3140	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	48.6312	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.7138	29.5466	29.3827	28.6128	28.4687	27.7982	27.7982	27.6740	28.0565	28.4687	28.7601	29.0648	(38)
Heat transfer coeff													

	78.3450	78.1778	78.0138	77.2439	77.0999	76.4293	76.4293	76.3052	76.6876	77.0999	77.3913	77.6960 (39)
Average = Sum(39)m / 12 =												77.2433
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2211	1.2185	1.2159	1.2039	1.2017	1.1912	1.1912	1.1893	1.1953	1.2017	1.2062	1.2110 (40)
HLP (average)												1.2039
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0965 (42)
Hot water usage for mixer showers												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths												
	25.6546	25.2736	24.7371	23.7478	23.0070	22.1856	21.7420	22.2747	22.8549	23.7338	24.7434	25.5679 (42b)
Hot water usage for other uses												
	36.1001	34.7874	33.4746	32.1619	30.8492	29.5365	29.5365	30.8492	32.1619	33.4746	34.7874	36.1001 (42c)
Average daily hot water use (litres/day)												56.6041 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	61.7547	60.0610	58.2117	55.9097	53.8562	51.7221	51.2784	53.1239	55.0168	57.2084	59.5308	61.6680 (44)
Energy conte	97.8044	85.5260	89.4692	76.5376	72.5008	63.5983	62.0168	65.7785	67.8412	77.6313	84.8125	96.5572 (45)
Energy content (annual)										Total = Sum(45)m =		940.0737
Distribution loss (46)m = 0.15 x (45)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	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												
	83.1337	72.6971	76.0488	65.0569	61.6257	54.0586	52.7143	55.9117	57.6650	65.9866	72.0906	82.0736 (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												
	83.1337	72.6971	76.0488	65.0569	61.6257	54.0586	52.7143	55.9117	57.6650	65.9866	72.0906	82.0736 (64)
										Total per year (kWh/year) = Sum(64)m =		799.0627 (64)
12Total per year (kWh/year)												799 (64)
Electric shower(s)												
	47.5461	42.3640	46.2598	44.1452	44.9736	42.9004	44.3304	44.9736	44.1452	46.2598	45.3900	47.5461 (64a)
												540.8340 (64a)
Heat gains from water heating, kWh/month												
	32.6700	28.7653	30.5772	27.3005	26.6498	24.2397	24.2612	25.2213	25.4525	28.0616	29.3702	32.4049 (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	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	93.0390	103.0075	93.0390	96.1403	93.0390	96.1403	93.0390	93.0390	96.1403	93.0390	96.1403	93.0390 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	183.3037	185.2058	180.4125	170.2082	157.3271	145.2206	137.1328	135.2307	140.0239	150.2283	163.1094	175.2158 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594 (71)
Water heating gains (Table 5)												
	43.9112	42.8055	41.0983	37.9174	35.8196	33.6663	32.6091	33.8996	35.3508	37.7172	40.7919	43.5550 (72)
Total internal gains												
	374.7012	385.4660	368.9971	358.7132	340.6330	329.4745	317.2282	316.6166	325.9623	335.4318	354.4889	366.2571 (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	4.5900	10.6334	0.6300	0.7000	0.7700	14.9161	(74)
East	6.3100	19.6403	0.6300	0.7000	0.7700	37.8746	(76)
South	1.6800	26.0000	0.6300	0.7000	1.0000	17.3366	(82)

Solar gains	70.1274	138.6031	234.4669	355.7769	450.9226	468.8129	443.3241	370.3696	276.8299	165.8554	87.6303	57.5837 (83)
Total gains	444.8286	524.0691	603.4640	714.4901	791.5556	798.2875	760.5523	686.9862	602.7922	501.2871	442.1192	423.8408 (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	38.7456	38.8285	38.9100	39.2979	39.3713	39.7167	39.7167	39.7813	39.5829	39.3713	39.2230	39.0692
alpha	3.5830	3.5886	3.5940	3.6199	3.6248	3.6478	3.6478	3.6521	3.6389	3.6248	3.6149	3.6046
util living area												
	0.9861	0.9744	0.9484	0.8747	0.7435	0.5685	0.4293	0.4884	0.7307	0.9229	0.9759	0.9882 (86)
MIT	19.0905	19.3567	19.7714	20.3172	20.7165	20.9218	20.9784	20.9658	20.8041	20.2518	19.5805	19.0491 (87)
Th 2	19.9032	19.9052	19.9073	19.9169	19.9187	19.9270	19.9270	19.9286	19.9238	19.9187	19.9150	19.9112 (88)
util rest of house												
	0.9828	0.9685	0.9363	0.8463	0.6896	0.4876	0.3302	0.3840	0.6551	0.8989	0.9694	0.9855 (89)
MIT 2	18.1792	18.4432	18.8501	19.3738	19.7250	19.8875	19.9201	19.9166	19.8095	19.3278	18.6741	18.1439 (90)
Living area fraction										fLA = Living area / (4) =		0.4749 (91)

MIT	18.6120	18.8770	19.2876	19.8218	20.1958	20.3787	20.4227	20.4149	20.2818	19.7666	19.1046	18.5738	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6120	18.8770	19.2876	19.8218	20.1958	20.3787	20.4227	20.4149	20.2818	19.7666	19.1046	18.5738	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9777	0.9614	0.9280	0.8435	0.7043	0.5228	0.3768	0.4327	0.6822	0.8948	0.9630	0.9809	(94)
Useful gains	434.9116	503.8508	559.9954	602.6382	557.5253	417.3349	286.6116	297.2521	411.2034	448.5610	425.7691	415.7448	(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													
	1121.2703	1092.6924	997.6119	843.6462	655.0289	441.6604	292.1651	306.3548	474.0700	706.7453	929.0479	1116.7848	(97)
Space heating kWh													
	510.6509	395.7016	325.5867	173.5258	72.5426	0.0000	0.0000	0.0000	0.0000	192.0892	362.3607	521.5738	(98a)
Space heating requirement - total per year (kWh/year)												2554.0313	
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													
	510.6509	395.7016	325.5867	173.5258	72.5426	0.0000	0.0000	0.0000	0.0000	192.0892	362.3607	521.5738	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2554.0313	
Space heating per m2											(98c) / (4) =	39.8072	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	718.4359	565.5772	579.9193	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8549	0.9067	0.8745	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	614.2172	512.8365	507.1194	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	875.6073	834.5805	754.0003	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	188.2009	239.3775	183.6794	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction											fC = cooled area / (4) =	1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	47.0502	59.8444	45.9199	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												152.8144	(107)
Energy for space heating												39.8072	(99)
Energy for space cooling												2.3818	(108)
Total												42.1890	(109)
Fabric Energy Efficiency (TFEE)												42.2	(109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.1600	(1b)	x 2.4000	(2b)	= 153.9840	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.1600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		= 153.9840	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(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													
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(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) = 81.0000 (23c)

Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			10.9000	1.1450	12.4809			(27)
rooflight			1.6800	1.2357	2.0760			(27a)
External Wall 1	40.3200	10.9000	29.4200	0.1300	3.8246	70.0000	2059.4000	(29a)
sheltered	14.1600	2.1000	12.0600	0.1300	1.5678	70.0000	844.2000	(29a)
External Roof 1	64.1600	1.6800	62.4800	0.1100	6.8728	9.0000	562.3200	(30)
Total net area of external elements Aum(A, m2)			118.6400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.7622			(33)
Party Wall 1			25.7700	0.0000	0.0000	180.0000	4638.6000	(32)
Party Floor 1			64.1600			30.0000	1924.8000	(32d)
Internal Wall 1			99.8400			9.0000	898.5600	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10927.8800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 170.3223 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.9700	0.0600	0.4182
E3 Sill	5.9700	0.0400	0.2388
E4 Jamb	25.6400	0.0200	0.5128
R11 Upstands or kerbs of rooflights	7.6000	0.2400	1.8240
E7 Party floor between dwellings (in blocks of flats)	16.9000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	5.8000	0.2800	1.6240
E15 Flat roof with parapet	16.9000	0.3000	5.0700
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.9000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	10.9000	0.4800	5.2320
P4 Party wall - Roof (insulation at ceiling level)	5.8000	0.4800	2.7840
E18 Party wall between dwellings	2.4000	0.2400	0.5760
E18 Party wall between dwellings	2.4000	0.2400	0.5760
E16 Corner (normal)	7.2000	0.0500	0.3600
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0600	-0.1440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 19.0718 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 48.8340 (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	13.0880	12.9260	12.7640	11.9542	11.7922	10.9823	10.9823	10.8204	11.3063	11.7922	12.1161	12.4401	(38)
Heat transfer coeff	61.9219	61.7600	61.5980	60.7881	60.6262	59.8163	59.8163	59.6543	60.1402	60.6262	60.9501	61.2740	(39)

Average = Sum(39)m / 12 = 60.7476

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9651	0.9626	0.9601	0.9474	0.9449	0.9323	0.9323	0.9298	0.9373	0.9449	0.9500	0.9550	(40)
HLP (average)												0.9468	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0965 (42)
Hot water usage for mixer showers

89.0562	87.7178	85.7676	82.0362	79.2825	76.2116	74.4661	76.4016	78.5232	81.8204	85.6320	88.7149	(42a)

Hot water usage for baths

25.6546	25.2736	24.7371	23.7478	23.0070	22.1856	21.7420	22.2747	22.8549	23.7338	24.7434	25.5679	(42b)

Hot water usage for other uses

36.1001	34.7874	33.4746	32.1619	30.8492	29.5365	29.5365	30.8492	32.1619	33.4746	34.7874	36.1001	(42c)

Average daily hot water use (litres/day) 138.7109 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.8109	147.7788	143.9793	137.9459	133.1387	127.9337	125.7445	129.5255	133.5400	139.0288	145.1628	150.3829	(44)
Energy conte	238.8475	210.4350	221.2908	188.8410	179.2303	157.3094	152.0771	160.3797	164.6682	188.6608	206.8110	235.4633	(45)
Energy content (annual)										Total = Sum(45)m =		2304.0141	
Distribution loss (46)m = 0.15 x (45)m	35.8271	31.5653	33.1936	28.3262	26.8845	23.5964	22.8116	24.0569	24.7002	28.2991	31.0216	35.3195	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	289.8064	256.4624	272.2497	238.1561	230.1892	206.6245	203.0360	211.3386	213.9832	239.6197	256.1260	286.4222	(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	289.8064	256.4624	272.2497	238.1561	230.1892	206.6245	203.0360	211.3386	213.9832	239.6197	256.1260	286.4222	(64)
										Total per year (kWh/year) = Sum(64)m =		2904.0141	(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	92.1565	81.4765	86.3189	75.1184	72.3338	64.6341	63.3054	66.0660	67.0809	75.4694	81.0934	91.0313	(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	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	(66)

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

	28.9280	25.6936	20.8954	15.8192	11.8250	9.9832	10.7872	14.0216	18.8198	23.8960	27.8902	29.7320 (67)

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

	273.5876	276.4265	269.2724	254.0421	234.8165	216.7472	204.6758	201.8368	208.9910	224.2213	243.4468	261.5161 (68)

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

	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754 (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)

	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594 (71)

Water heating gains (Table 5)

	123.8663	121.2448	116.0201	104.3311	97.2228	89.7697	85.0879	88.7983	93.1680	101.4374	112.6297	122.3539 (72)

Total internal gains

	520.9870	517.9700	500.7930	468.7975	438.4695	408.1052	392.1560	396.2619	412.5838	444.1598	478.5718	508.2071 (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	4.5900	10.6334	0.7200	0.7000	0.7700	17.0470	(74)
East	6.3100	19.6403	0.7200	0.7000	0.7700	43.2853	(76)
South	1.6800	26.0000	0.7200	0.7000	1.0000	19.8132	(82)

Solar gains	80.1456	158.4035	267.9622	406.6022	515.3401	535.7862	506.6562	423.2795	316.3770	189.5490	100.1490	65.8100	(83)
Total gains	601.1325	676.3736	768.7551	875.3997	953.8096	943.8914	898.8121	819.5414	728.9608	633.7088	578.7208	574.0171	(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	49.0218	49.1503	49.2796	49.9361	50.0695	50.7474	50.7474	50.8852	50.4741	50.0695	49.8034	49.5401	
alpha	4.2681	4.2767	4.2853	4.3291	4.3380	4.3832	4.3832	4.3923	4.3649	4.3380	4.3202	4.3027	
util living area	0.9561	0.9292	0.8662	0.7357	0.5648	0.4009	0.2919	0.3330	0.5472	0.8106	0.9297	0.9625	(86)
MIT	19.9257	20.1438	20.4678	20.7850	20.9410	20.9896	20.9980	20.9965	20.9622	20.7254	20.2741	19.8817	(87)
Th 2	20.1125	20.1146	20.1167	20.1274	20.1295	20.1401	20.1401	20.1423	20.1359	20.1295	20.1252	20.1210	(88)
util rest of house	0.9479	0.9166	0.8444	0.7000	0.5186	0.3488	0.2353	0.2717	0.4858	0.7733	0.9150	0.9553	(89)
MIT 2	19.1552	19.3665	19.6726	19.9636	20.0909	20.1350	20.1395	20.1410	20.1149	19.9233	19.5046	19.1193	(90)
Living area fraction									fLA = Living area / (4) =			0.4749	(91)
MIT	19.5211	19.7356	20.0502	20.3537	20.4946	20.5409	20.5472	20.5473	20.5173	20.3042	19.8700	19.4814	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.3711	19.5856	19.9002	20.2037	20.3446	20.3909	20.3972	20.3973	20.3673	20.1542	19.7200	19.3314	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9396	0.9079	0.8385	0.7033	0.5303	0.3641	0.2522	0.2900	0.5026	0.7744	0.9071	0.9475	(94)
Useful gains	564.8232	614.0865	644.5707	615.6684	505.7605	343.6664	226.7241	237.7066	366.3822	490.7638	524.9695	543.8618	(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	933.2317	906.9831	825.4271	687.1323	524.0903	346.3873	227.1330	238.4541	376.9154	579.2347	769.1913	927.1590	(97)
Space heating kWh	274.0959	196.8265	134.5571	51.4540	13.6374	0.0000	0.0000	0.0000	0.0000	65.8224	175.8397	285.1731	(98a)
Space heating requirement - total per year (kWh/year)												1197.4061	
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	274.0959	196.8265	134.5571	51.4540	13.6374	0.0000	0.0000	0.0000	0.0000	65.8224	175.8397	285.1731	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1197.4061	
Space heating per m2											(98c) / (4) =	18.6628	(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 %)	89.5000 (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	274.0959	196.8265	134.5571	51.4540	13.6374	0.0000	0.0000	0.0000	0.0000	65.8224	175.8397	285.1731	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	306.2524	219.9179	150.3432	57.4905	15.2373	0.0000	0.0000	0.0000	0.0000	73.5445	196.4690	318.6292	(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	289.8064	256.4624	272.2497	238.1561	230.1892	206.6245	203.0360	211.3386	213.9832	239.6197	256.1260	286.4222	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	323.8061	286.5502	304.1896	266.0962	257.1946	230.8653	226.8559	236.1325	239.0874	267.7315	286.1743	320.0248	(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	16.0795	14.5234	16.0795	15.5608	16.0795	15.5608	16.0795	16.0795	15.5608	16.0795	15.5608	16.0795	(231)
Lighting	25.3205	20.3131	18.2897	13.3998	10.3504	8.4563	9.4420	12.2730	15.9414	20.9160	23.6246	26.0242	(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	1337.8839	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	3244.7085	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.0000, SFP = 0.5500)		
mechanical ventilation fans (SFP = 0.5500)	103.3233	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	189.3233	(231)
Electricity for lighting (calculated in Appendix L)	204.3510	(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	4976.2667	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1337.8839	3.6400	48.6990	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3244.7085	3.6400	118.1074	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	189.3233	16.4900	31.2194	(249)
Energy for lighting	204.3510	16.4900	33.6975	(250)
Additional standing charges			92.0000	(251)
Total energy cost			323.7233	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0676	(257)
SAP value		82.6940	
SAP rating (Section 12)		83	(258)
SAP band		B	

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	1337.8839	0.2100	280.9556	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3244.7085	0.2100	681.3888	(264)
Space and water heating			962.3444	(265)
Pumps, fans and electric keep-hot	189.3233	0.1387	26.2615	(267)
Energy for lighting	204.3510	0.1443	29.4942	(268)
Total CO2, kg/year			1018.1000	(272)
CO2 emissions per m2			15.8700	(273)
EI value			87.5023	
EI rating			88	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.1600 (1b)	x	2.4000 (2b)	=	153.9840	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.1600					(4)

Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 153.9840 (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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000	(22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750	(22a)
Adj infilt rate	0.1466	0.1371	0.1403	0.1275	0.1275	0.1116	0.1148	0.1211	0.1179	0.1243	0.1243	0.1371	(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) =	81.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2416	0.2321	0.2352	0.2225	0.2225	0.2066	0.2097	0.2161	0.2129	0.2193	0.2193	0.2321	(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	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			10.9000	1.1450	12.4809			(27)
rooflight			1.6800	1.2357	2.0760			(27a)
External Wall 1	40.3200	10.9000	29.4200	0.1300	3.8246	70.0000	2059.4000	(29a)
sheltered	14.1600	2.1000	12.0600	0.1300	1.5678	70.0000	844.2000	(29a)
External Roof 1	64.1600	1.6800	62.4800	0.1100	6.8728	9.0000	562.3200	(30)
Total net area of external elements Aum(A, m2)			118.6400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.7622			(33)
Party Wall 1			25.7700	0.0000	0.0000	180.0000	4638.6000	(32)
Party Floor 1			64.1600			30.0000	1924.8000	(32d)
Internal Wall 1			99.8400			9.0000	898.5600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10927.8800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		170.3223 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.9700	0.0600	0.4182
E3 Sill	5.9700	0.0400	0.2388
E4 Jamb	25.6400	0.0200	0.5128
R11 Upstands or kerbs of rooflights	7.6000	0.2400	1.8240
E7 Party floor between dwellings (in blocks of flats)	16.9000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	5.8000	0.2800	1.6240
E15 Flat roof with parapet	16.9000	0.3000	5.0700
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.9000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	10.9000	0.4800	5.2320
P4 Party wall - Roof (insulation at ceiling level)	5.8000	0.4800	2.7840
E18 Party wall between dwellings	2.4000	0.2400	0.5760
E18 Party wall between dwellings	2.4000	0.2400	0.5760
E16 Corner (normal)	7.2000	0.0500	0.3600
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0600	-0.1440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		19.0718 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	48.8340 (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	12.2781	11.7922	11.9542	11.3063	11.3063	10.4964	10.6584	10.9823	10.8204	11.1443	11.1443	11.7922	(38)
Heat transfer coeff	61.1121	60.6262	60.7881	60.1402	60.1402	59.3304	59.4923	59.8163	59.6543	59.9783	59.9783	60.6262	(39)
Average = Sum(39)m / 12 =												60.1402	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9525	0.9449	0.9474	0.9373	0.9373	0.9247	0.9272	0.9323	0.9298	0.9348	0.9348	0.9449	(40)
HLP (average)												0.9373	
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	2.0965	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
89.0562	87.7178	85.7676	82.0362	79.2825	76.2116	74.4661	76.4016	78.5232	81.8204	85.6320	88.7149	(42a)

Hot water usage for baths

25.6546	25.2736	24.7371	23.7478	23.0070	22.1856	21.7420	22.2747	22.8549	23.7338	24.7434	25.5679	(42b)

Hot water usage for other uses

36.1001	34.7874	33.4746	32.1619	30.8492	29.5365	29.5365	30.8492	32.1619	33.4746	34.7874	36.1001	(42c)

Average daily hot water use (litres/day)	138.7109	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.8109	147.7788	143.9793	137.9459	133.1387	127.9337	125.7445	129.5255	133.5400	139.0288	145.1628	150.3829	(44)
Energy conte	238.8475	210.4350	221.2908	188.8410	179.2303	157.3094	152.0771	160.3797	164.6682	188.6608	206.8110	235.4633	(45)
Energy content (annual)											Total = Sum(45)m =	2304.0141	
Distribution loss (46)m = 0.15 x (45)m	35.8271	31.5653	33.1936	28.3262	26.8845	23.5964	22.8116	24.0569	24.7002	28.2991	31.0216	35.3195	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	289.8064	256.4624	272.2497	238.1561	230.1892	206.6245	203.0360	211.3386	213.9832	239.6197	256.1260	286.4222	(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	289.8064	256.4624	272.2497	238.1561	230.1892	206.6245	203.0360	211.3386	213.9832	239.6197	256.1260	286.4222	(64)
											Total per year (kWh/year) = Sum(64)m =	2904.0141	(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	92.1565	81.4765	86.3189	75.1184	72.3338	64.6341	63.3054	66.0660	67.0809	75.4694	81.0934	91.0313	(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	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.9280	25.6936	20.8954	15.8192	11.8250	9.9832	10.7872	14.0216	18.8198	23.8960	27.8902	29.7320	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	273.5876	276.4265	269.2724	254.0421	234.8165	216.7472	204.6758	201.8368	208.9910	224.2213	243.4468	261.5161	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754	(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)	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	(71)
Water heating gains (Table 5)	123.8663	121.2448	116.0201	104.3311	97.2228	89.7697	85.0879	88.7983	93.1680	101.4374	112.6297	122.3539	(72)
Total internal gains	520.9870	517.9700	500.7930	468.7975	438.4695	408.1052	392.1560	396.2619	412.5838	444.1598	478.5718	508.2071	(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	4.5900	11.5821	0.7200	0.7000	0.7700	18.5679	(74)
East	6.3100	21.5869	0.7200	0.7000	0.7700	47.5756	(76)
South	1.6800	29.0000	0.7200	0.7000	1.0000	22.0994	(82)

Solar gains	88.2429	156.7952	266.2738	418.9484	512.1305	570.3701	541.1441	462.8044	347.7154	204.9829	113.9273	74.1884	(83)
Total gains	609.2298	674.7652	767.0668	887.7459	950.6000	978.4753	933.3000	859.0662	760.2992	649.1428	592.4992	582.3955	(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	49.6714	50.0695	49.9361	50.4741	50.4741	51.1630	51.0237	50.7474	50.8852	50.6104	50.6104	50.0695	
alpha	4.3114	4.3380	4.3291	4.3649	4.3649	4.4109	4.4016	4.3832	4.3923	4.3740	4.3740	4.3380	
util living area	0.9423	0.9145	0.8302	0.6653	0.4704	0.2782	0.1593	0.1879	0.4180	0.7269	0.9001	0.9493	(86)
MIT	20.1101	20.2843	20.6109	20.8755	20.9767	20.9983	20.9999	20.9998	20.9898	20.8539	20.4616	20.0763	(87)
Th 2	20.1231	20.1295	20.1274	20.1359	20.1359	20.1465	20.1444	20.1401	20.1423	20.1380	20.1380	20.1295	(88)
util rest of house	0.9312	0.8992	0.8027	0.6237	0.4202	0.2269	0.1048	0.1281	0.3539	0.6775	0.8794	0.9393	(89)
MIT 2	19.3431	19.5136	19.8135	20.0467	20.1225	20.1459	20.1444	20.1401	20.1378	20.0382	19.6925	19.3163	(90)
Living area fraction										fLA = Living area / (4) =		0.4749	(91)
MIT	19.7073	19.8796	20.1922	20.4403	20.5282	20.5507	20.5507	20.5484	20.5424	20.4256	20.0578	19.6772	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.5573	19.7296	20.0422	20.2903	20.3782	20.4007	20.4007	20.3984	20.3924	20.2756	19.9078	19.5272	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9228	0.8912	0.7998	0.6314	0.4344	0.2422	0.1211	0.1461	0.3728	0.6858	0.8731	0.9312	(94)
Useful gains	562.2038	601.3694	613.5339	560.5251	412.9778	237.0179	113.0668	125.4938	283.4475	445.1915	517.3135	542.3022	(95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000	(96)
Heat loss rate W	865.1847	844.4997	744.1800	600.8194	419.6679	237.3660	113.0760	125.5172	285.8897	490.3598	696.2131	856.4785	(97)
Space heating kWh	225.4178	163.3835	97.2007	29.0119	4.9774	0.0000	0.0000	0.0000	0.0000	33.6052	128.8077	233.7472	(98a)
Space heating requirement - total per year (kWh/year)												916.1515	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													

	225.4178	163.3835	97.2007	29.0119	4.9774	0.0000	0.0000	0.0000	0.0000	33.6052	128.8077	233.7472 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												916.1515
Space heating per m2											(98c) / (4) =	14.2792 (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 %)													89.5000 (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													
	225.4178	163.3835	97.2007	29.0119	4.9774	0.0000	0.0000	0.0000	0.0000	33.6052	128.8077	233.7472	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	251.8634	182.5514	108.6041	32.4156	5.5613	0.0000	0.0000	0.0000	0.0000	37.5478	143.9192	261.1700	(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													
	289.8064	256.4624	272.2497	238.1561	230.1892	206.6245	203.0360	211.3386	213.9832	239.6197	256.1260	286.4222	(64)
Efficiency of water heater													89.5000 (216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	323.8061	286.5502	304.1896	266.0962	257.1946	230.8653	226.8559	236.1325	239.0874	267.7315	286.1743	320.0248	(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	16.0795	14.5234	16.0795	15.5608	16.0795	15.5608	16.0795	16.0795	15.5608	16.0795	15.5608	16.0795	(231)
Lighting	25.3205	20.3131	18.2897	13.3998	10.3504	8.4563	9.4420	12.2730	15.9414	20.9160	23.6246	26.0242	(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	1023.6329	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	3244.7085	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.0000, SFP = 0.5500)		
mechanical ventilation fans (SFP = 0.5500)	103.3233	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	189.3233	(231)
Electricity for lighting (calculated in Appendix L)	204.3510	(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	4662.0158	(238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1023.6329	6.1900	63.3629	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3244.7085	6.1900	200.8475	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	189.3233	25.1600	47.6337	(249)
Energy for lighting	204.3510	25.1600	51.4147	(250)
Additional standing charges			102.0000	(251)
Total energy cost			465.2588	(255)

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	1023.6329	0.2100	214.9629	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3244.7085	0.2100	681.3888	(264)
Space and water heating			896.3517	(265)
Pumps, fans and electric keep-hot	189.3233	0.1387	26.2615	(267)
Energy for lighting	204.3510	0.1443	29.4942	(268)

Total CO2, kg/year 952.1073 (272)

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	1023.6329	1.1300	1156.7052	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3244.7085	1.1300	3666.5206	(278)
Space and water heating			4823.2259	(279)
Pumps, fans and electric keep-hot	189.3233	1.5128	286.4082	(281)
Energy for lighting	204.3510	1.5338	313.4404	(282)
Total Primary energy kWh/year			5423.0745	(286)

SAP 10 EPC IMPROVEMENTS

Be Lean

Current energy efficiency rating: B 83
Current environmental impact rating: B 88

N	Solar water heating	Not applicable	
U	Solar photovoltaic panels	Not applicable	
V2	Wind turbine	Not applicable	

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 83
Potential environmental impact rating: B 88

Fuel prices for cost data on this page from database revision number 538 TEST (29 Feb 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£99	£99	£0
Mains gas	£366	£366	£0
Space heating	£213	£213	£0
Water heating	£201	£201	£0
Lighting	£51	£51	£0
Total cost of fuels	£465	£465	£0
Total cost of uses	£465	£465	£0
Delivered energy	73 kWh/m²	73 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.0 tonnes	1.0 tonnes	0.0 tonnes
CO2 emissions per m²	15 kg/m²	15 kg/m²	0 kg/m²
Primary energy	85 kWh/m²	85 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.1600 (1b)	x	2.4000 (2b)	=	153.9840	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.1600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	153.9840	(5)

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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	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(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) =	81.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			10.9000	1.1450	12.4809			(27)
rooflight			1.6800	1.2357	2.0760			(27a)
External Wall 1	40.3200	10.9000	29.4200	0.1300	3.8246	70.0000	2059.4000	(29a)
sheltered	14.1600	2.1000	12.0600	0.1300	1.5678	70.0000	844.2000	(29a)
External Roof 1	64.1600	1.6800	62.4800	0.1100	6.8728	9.0000	562.3200	(30)
Total net area of external elements Aum(A, m2)			118.6400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.7622			(33)
Party Wall 1			25.7700	0.0000	0.0000	180.0000	4638.6000	(32)
Party Floor 1			64.1600			30.0000	1924.8000	(32d)
Internal Wall 1			99.8400			9.0000	898.5600	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	10927.8800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	170.3223	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.9700	0.0600	0.4182
E3 Sill	5.9700	0.0400	0.2388
E4 Jamb	25.6400	0.0200	0.5128
R11 Upstands or kerbs of rooflights	7.6000	0.2400	1.8240
E7 Party floor between dwellings (in blocks of flats)	16.9000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	5.8000	0.2800	1.6240
E15 Flat roof with parapet	16.9000	0.3000	5.0700
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.9000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	10.9000	0.4800	5.2320
P4 Party wall - Roof (insulation at ceiling level)	5.8000	0.4800	2.7840
E18 Party wall between dwellings	2.4000	0.2400	0.5760
E18 Party wall between dwellings	2.4000	0.2400	0.5760
E16 Corner (normal)	7.2000	0.0500	0.3600
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0600	-0.1440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	19.0718	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	48.8340	(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	13.0880	12.9260	12.7640	11.9542	11.7922	10.9823	10.9823	10.8204	11.3063	11.7922	12.1161	12.4401	(38)
Heat transfer coeff	61.9219	61.7600	61.5980	60.7881	60.6262	59.8163	59.8163	59.6543	60.1402	60.6262	60.9501	61.2740	(39)
Average = Sum(39)m / 12 =												60.7476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9651	0.9626	0.9601	0.9474	0.9449	0.9323	0.9323	0.9298	0.9373	0.9449	0.9500	0.9550	(40)
HLP (average)												0.9468	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0965	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	89.0562	87.7178	85.7676	82.0362	79.2825	76.2116	74.4661	76.4016	78.5232	81.8204	85.6320	88.7149	(42a)
Hot water usage for baths	25.6546	25.2736	24.7371	23.7478	23.0070	22.1856	21.7420	22.2747	22.8549	23.7338	24.7434	25.5679	(42b)
Hot water usage for other uses	36.1001	34.7874	33.4746	32.1619	30.8492	29.5365	29.5365	30.8492	32.1619	33.4746	34.7874	36.1001	(42c)
Average daily hot water use (litres/day)												138.7109	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.8109	147.7788	143.9793	137.9459	133.1387	127.9337	125.7445	129.5255	133.5400	139.0288	145.1628	150.3829	(44)
Energy conte	238.8475	210.4350	221.2908	188.8410	179.2303	157.3094	152.0771	160.3797	164.6682	188.6608	206.8110	235.4633	(45)
Energy content (annual)										Total = Sum(45)m =		2304.0141	
Distribution loss (46)m = 0.15 x (45)m	35.8271	31.5653	33.1936	28.3262	26.8845	23.5964	22.8116	24.0569	24.7002	28.2991	31.0216	35.3195	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	289.8064	256.4624	272.2497	238.1561	230.1892	206.6245	203.0360	211.3386	213.9832	239.6197	256.1260	286.4222	(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	289.8064	256.4624	272.2497	238.1561	230.1892	206.6245	203.0360	211.3386	213.9832	239.6197	256.1260	286.4222	(64)

											Total per year (kWh/year) = Sum(64)m =		2904.0141 (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													
	92.1565	81.4765	86.3189	75.1184	72.3338	64.6341	63.3054	66.0660	67.0809	75.4694	81.0934	91.0313	(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	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	28.9280	25.6936	20.8954	15.8192	11.8250	9.9832	10.7872	14.0216	18.8198	23.8960	27.8902	29.7320	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	273.5876	276.4265	269.2724	254.0421	234.8165	216.7472	204.6758	201.8368	208.9910	224.2213	243.4468	261.5161	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754	(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)													
	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	(71)
Water heating gains (Table 5)													
	123.8663	121.2448	116.0201	104.3311	97.2228	89.7697	85.0879	88.7983	93.1680	101.4374	112.6297	122.3539	(72)
Total internal gains													
	520.9870	517.9700	500.7930	468.7975	438.4695	408.1052	392.1560	396.2619	412.5838	444.1598	478.5718	508.2071	(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	4.5900	10.6334	0.7200	0.7000	0.7700	17.0470	(74)
East	6.3100	19.6403	0.7200	0.7000	0.7700	43.2853	(76)
South	1.6800	26.0000	0.7200	0.7000	1.0000	19.8132	(82)

Solar gains	80.1456	158.4035	267.9622	406.6022	515.3401	535.7862	506.6562	423.2795	316.3770	189.5490	100.1490	65.8100	(83)
Total gains	601.1325	676.3736	768.7551	875.3997	953.8096	943.8914	898.8121	819.5414	728.9608	633.7088	578.7208	574.0171	(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	49.0218	49.1503	49.2796	49.9361	50.0695	50.7474	50.7474	50.8852	50.4741	50.0695	49.8034	49.5401	
alpha	4.2681	4.2767	4.2853	4.3291	4.3380	4.3832	4.3832	4.3923	4.3649	4.3380	4.3202	4.3027	
util living area													
	0.9561	0.9292	0.8662	0.7357	0.5648	0.4009	0.2919	0.3330	0.5472	0.8106	0.9297	0.9625	(86)
MIT	19.9257	20.1438	20.4678	20.7850	20.9410	20.9896	20.9980	20.9965	20.9622	20.7254	20.2741	19.8817	(87)
Th 2	20.1125	20.1146	20.1167	20.1274	20.1295	20.1401	20.1401	20.1423	20.1359	20.1295	20.1252	20.1210	(88)
util rest of house													
	0.9479	0.9166	0.8444	0.7000	0.5186	0.3488	0.2353	0.2717	0.4858	0.7733	0.9150	0.9553	(89)
MIT 2	19.1552	19.3665	19.6726	19.9636	20.0909	20.1350	20.1395	20.1410	20.1149	19.9233	19.5046	19.1193	(90)
Living area fraction										fLA = Living area / (4) =		0.4749	(91)
MIT	19.5211	19.7356	20.0502	20.3537	20.4946	20.5409	20.5472	20.5473	20.5173	20.3042	19.8700	19.4814	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.3711	19.5856	19.9002	20.2037	20.3446	20.3909	20.3972	20.3973	20.3673	20.1542	19.7200	19.3314	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9396	0.9079	0.8385	0.7033	0.5303	0.3641	0.2522	0.2900	0.5026	0.7744	0.9071	0.9475	(94)
Useful gains	564.8232	614.0865	644.5707	615.6684	505.7605	343.6664	226.7241	237.7066	366.3822	490.7638	524.9695	543.8618	(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													
	933.2317	906.9831	825.4271	687.1323	524.0903	346.3873	227.1330	238.4541	376.9154	579.2347	769.1913	927.1590	(97)
Space heating kWh													
	274.0959	196.8265	134.5571	51.4540	13.6374	0.0000	0.0000	0.0000	0.0000	65.8224	175.8397	285.1731	(98a)
Space heating requirement - total per year (kWh/year)												1197.4061	
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													
	274.0959	196.8265	134.5571	51.4540	13.6374	0.0000	0.0000	0.0000	0.0000	65.8224	175.8397	285.1731	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1197.4061	
Space heating per m2											(98c) / (4) =	18.6628	(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 %)												89.5000	(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													
	274.0959	196.8265	134.5571	51.4540	13.6374	0.0000	0.0000	0.0000	0.0000	65.8224	175.8397	285.1731	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	306.2524	219.9179	150.3432	57.4905	15.2373	0.0000	0.0000	0.0000	0.0000	73.5445	196.4690	318.6292	(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	(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	(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	(215)
Water heating												
Water heating requirement												
	289.8064	256.4624	272.2497	238.1561	230.1892	206.6245	203.0360	211.3386	213.9832	239.6197	256.1260	286.4222 (64)
Efficiency of water heater												89.5000 (216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000 (217)
Fuel for water heating, kWh/month												
	323.8061	286.5502	304.1896	266.0962	257.1946	230.8653	226.8559	236.1325	239.0874	267.7315	286.1743	320.0248 (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	16.0795	14.5234	16.0795	15.5608	16.0795	15.5608	16.0795	16.0795	15.5608	16.0795	15.5608	16.0795 (231)
Lighting	25.3205	20.3131	18.2897	13.3998	10.3504	8.4563	9.4420	12.2730	15.9414	20.9160	23.6246	26.0242 (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	1337.8839	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	3244.7085	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.0000, SFP = 0.5500)		
mechanical ventilation fans (SFP = 0.5500)	103.3233	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	189.3233	(231)
Electricity for lighting (calculated in Appendix L)	204.3510	(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	4976.2667	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1337.8839	3.6400	48.6990	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3244.7085	3.6400	118.1074	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	189.3233	16.4900	31.2194	(249)
Energy for lighting	204.3510	16.4900	33.6975	(250)
Additional standing charges			92.0000	(251)
Total energy cost			323.7233	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0676	(257)
SAP value		82.6940	
SAP rating (Section 12)		83	(258)
SAP band		B	

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	1337.8839	0.2100	280.9556	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3244.7085	0.2100	681.3888	(264)
Space and water heating			962.3444	(265)
Pumps, fans and electric keep-hot	189.3233	0.1387	26.2615	(267)
Energy for lighting	204.3510	0.1443	29.4942	(268)
Total CO2, kg/year			1018.1000	(272)
CO2 emissions per m2			15.8700	(273)
EI value			87.5023	
EI rating			88	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.1600	(1b)	x 2.4000	(2b) =	153.9840	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.1600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		153.9840	(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		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000	(22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750	(22a)
Adj infilt rate	0.1466	0.1371	0.1403	0.1275	0.1275	0.1116	0.1148	0.1211	0.1179	0.1243	0.1243	0.1371	(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) =	81.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2416	0.2321	0.2352	0.2225	0.2225	0.2066	0.2097	0.2161	0.2129	0.2193	0.2193	0.2321	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			10.9000	1.1450	12.4809			(27)
rooflight			1.6800	1.2357	2.0760			(27a)
External Wall 1	40.3200	10.9000	29.4200	0.1300	3.8246	70.0000	2059.4000	(29a)
sheltered	14.1600	2.1000	12.0600	0.1300	1.5678	70.0000	844.2000	(29a)
External Roof 1	64.1600	1.6800	62.4800	0.1100	6.8728	9.0000	562.3200	(30)
Total net area of external elements Aum(A, m2)			118.6400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.7622			(33)
Party Wall 1			25.7700	0.0000	0.0000	180.0000	4638.6000	(32)
Party Floor 1			64.1600			30.0000	1924.8000	(32d)
Internal Wall 1			99.8400			9.0000	898.5600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 10927.8800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	170.3223	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	6.9700	0.0600	0.4182
E2 Other lintels (including other steel lintels)	5.9700	0.0400	0.2388
E3 Sill	25.6400	0.0200	0.5128
E4 Jamb	7.6000	0.2400	1.8240
R11 Upstands or kerbs of rooflights	16.9000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	5.8000	0.2800	1.6240
E7 Party floor between dwellings (in blocks of flats)	16.9000	0.3000	5.0700
E15 Flat roof with parapet	10.9000	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.9000	0.4800	5.2320
P4 Party wall - Roof (insulation at ceiling level)	5.8000	0.4800	2.7840
P4 Party wall - Roof (insulation at ceiling level)	2.4000	0.2400	0.5760
E18 Party wall between dwellings	2.4000	0.2400	0.5760
E18 Party wall between dwellings	7.2000	0.0500	0.3600
E16 Corner (normal)	2.4000	-0.0600	-0.1440
E17 Corner (inverted - internal area greater than external area)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	19.0718	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	48.8340	(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	12.2781	11.7922	11.9542	11.3063	11.3063	10.4964	10.6584	10.9823	10.8204	11.1443	11.1443	11.7922	(38)
Heat transfer coeff	61.1121	60.6262	60.7881	60.1402	60.1402	59.3304	59.4923	59.8163	59.6543	59.9783	59.9783	60.6262	(39)
Average = Sum(39)m / 12 =												60.1402	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9525	0.9449	0.9474	0.9373	0.9373	0.9247	0.9272	0.9323	0.9298	0.9348	0.9348	0.9449	(40)
HLP (average)												0.9373	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0965	(42)
Hot water usage for mixer showers													
	89.0562	87.7178	85.7676	82.0362	79.2825	76.2116	74.4661	76.4016	78.5232	81.8204	85.6320	88.7149	(42a)
Hot water usage for baths													
	25.6546	25.2736	24.7371	23.7478	23.0070	22.1856	21.7420	22.2747	22.8549	23.7338	24.7434	25.5679	(42b)
Hot water usage for other uses													
	36.1001	34.7874	33.4746	32.1619	30.8492	29.5365	29.5365	30.8492	32.1619	33.4746	34.7874	36.1001	(42c)
Average daily hot water use (litres/day)												138.7109	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	150.8109	147.7788	143.9793	137.9459	133.1387	127.9337	125.7445	129.5255	133.5400	139.0288	145.1628	150.3829	(44)
Energy conte	238.8475	210.4350	221.2908	188.8410	179.2303	157.3094	152.0771	160.3797	164.6682	188.6608	206.8110	235.4633	(45)
Energy content (annual)											Total = Sum(45)m =	2304.0141	
Distribution loss (46)m = 0.15 x (45)m													
	35.8271	31.5653	33.1936	28.3262	26.8845	23.5964	22.8116	24.0569	24.7002	28.2991	31.0216	35.3195	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	289.8064	256.4624	272.2497	238.1561	230.1892	206.6245	203.0360	211.3386	213.9832	239.6197	256.1260	286.4222	(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													
	289.8064	256.4624	272.2497	238.1561	230.1892	206.6245	203.0360	211.3386	213.9832	239.6197	256.1260	286.4222	(64)
											Total per year (kWh/year) = Sum(64)m =	2904.0141	(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													
	92.1565	81.4765	86.3189	75.1184	72.3338	64.6341	63.3054	66.0660	67.0809	75.4694	81.0934	91.0313	(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	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	125.7891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	28.9280	25.6936	20.8954	15.8192	11.8250	9.9832	10.7872	14.0216	18.8198	23.8960	27.8902	29.7320	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	273.5876	276.4265	269.2724	254.0421	234.8165	216.7472	204.6758	201.8368	208.9910	224.2213	243.4468	261.5161	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754	49.6754	(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)													
	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	(71)
Water heating gains (Table 5)													
	123.8663	121.2448	116.0201	104.3311	97.2228	89.7697	85.0879	88.7983	93.1680	101.4374	112.6297	122.3539	(72)
Total internal gains													
	520.9870	517.9700	500.7930	468.7975	438.4695	408.1052	392.1560	396.2619	412.5838	444.1598	478.5718	508.2071	(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	4.5900	11.5821	0.7200	0.7000	0.7700	18.5679	(74)
East	6.3100	21.5869	0.7200	0.7000	0.7700	47.5756	(76)
South	1.6800	29.0000	0.7200	0.7000	1.0000	22.0994	(82)

Solar gains	88.2429	156.7952	266.2738	418.9484	512.1305	570.3701	541.1441	462.8044	347.7154	204.9829	113.9273	74.1884	(83)
Total gains	609.2298	674.7652	767.0668	887.7459	950.6000	978.4753	933.3000	859.0662	760.2992	649.1428	592.4992	582.3955	(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	49.6714	50.0695	49.9361	50.4741	50.4741	51.1630	51.0237	50.7474	50.8852	50.6104	50.6104	50.0695	
alpha	4.3114	4.3380	4.3291	4.3649	4.3649	4.4109	4.4016	4.3832	4.3923	4.3740	4.3740	4.3380	
util living area													
	0.9423	0.9145	0.8302	0.6653	0.4704	0.2782	0.1593	0.1879	0.4180	0.7269	0.9001	0.9493	(86)
MIT	20.1101	20.2843	20.6109	20.8755	20.9767	20.9983	20.9999	20.9998	20.9898	20.8539	20.4616	20.0763	(87)
Th 2	20.1231	20.1295	20.1274	20.1359	20.1359	20.1465	20.1444	20.1401	20.1423	20.1380	20.1380	20.1295	(88)
util rest of house													
	0.9312	0.8992	0.8027	0.6237	0.4202	0.2269	0.1048	0.1281	0.3539	0.6775	0.8794	0.9393	(89)
MIT 2	19.3431	19.5136	19.8135	20.0467	20.1225	20.1459	20.1444	20.1401	20.1378	20.0382	19.6925	19.3163	(90)
Living area fraction										fLA = Living area / (4) =		0.4749	(91)
MIT	19.7073	19.8796	20.1922	20.4403	20.5282	20.5507	20.5507	20.5484	20.5424	20.4256	20.0578	19.6772	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.5573	19.7296	20.0422	20.2903	20.3782	20.4007	20.4007	20.3984	20.3924	20.2756	19.9078	19.5272	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9228	0.8912	0.7998	0.6314	0.4344	0.2422	0.1211	0.1461	0.3728	0.6858	0.8731	0.9312	(94)
Useful gains	562.2038	601.3694	613.5339	560.5251	412.9778	237.0179	113.0668	125.4938	283.4475	445.1915	517.3135	542.3022	(95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000	(96)
Heat loss rate W	865.1847	844.4997	744.1800	600.8194	419.6679	237.3660	113.0760	125.5172	285.8897	490.3598	696.2131	856.4785	(97)
Space heating kWh	225.4178	163.3835	97.2007	29.0119	4.9774	0.0000	0.0000	0.0000	0.0000	33.6052	128.8077	233.7472	(98a)
Space heating requirement - total per year (kWh/year)												916.1515	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	225.4178	163.3835	97.2007	29.0119	4.9774	0.0000	0.0000	0.0000	0.0000	33.6052	128.8077	233.7472	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												916.1515	
Space heating per m2											(98c) / (4) =	14.2792	(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 %)	89.5000	(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	225.4178	163.3835	97.2007	29.0119	4.9774	0.0000	0.0000	0.0000	0.0000	33.6052	128.8077	233.7472	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	251.8634	182.5514	108.6041	32.4156	5.5613	0.0000	0.0000	0.0000	0.0000	37.5478	143.9192	261.1700	(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	289.8064	256.4624	272.2497	238.1561	230.1892	206.6245	203.0360	211.3386	213.9832	239.6197	256.1260	286.4222	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	323.8061	286.5502	304.1896	266.0962	257.1946	230.8653	226.8559	236.1325	239.0874	267.7315	286.1743	320.0248	(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	16.0795	14.5234	16.0795	15.5608	16.0795	15.5608	16.0795	16.0795	15.5608	16.0795	15.5608	16.0795	(231)
Lighting	25.3205	20.3131	18.2897	13.3998	10.3504	8.4563	9.4420	12.2730	15.9414	20.9160	23.6246	26.0242	(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	1023.6329	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	3244.7085	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.0000, SFP = 0.5500)		
mechanical ventilation fans (SFP = 0.5500)	103.3233	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	189.3233	(231)
Electricity for lighting (calculated in Appendix L)	204.3510	(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	4662.0158	(238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1023.6329	6.1900	63.3629	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3244.7085	6.1900	200.8475	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	189.3233	25.1600	47.6337	(249)
Energy for lighting	204.3510	25.1600	51.4147	(250)
Additional standing charges			102.0000	(251)
Total energy cost			465.2588	(255)

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	1023.6329	0.2100	214.9629	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3244.7085	0.2100	681.3888	(264)
Space and water heating			896.3517	(265)
Pumps, fans and electric keep-hot	189.3233	0.1387	26.2615	(267)
Energy for lighting	204.3510	0.1443	29.4942	(268)
Total CO2, kg/year			952.1073	(272)

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	1023.6329	1.1300	1156.7052	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3244.7085	1.1300	3666.5206	(278)
Space and water heating			4823.2259	(279)
Pumps, fans and electric keep-hot	189.3233	1.5128	286.4082	(281)
Energy for lighting	204.3510	1.5338	313.4404	(282)
Total Primary energy kWh/year			5423.0745	(286)

Full SAP Calculation Printout

Property Reference	Flat 3 Block A	**Issued on Date**	13/03/2024
Assessment Reference	Be Lean	**Prop Type Ref**	
Property	Flat 3 Block A, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	83 B	**DER**	15.94	**TER**	15.01
Environmental	89 B	**% DER < TER**			-6.20
CO_2 Emissions (t/year)	0.7	**DFEE**	29.19	**TFEE**	31.08
Compliance Check	See BREL	**% DFEE < TFEE**			6.09
% DPER < TPER	-14.52	**DPER**	91.58	**TPER**	79.97

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client	KGH, Kurt Gander - Howe		

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	46.4600	(1b)	x 2.4900	(2b) =	115.6854	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	115.6854	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(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) =	81.0000	(23c)

Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			3.3000	1.1450	3.7786			(27)
exposed upper			2.5600	0.1300	0.3328	20.0000	51.2000	(28b)
over commercial			43.9000	0.1300	5.7070	20.0000	878.0000	(28b)
External Wall 1	12.7000	3.3000	9.4000	0.1300	1.2220	70.0000	658.0000	(29a)
sheltered	16.9300	2.1000	14.8300	0.1300	1.9279	70.0000	1038.1000	(29a)
Total net area of external elements Aum(A, m2)			76.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.9083			(33)
Party Wall 1			20.6600	0.0000	0.0000	180.0000	3718.8000	(32)
Party Wall 2 to existing			24.1500	0.0000	0.0000	180.0000	4347.0000	(32)
Party Ceiling 1			62.8800			20.0000	1257.6000	(32b)
Internal Wall 1			17.9200			9.0000	161.2800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12109.9800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	260.6539	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	2.9400	0.0600	0.1764
E3 Sill	1.9400	0.0400	0.0776
E4 Jamb	11.0000	0.0200	0.2200
E7 Party floor between dwellings (in blocks of flats)	9.7000	0.0000	0.0000
E20 Exposed floor (normal)	4.8000	0.3200	1.5360
E21 Exposed floor (inverted)	4.2000	0.3200	1.3440
E7 Party floor between dwellings (in blocks of flats)	13.6000	0.2000	2.7200
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E16 Corner (normal)	2.4900	0.1800	0.4482
E17 Corner (inverted - internal area greater than external area)	2.4900	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	31.9000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.9126 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.8209 (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	9.2852	9.1742	9.0633	8.5085	8.3976	7.8428	7.8428	7.7319	8.0647	8.3976	8.6195	8.8414	(38)
Heat transfer coeff	34.1061	33.9951	33.8842	33.3294	33.2185	32.6637	32.6637	32.5528	32.8856	33.2185	33.4404	33.6623	(39)

Average = Sum(39)m / 12 = 33.3017

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7341	0.7317	0.7293	0.7174	0.7150	0.7031	0.7031	0.7007	0.7078	0.7150	0.7198	0.7245	(40)
HLP (average)												0.7168	
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 1.5866 (42)

Hot water usage for mixer showers

76.2330	75.0873	73.4179	70.2238	67.8666	65.2379	63.7438	65.4006	67.2167	70.0391	73.3018	75.9409	(42a)

Hot water usage for baths

21.9783	21.6519	21.1923	20.3448	19.7102	19.0065	18.6264	19.0828	19.5798	20.3328	21.1977	21.9040	(42b)

Hot water usage for other uses

30.8787	29.7558	28.6329	27.5101	26.3872	25.2644	25.2644	26.3872	27.5101	28.6329	29.7558	30.8787	(42c)

Average daily hot water use (litres/day) 118.7332 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.0900	126.4951	123.2432	118.0787	113.9640	109.5088	107.6345	110.8706	114.3066	119.0048	124.2554	128.7236	(44)
Energy conte	204.4470	180.1273	189.4201	161.6438	153.4175	134.6538	130.1746	137.2809	140.9514	161.4884	177.0246	201.5501	(45)

Energy content (annual) Total = Sum(45)m = 1972.1795

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

30.6670	27.0191	28.4130	24.2466	23.0126	20.1981	19.5262	20.5921	21.1427	24.2233	26.5537	30.2325	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)

Primary loss, Combi loss

Total heat required for water heating calculated for each month

255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090	(62)
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)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS, PV diverter, Solar input, FGHRS

Output from w/h

255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090	(64)

Total per year (kWh/year) = Sum(64)m = 2572.1795 (64)

12Total per year (kWh/year) 2572 (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

80.7183	71.3992	75.7219	66.0753	63.7510	57.1012	56.0228	58.3856	59.1951	66.4346	71.1894	79.7551	(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	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	85.8594	95.0586	85.8594	88.7214	85.8594	88.7214	85.8594	85.8594	88.7214	85.8594	88.7214	85.8594	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	138.0513	139.4839	135.8739	128.1887	118.4876	109.3699	103.2787	101.8461	105.4561	113.1413	122.8424	131.9601	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	(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)	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)
Water heating gains (Table 5)	108.4924	106.2488	101.7768	91.7713	85.6869	79.3072	75.2994	78.4753	82.2154	89.2938	98.8742	107.1977	(72)
Total internal gains	382.2025	390.5907	373.3095	358.4808	339.8333	324.1978	311.2369	312.9803	323.1923	338.0939	360.2374	374.8167	(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	
South	3.3000	46.7521	0.7200	0.7000	0.7700	53.8863	(78)

Solar gains	53.8863	88.2519	112.4173	127.0559	132.4001	127.4171	124.4943	120.9012	117.4331	95.1880	63.8737	46.5627	(83)
Total gains	436.0888	478.8426	485.7268	485.5367	472.2334	451.6149	435.7312	433.8815	440.6254	433.2819	424.1111	421.3794	(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	98.6300	98.9519	99.2759	100.9283	101.2654	102.9852	102.9852	103.3362	102.2903	101.2654	100.5934	99.9303	
alpha	7.5753	7.5968	7.6184	7.7286	7.7510	7.8657	7.8657	7.8891	7.8194	7.7510	7.7062	7.6620	
util living area	0.9655	0.9336	0.8890	0.7888	0.6455	0.4623	0.3298	0.3451	0.5136	0.7649	0.9214	0.9710	(86)
MIT	20.6423	20.7584	20.8565	20.9510	20.9901	20.9994	21.0000	20.9999	20.9985	20.9661	20.8212	20.6227	(87)
Th 2	20.3108	20.3129	20.3150	20.3255	20.3276	20.3381	20.3381	20.3402	20.3339	20.3276	20.3234	20.3192	(88)
util rest of house	0.9571	0.9194	0.8670	0.7549	0.6019	0.4148	0.2802	0.2956	0.4646	0.7246	0.9027	0.9638	(89)
MIT 2	20.0009	20.1111	20.2017	20.2910	20.3219	20.3379	20.3381	20.3402	20.3333	20.3055	20.1801	19.9898	(90)
Living area fraction										fLA = Living area / (4) =		0.8717	(91)
MIT	20.5600	20.6754	20.7725	20.8663	20.9044	20.9145	20.9151	20.9153	20.9132	20.8813	20.7389	20.5415	(92)
Temperature adjustment												-0.1500	
adjusted MIT	20.4100	20.5254	20.6225	20.7163	20.7544	20.7645	20.7651	20.7653	20.7632	20.7313	20.5889	20.3915	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9584	0.9241	0.8773	0.7749	0.6298	0.4454	0.3122	0.3275	0.4962	0.7493	0.9105	0.9646	(94)
Useful gains	417.9617	442.4833	426.1102	376.2504	297.3996	201.1615	136.0366	142.0889	218.6542	324.6406	386.1467	406.4633	(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	549.4485	531.1873	478.5294	393.8310	300.7736	201.3559	136.0465	142.1033	219.1226	336.5474	451.0747	545.0425	(97)
Space heating kWh	97.8262	59.6091	38.9999	12.6581	2.5103	0.0000	0.0000	0.0000	0.0000	8.8587	46.7482	103.1029	(98a)
Space heating requirement - total per year (kWh/year)												370.3133	
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	97.8262	59.6091	38.9999	12.6581	2.5103	0.0000	0.0000	0.0000	0.0000	8.8587	46.7482	103.1029	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												370.3133	
Space heating per m2										(98c) / (4) =		7.9706	(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 %) 89.5000 (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	97.8262	59.6091	38.9999	12.6581	2.5103	0.0000	0.0000	0.0000	0.0000	8.8587	46.7482	103.1029	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	109.3030	66.6023	43.5753	14.1431	2.8048	0.0000	0.0000	0.0000	0.0000	9.8979	52.2326	115.1988	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	285.3697	252.6868	268.5799	235.7082	228.3535	205.5518	202.3838	210.3239	212.5883	237.3713	252.8934	282.1329	(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	14.5562	13.1475	14.5562	14.0866	14.5562	14.0866	14.5562	14.5562	14.0866	14.5562	14.0866	14.5562	(231)
Lighting	22.6544	18.1742	16.3639	11.9889	9.2605	7.5659	8.4478	10.9807	14.2629	18.7137	21.1371	23.2840	(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 1 413.7579 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 89.5000

Water heating fuel used 2873.9436 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)

mechanical ventilation fans (SFP = 0.6050) 85.3874 (230a)

central heating pump 41.0000 (230c)

main heating flue fan 45.0000 (230e)

Total electricity for the above, kWh/year	171.3874	(231)
Electricity for lighting (calculated in Appendix L)	182.8340	(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	3641.9229	(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	413.7579	0.2100	86.8892	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2873.9436	0.2100	603.5281	(264)
Space and water heating			690.4173	(265)
Pumps, fans and electric keep-hot	171.3874	0.1387	23.7735	(267)
Energy for lighting	182.8340	0.1443	26.3886	(268)
Total CO2, kg/year			740.5795	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			15.9400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	413.7579	1.1300	467.5464	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2873.9436	1.1300	3247.5562	(278)
Space and water heating			3715.1027	(279)
Pumps, fans and electric keep-hot	171.3874	1.5128	259.2748	(281)
Energy for lighting	182.8340	1.5338	280.4370	(282)
Total Primary energy kWh/year			4254.8145	(286)
Dwelling Primary energy Rate (DPER)			91.5800	(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	46.4600 (1b)	x	2.4900 (2b)	=	115.6854	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	115.6854	(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) =	0.1729	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4229	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3277	(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	0.4179	0.4097	0.4015	0.3605	0.3523	0.3113	0.3113	0.3032	0.3277	0.3523	0.3687	0.3851	(22b)
Effective ac	0.5873	0.5839	0.5806	0.5650	0.5621	0.5485	0.5485	0.5460	0.5537	0.5621	0.5680	0.5741	(25)

3. Heat losses and heat loss parameter

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

	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			3.3000	1.1450	3.7786			(27)
exposed upper			2.5600	0.1300	0.3328			(28b)
over commercial			43.9000	0.1300	5.7070			(28b)
External Wall 1	12.7000	3.3000	9.4000	0.1800	1.6920			(29a)
sheltered	16.9300	2.1000	14.8300	0.1800	2.6694			(29a)
Total net area of external elements Aum(A, m2)			76.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.2798			(33)
Party Wall 1			20.6600	0.0000	0.0000			(32)
Party Wall 2 to existing			24.1500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 274.1881 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	2.9400	0.0500	0.1470
E3 Sill	1.9400	0.0500	0.0970
E4 Jamb	11.0000	0.0500	0.5500
E7 Party floor between dwellings (in blocks of flats)	9.7000	0.0700	0.6790
E20 Exposed floor (normal)	4.8000	0.3200	1.5360
E21 Exposed floor (inverted)	4.2000	0.3200	1.3440
E7 Party floor between dwellings (in blocks of flats)	13.6000	0.0700	0.9520
E18 Party wall between dwellings	4.9800	0.0600	0.2988
E18 Party wall between dwellings	4.9800	0.0600	0.2988
E16 Corner (normal)	2.4900	0.0900	0.2241
E17 Corner (inverted - internal area greater than external area)	2.4900	-0.0900	-0.2241
E7 Party floor between dwellings (in blocks of flats)	31.9000	0.0700	2.2330

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.1356 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 24.4154 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.4210	22.2916	22.1647	21.5689	21.4574	20.9384	20.9384	20.8423	21.1383	21.4574	21.6829	21.9187	(38)
Heat transfer coeff	46.8364	46.7070	46.5802	45.9843	45.8728	45.3539	45.3539	45.2578	45.5538	45.8728	46.0984	46.3341	(39)

Average = Sum(39)m / 12 = 45.9838

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0081	1.0053	1.0026	0.9898	0.9874	0.9762	0.9762	0.9741	0.9805	0.9874	0.9922	0.9973	(40)
HLP (average)												0.9897	
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 1.5866 (42)

Hot water usage for mixer showers

50.8220	50.0582	48.9453	46.8159	45.2444	43.4920	42.4958	43.6004	44.8111	46.6927	48.8679	50.6273	(42a)

Hot water usage for baths

21.9783	21.6519	21.1923	20.3448	19.7102	19.0065	18.6264	19.0828	19.5798	20.3328	21.1977	21.9040	(42b)

Hot water usage for other uses

30.8787	29.7558	28.6329	27.5101	26.3872	25.2644	25.2644	26.3872	27.5101	28.6329	29.7558	30.8787	(42c)

Average daily hot water use (litres/day) 95.3051 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.6790	101.4660	98.7705	94.6707	91.3418	87.7628	86.3866	89.0704	91.9010	95.6584	99.8214	103.4100	(44)
Energy conte	164.2022	144.4862	151.8066	129.5995	122.9636	107.9146	104.4771	110.2878	113.3231	129.8076	142.2139	161.9150	(45)
Energy content (annual)										Total = Sum(45)m =		1582.9972	
Distribution loss (46)m = 0.15 x (45)m	24.6303	21.6729	22.7710	19.4399	18.4445	16.1872	15.6716	16.5432	16.9985	19.4711	21.3321	24.2873	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.3324	46.6869	46.5468	43.2803	44.0217	45.3893	45.3210	48.7465	49.2270	50.9589	(61)
Total heat required for water heating calculated for each month	215.1611	190.5136	202.1390	176.2864	169.5104	151.1949	148.4987	155.6771	158.6442	178.5541	191.4409	212.8739	(62)
WWHRS	-23.2337	-20.5481	-21.5168	-17.8167	-16.6045	-14.2086	-13.3183	-14.1627	-14.7008	-17.3306	-19.6335	-22.8034	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	191.9274	169.9655	180.6222	158.4697	152.9059	136.9862	135.1804	141.5144	143.9434	161.2235	171.8074	190.0705	(64)
									Total per year (kWh/year) = Sum(64)m =			1934.6165	(64)
12Total per year (kWh/year)												1935	(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	67.3370	59.5485	63.0588	54.7636	52.5221	46.7017	45.7440	48.0180	49.0102	55.3477	59.5929	66.5765	(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	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	85.8594	95.0586	85.8594	88.7214	85.8594	88.7214	85.8594	85.8594	88.7214	85.8594	88.7214	85.8594	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	138.0513	139.4839	135.8739	128.1887	118.4876	109.3699	103.2787	101.8461	105.4561	113.1413	122.8424	131.9601	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	(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)	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)
Water heating gains (Table 5)	90.5067	88.6138	84.7564	76.0605	70.5942	64.8634	61.4839	64.5403	68.0697	74.3920	82.7679	89.4845	(72)
Total internal gains	364.2168	372.9557	356.2891	342.7700	324.7406	309.7541	297.4214	299.0453	309.0466	323.1921	344.1311	357.1034	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	3.3000	46.7521	0.6300	0.7000	0.7700	47.1505	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	47.1505	77.2204	98.3651	111.1739	115.8501	111.4900	108.9325	105.7885	102.7540	83.2895	55.8895	40.7424	(83)
Total gains	411.3673	450.1762	454.6543	453.9440	440.5907	421.2441	406.3539	404.8338	411.8006	406.4815	400.0206	397.8458	(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	75.5512	75.7606	75.9669	76.9512	77.1383	78.0209	78.0209	78.1866	77.6785	77.1383	76.7609	76.3703	
alpha	6.0367	6.0507	6.0645	6.1301	6.1426	6.2014	6.2014	6.2124	6.1786	6.1426	6.1174	6.0914	
util living area	0.9901	0.9815	0.9684	0.9309	0.8458	0.6662	0.4880	0.5102	0.7235	0.9188	0.9782	0.9917	(86)
MIT	20.1767	20.3186	20.4832	20.7052	20.8810	20.9788	20.9973	20.9964	20.9639	20.7717	20.4506	20.1554	(87)
Th 2	20.4959	20.4973	20.4987	20.5051	20.5063	20.5119	20.5119	20.5129	20.5098	20.5063	20.5039	20.5014	(88)
util rest of house	0.9885	0.9785	0.9631	0.9190	0.8201	0.6219	0.4352	0.4578	0.6821	0.9031	0.9742	0.9904	(89)
MIT 2	19.7231	19.8646	20.0279	20.2486	20.4123	20.4983	20.5106	20.5112	20.4853	20.3138	20.0013	19.7064	(90)
Living area fraction									fLA = Living area / (4) =			0.8717	(91)
MIT	20.1185	20.2603	20.4248	20.6466	20.8209	20.9171	20.9348	20.9341	20.9025	20.7129	20.3930	20.0978	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1185	20.2603	20.4248	20.6466	20.8209	20.9171	20.9348	20.9341	20.9025	20.7129	20.3930	20.0978	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9870	0.9769	0.9623	0.9226	0.8368	0.6589	0.4810	0.5032	0.7156	0.9100	0.9732	0.9891	(94)
Useful gains	406.0362	439.7908	437.4978	418.8273	368.6964	277.5540	195.4706	203.7081	294.6671	369.9023	389.2817	393.4974	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	740.8842	717.4361	648.6184	540.1597	418.4012	286.5058	196.6012	205.2048	309.8781	463.9085	612.7852	736.6125	(97)
Space heating kWh	249.1269	186.5777	157.0737	87.3593	36.9804	0.0000	0.0000	0.0000	0.0000	69.9406	160.9225	255.2776	(98a)
Space heating requirement - total per year (kWh/year)												1203.2588	
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	249.1269	186.5777	157.0737	87.3593	36.9804	0.0000	0.0000	0.0000	0.0000	69.9406	160.9225	255.2776	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1203.2588	
Space heating per m2											(98c) / (4) =	25.8988	(99)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	249.1269	186.5777	157.0737	87.3593	36.9804	0.0000	0.0000	0.0000	0.0000	69.9406	160.9225	255.2776	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	269.6178	201.9239	169.9932	94.5447	40.0221	0.0000	0.0000	0.0000	0.0000	75.6933	174.1586	276.2744	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	191.9274	169.9655	180.6222	158.4697	152.9059	136.9862	135.1804	141.5144	143.9434	161.2235	171.8074	190.0705	(64)
Efficiency of water heater												80.3000	(216)
(217)m	84.9414	84.5817	84.0834	83.1588	81.8419	80.3000	80.3000	80.3000	80.3000	82.7212	84.2414	85.0141	(217)
Fuel for water heating, kWh/month	225.9528	200.9482	214.8131	190.5628	186.8308	170.5931	168.3442	176.2321	179.2570	194.8999	203.9466	223.5752	(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	17.8399	14.3118	12.8862	9.4410	7.2925	5.9580	6.6525	8.6471	11.2317	14.7367	16.6450	18.3357	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-16.0908	-23.5607	-35.1586	-41.0999	-45.7067	-43.2054	-42.7306	-39.6940	-34.5073	-27.6979	-18.0183	-13.8149	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.5847	-14.0881	-28.4357	-43.3338	-57.8889	-58.3458	-57.6058	-48.4527	-35.1298	-20.2903	-8.8411	-5.1854	(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	1302.2281	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2335.9560	(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)	143.9781	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-765.4673	(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	3102.6949	(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	1302.2281	0.2100	273.4679	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2335.9560	0.2100	490.5508	(264)
Space and water heating			764.0187	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	143.9781	0.1443	20.7805	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-381.2851	0.1338	-51.0052	
PV Unit electricity exported	-384.1822	0.1255	-48.2118	
Total			-99.2171	(269)
Total CO2, kg/year			697.5113	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.0100	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1302.2281	1.1300	1471.5178	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2335.9560	1.1300	2639.6302	(278)
Space and water heating			4111.1480	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	143.9781	1.5338	220.8384	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-381.2851	1.4944	-569.7741	
PV Unit electricity exported	-384.1822	0.4606	-176.9639	
Total			-746.7380	(283)
Total Primary energy kWh/year			3715.3492	(286)
Target Primary Energy Rate (TPER)			79.9700	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	46.4600 (1b)	x	2.4900 (2b)	=	115.6854	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 46.4600						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	115.6854	(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) =	0.1729	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3229	(18)
Number of sides sheltered		3	(19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2502 (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	0.3190	0.3128	0.3065	0.2753	0.2690	0.2377	0.2377	0.2315	0.2502	0.2690	0.2815	0.2940	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5509	0.5489	0.5470	0.5379	0.5362	0.5283	0.5283	0.5268	0.5313	0.5362	0.5396	0.5432	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			3.3000	1.1450	3.7786			(27)
exposed upper			2.5600	0.1300	0.3328	20.0000	51.2000	(28b)
over commercial			43.9000	0.1300	5.7070	20.0000	878.0000	(28b)
External Wall 1	12.7000	3.3000	9.4000	0.1300	1.2220	70.0000	658.0000	(29a)
sheltered	16.9300	2.1000	14.8300	0.1300	1.9279	70.0000	1038.1000	(29a)
Total net area of external elements Aum(A, m2)			76.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.9083			(33)
Party Wall 1			20.6600	0.0000	0.0000	180.0000	3718.8000	(32)
Party Wall 2 to existing			24.1500	0.0000	0.0000	180.0000	4347.0000	(32)
Party Ceiling 1			62.8800			30.0000	1886.4000	(32b)
Internal Wall 1			17.9200			9.0000	161.2800	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12738.7800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 274.1881 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	2.9400	0.0600	0.1764
E3 Sill	1.9400	0.0400	0.0776
E4 Jamb	11.0000	0.0200	0.2200
E7 Party floor between dwellings (in blocks of flats)	9.7000	0.0000	0.0000
E20 Exposed floor (normal)	4.8000	0.3200	1.5360
E21 Exposed floor (inverted)	4.2000	0.3200	1.3440
E7 Party floor between dwellings (in blocks of flats)	13.6000	0.2000	2.7200
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E16 Corner (normal)	2.4900	0.1800	0.4482
E17 Corner (inverted - internal area greater than external area)	2.4900	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	31.9000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.9126 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.8209 (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	21.0311	20.9557	20.8817	20.5343	20.4693	20.1668	20.1668	20.1108	20.2833	20.4693	20.6008	20.7383	(38)
Heat transfer coeff	45.8520	45.7766	45.7026	45.3553	45.2903	44.9877	44.9877	44.9317	45.1043	45.2903	45.4217	45.5592	(39)
Average = Sum(39)m / 12 =												45.3549	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9869	0.9853	0.9837	0.9762	0.9748	0.9683	0.9683	0.9671	0.9708	0.9748	0.9777	0.9806	(40)
HLP (average)												0.9762	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.5866 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.9783	21.6519	21.1923	20.3448	19.7102	19.0065	18.6264	19.0828	19.5798	20.3328	21.1977	21.9040	(42b)

Hot water usage for other uses

30.8787	29.7558	28.6329	27.5101	26.3872	25.2644	25.2644	26.3872	27.5101	28.6329	29.7558	30.8787	(42c)

Average daily hot water use (litres/day) 48.4489 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	52.8570	51.4077	49.8252	47.8548	46.0974	44.2708	43.8907	45.4700	47.0899	48.9657	50.9535	52.7827	(44)
Energy conte	83.7126	73.2039	76.5795	65.5109	62.0559	54.4362	53.0820	56.3014	58.0665	66.4460	72.5926	82.6450	(45)
Energy content (annual)										Total = Sum(45)m =		804.6325	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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	71.1557	62.2233	65.0926	55.6843	52.7475	46.2707	45.1197	47.8562	49.3565	56.4791	61.7037	70.2482	(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	71.1557	62.2233	65.0926	55.6843	52.7475	46.2707	45.1197	47.8562	49.3565	56.4791	61.7037	70.2482	(64)
										Total per year (kWh/year) = Sum(64)m =		683.9376	(64)
12Total per year (kWh/year)												684	(64)
Electric shower(s)	40.6999	36.2640	39.5989	37.7887	38.4978	36.7232	37.9473	38.4978	37.7887	39.5989	38.8543	40.6999	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		462.9595	(64a)
Heat gains from water heating, kWh/month	27.9639	24.6218	26.1729	23.3682	22.8113	20.7485	20.7668	21.5885	21.7863	24.0195	25.1395	27.7370	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	85.8594	95.0586	85.8594	88.7214	85.8594	88.7214	85.8594	85.8594	88.7214	85.8594	88.7214	85.8594	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	138.0513	139.4839	135.8739	128.1887	118.4876	109.3699	103.2787	101.8461	105.4561	113.1413	122.8424	131.9601	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)
Water heating gains (Table 5)													
	37.5859	36.6396	35.1786	32.4559	30.6604	28.8173	27.9123	29.0168	30.2588	32.2843	34.9160	37.2810	(72)
Total internal gains													
	308.2960	317.9815	303.7113	296.1654	281.8068	273.7080	263.8498	263.5218	271.2357	278.0843	293.2792	301.8999	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	3.3000	46.7521	0.7200	0.7000	0.7700	53.8863	(78)

Solar gains	53.8863	88.2519	112.4173	127.0559	132.4001	127.4171	124.4943	120.9012	117.4331	95.1880	63.8737	46.5627	(83)
Total gains	362.1823	406.2334	416.1286	423.2213	414.2069	401.1251	388.3441	384.4229	388.6688	373.2723	357.1528	348.4626	(84)

7. Mean internal temperature (heating season)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
tau	77.1732	77.3004	77.4255	78.0185	78.1305	78.6559	78.6559	78.7540	78.4527	78.1305	77.9043	77.6693	
alpha	6.1449	6.1534	6.1617	6.2012	6.2087	6.2437	6.2437	6.2503	6.2302	6.2087	6.1936	6.1780	
util living area													
	0.9947	0.9883	0.9781	0.9460	0.8684	0.6897	0.5060	0.5325	0.7507	0.9398	0.9870	0.9958	(86)
MIT	20.1063	20.2603	20.4361	20.6722	20.8641	20.9751	20.9968	20.9956	20.9571	20.7344	20.3844	20.0767	(87)
Th 2	20.0943	20.0956	20.0969	20.1032	20.1044	20.1098	20.1098	20.1108	20.1077	20.1044	20.1020	20.0995	(88)
util rest of house													
	0.9929	0.9845	0.9704	0.9265	0.8224	0.6059	0.4057	0.4324	0.6731	0.9146	0.9820	0.9943	(89)
MIT 2	19.2906	19.4437	19.6170	19.8470	20.0160	20.0991	20.1091	20.1097	20.0870	19.9077	19.5725	19.2657	(90)
Living area fraction									fLA = Living area / (4) =			0.8717	(91)
MIT	20.0016	20.1555	20.3310	20.5664	20.7553	20.8627	20.8829	20.8819	20.8454	20.6284	20.2802	19.9727	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0016	20.1555	20.3310	20.5664	20.7553	20.8627	20.8829	20.8819	20.8454	20.6284	20.2802	19.9727	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9927	0.9848	0.9726	0.9374	0.8570	0.6774	0.4930	0.5194	0.7382	0.9304	0.9831	0.9941	(94)
Useful gains	359.5219	400.0461	404.7418	396.7073	354.9631	271.7323	191.4497	199.6798	286.9281	347.2868	351.1289	346.3994	(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													
	719.9516	698.3459	632.1143	529.1314	410.1185	281.7450	192.6781	201.3811	304.2485	454.1877	598.6695	718.5915	(97)
Space heating kWh													
	268.1597	200.4575	169.1651	95.3453	41.0357	0.0000	0.0000	0.0000	0.0000	79.5343	178.2292	276.9109	(98a)
Space heating requirement - total per year (kWh/year)												1308.8377	
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													
	268.1597	200.4575	169.1651	95.3453	41.0357	0.0000	0.0000	0.0000	0.0000	79.5343	178.2292	276.9109	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1308.8377	
Space heating per m2											(98c) / (4) =	28.1713	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	422.8846	332.9091	341.4809	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8654	0.9365	0.9279	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	365.9762	311.7534	316.8733	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	426.3363	413.5287	410.7293	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	43.4593	75.7208	69.8288	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	10.8648	18.9302	17.4572	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												47.2522	(107)
Energy for space heating												28.1713	(99)
Energy for space cooling												1.0171	(108)
Total												29.1883	(109)
Fabric Energy Efficiency (DFEE)												29.2	(109)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	46.4600 (1b)	x	2.4900 (2b)	=	115.6854	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	115.6854	(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) =	0.1729	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4229	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3277	(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	0.4179	0.4097	0.4015	0.3605	0.3523	0.3113	0.3113	0.3032	0.3277	0.3523	0.3687	0.3851	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5873	0.5839	0.5806	0.5650	0.5621	0.5485	0.5485	0.5460	0.5537	0.5621	0.5680	0.5741	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			3.3000	1.1450	3.7786			(27)
exposed upper			2.5600	0.1300	0.3328			(28b)
over commercial			43.9000	0.1300	5.7070			(28b)
External Wall 1	12.7000	3.3000	9.4000	0.1800	1.6920			(29a)
sheltered	16.9300	2.1000	14.8300	0.1800	2.6694			(29a)
Total net area of external elements Aum(A, m2)			76.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.2798			(33)
Party Wall 1			20.6600	0.0000	0.0000			(32)
Party Wall 2 to existing			24.1500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K: 274.1881 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	2.9400	0.0500	0.1470
E3 Sill	1.9400	0.0500	0.0970
E4 Jamb	11.0000	0.0500	0.5500
E7 Party floor between dwellings (in blocks of flats)	9.7000	0.0700	0.6790
E20 Exposed floor (normal)	4.8000	0.3200	1.5360
E21 Exposed floor (inverted)	4.2000	0.3200	1.3440
E7 Party floor between dwellings (in blocks of flats)	13.6000	0.0700	0.9520
E18 Party wall between dwellings	4.9800	0.0600	0.2988
E18 Party wall between dwellings	4.9800	0.0600	0.2988
E16 Corner (normal)	2.4900	0.0900	0.2241
E17 Corner (inverted - internal area greater than external area)	2.4900	-0.0900	-0.2241
E7 Party floor between dwellings (in blocks of flats)	31.9000	0.0700	2.2330

Thermal bridges (Sum(L x Psi) calculated using Appendix K): 8.1356 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.4154 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.4210	22.2916	22.1647	21.5689	21.4574	20.9384	20.9384	20.8423	21.1383	21.4574	21.6829	21.9187	(38)
Heat transfer coeff	46.8364	46.7070	46.5802	45.9843	45.8728	45.3539	45.3539	45.2578	45.5538	45.8728	46.0984	46.3341	(39)
Average = Sum(39)m / 12 =												45.9838	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0081	1.0053	1.0026	0.9898	0.9874	0.9762	0.9762	0.9741	0.9805	0.9874	0.9922	0.9973	(40)
HLP (average)												0.9897	
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												1.5866	(42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	21.9783	21.6519	21.1923	20.3448	19.7102	19.0065	18.6264	19.0828	19.5798	20.3328	21.1977	21.9040	(42b)
Hot water usage for other uses													
	30.8787	29.7558	28.6329	27.5101	26.3872	25.2644	25.2644	26.3872	27.5101	28.6329	29.7558	30.8787	(42c)
Average daily hot water use (litres/day)												48.4489	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	52.8570	51.4077	49.8252	47.8548	46.0974	44.2708	43.8907	45.4700	47.0899	48.9657	50.9535	52.7827	(44)
Energy conte	83.7126	73.2039	76.5795	65.5109	62.0559	54.4362	53.0820	56.3014	58.0665	66.4460	72.5926	82.6450	(45)
Energy content (annual)										Total = Sum(45)m =		804.6325	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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													
	71.1557	62.2233	65.0926	55.6843	52.7475	46.2707	45.1197	47.8562	49.3565	56.4791	61.7037	70.2482	(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													
	71.1557	62.2233	65.0926	55.6843	52.7475	46.2707	45.1197	47.8562	49.3565	56.4791	61.7037	70.2482	(64)
										Total per year (kWh/year) = Sum(64)m =		683.9376	(64)
12Total per year (kWh/year)												684	(64)
Electric shower(s)													
	40.6999	36.2640	39.5989	37.7887	38.4978	36.7232	37.9473	38.4978	37.7887	39.5989	38.8543	40.6999	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		462.9595	(64a)
Heat gains from water heating, kWh/month													
	27.9639	24.6218	26.1729	23.3682	22.8113	20.7485	20.7668	21.5885	21.7863	24.0195	25.1395	27.7370	(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	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	85.8594	95.0586	85.8594	88.7214	85.8594	88.7214	85.8594	85.8594	88.7214	85.8594	88.7214	85.8594	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	138.0513	139.4839	135.8739	128.1887	118.4876	109.3699	103.2787	101.8461	105.4561	113.1413	122.8424	131.9601	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)
Water heating gains (Table 5)													
	37.5859	36.6396	35.1786	32.4559	30.6604	28.8173	27.9123	29.0168	30.2588	32.2843	34.9160	37.2810	(72)
Total internal gains													
	308.2960	317.9815	303.7113	296.1654	281.8068	273.7080	263.8498	263.5218	271.2357	278.0843	293.2792	301.8999	(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	
South	3.3000	46.7521	0.6300	0.7000	0.7700	47.1505	(78)

Solar gains	47.1505	77.2204	98.3651	111.1739	115.8501	111.4900	108.9325	105.7885	102.7540	83.2895	55.8895	40.7424	(83)
Total gains	355.4466	395.2019	402.0764	407.3393	397.6569	385.1980	372.7823	369.3103	373.9896	361.3738	349.1686	342.6423	(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	75.5512	75.7606	75.9669	76.9512	77.1383	78.0209	78.0209	78.1866	77.6785	77.1383	76.7609	76.3703	
alpha	6.0367	6.0507	6.0645	6.1301	6.1426	6.2014	6.2014	6.2124	6.1786	6.1426	6.1174	6.0914	
util living area													
	0.9953	0.9902	0.9821	0.9556	0.8883	0.7166	0.5301	0.5566	0.7762	0.9489	0.9888	0.9962	(86)
MIT	20.0592	20.2076	20.3834	20.6317	20.8383	20.9686	20.9957	20.9942	20.9470	20.7043	20.3492	20.0384	(87)
Th 2	20.0766	20.0789	20.0812	20.0919	20.0939	20.1032	20.1032	20.1050	20.0996	20.0939	20.0898	20.0856	(88)
util rest of house													
	0.9937	0.9869	0.9757	0.9387	0.8458	0.6318	0.4250	0.4522	0.6991	0.9265	0.9843	0.9949	(89)
MIT 2	19.2295	19.3782	19.5529	19.8005	19.9865	20.0895	20.1022	20.1035	20.0735	19.8720	19.5280	19.2162	(90)
Living area fraction										fLA = Living area / (4) =		0.8717	(91)
MIT	19.9528	20.1012	20.2768	20.5251	20.7290	20.8558	20.8811	20.8799	20.8349	20.5975	20.2439	19.9329	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9528	20.1012	20.2768	20.5251	20.7290	20.8558	20.8811	20.8799	20.8349	20.5975	20.2439	19.9329	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9934	0.9870	0.9772	0.9475	0.8769	0.7038	0.5164	0.5430	0.7632	0.9400	0.9852	0.9946	(94)

Useful gains	353.1162	390.0605	392.9253	385.9396	348.6982	271.1066	192.5199	200.5182	285.4274	339.6936	343.9871	340.8058	(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	733.1210	710.0029	641.7268	534.5718	414.1872	283.7251	194.1636	202.7520	306.8004	458.6158	605.9104	728.9696	(97)
Space heating kWh	282.7236	215.0013	185.1083	107.0152	48.7238	0.0000	0.0000	0.0000	0.0000	88.4781	188.5848	288.7939	(98a)
Space heating requirement - total per year (kWh/year)												1404.4290	
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	282.7236	215.0013	185.1083	107.0152	48.7238	0.0000	0.0000	0.0000	0.0000	88.4781	188.5848	288.7939	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1404.4290	
Space heating per m2											(98c) / (4) =	30.2288	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	426.3263	335.6186	343.9590	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8412	0.9210	0.9118	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	358.6268	309.1033	313.6145	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	407.7202	395.3396	393.0651	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	35.3473	64.1598	59.1113	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction											fC = cooled area / (4) =	1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	8.8368	16.0399	14.7778	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												39.6546	(107)
Energy for space heating												30.2288	(99)
Energy for space cooling												0.8535	(108)
Total												31.0823	(109)
Fabric Energy Efficiency (TFEE)												31.1	(109)

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		46.4600 (1b)	x	2.4900 (2b)	=	115.6854	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	115.6854	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(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) =												81.0000	(23c)
Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316	(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	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			3.3000	1.1450	3.7786			(27)
exposed upper			2.5600	0.1300	0.3328	20.0000	51.2000	(28b)
over commercial			43.9000	0.1300	5.7070	20.0000	878.0000	(28b)
External Wall 1	12.7000	3.3000	9.4000	0.1300	1.2220	70.0000	658.0000	(29a)
sheltered	16.9300	2.1000	14.8300	0.1300	1.9279	70.0000	1038.1000	(29a)
Total net area of external elements Aum(A, m2)			76.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.9083			(33)
Party Wall 1			20.6600	0.0000	0.0000	180.0000	3718.8000	(32)
Party Wall 2 to existing			24.1500	0.0000	0.0000	180.0000	4347.0000	(32)
Party Ceiling 1			62.8800			30.0000	1886.4000	(32b)
Internal Wall 1			17.9200			9.0000	161.2800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12738.7800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		274.1881 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	2.9400	0.0600	0.1764
E3 Sill	1.9400	0.0400	0.0776
E4 Jamb	11.0000	0.0200	0.2200
E7 Party floor between dwellings (in blocks of flats)	9.7000	0.0000	0.0000
E20 Exposed floor (normal)	4.8000	0.3200	1.5360
E21 Exposed floor (inverted)	4.2000	0.3200	1.3440
E7 Party floor between dwellings (in blocks of flats)	13.6000	0.2000	2.7200
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E16 Corner (normal)	2.4900	0.1800	0.4482
E17 Corner (inverted - internal area greater than external area)	2.4900	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	31.9000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		8.9126 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.8209 (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	9.2852	9.1742	9.0633	8.5085	8.3976	7.8428	7.8428	7.7319	8.0647	8.3976	8.6195	8.8414	(38)
Heat transfer coeff	34.1061	33.9951	33.8842	33.3294	33.2185	32.6637	32.6637	32.5528	32.8856	33.2185	33.4404	33.6623	(39)
Average = Sum(39)m / 12 =												33.3017	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7341	0.7317	0.7293	0.7174	0.7150	0.7031	0.7031	0.7007	0.7078	0.7150	0.7198	0.7245	(40)
HLP (average)												0.7168	
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	1.5866	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	76.2330	75.0873	73.4179	70.2238	67.8666	65.2379	63.7438	65.4006	67.2167	70.0391	73.3018	75.9409	(42a)
Hot water usage for baths	21.9783	21.6519	21.1923	20.3448	19.7102	19.0065	18.6264	19.0828	19.5798	20.3328	21.1977	21.9040	(42b)
Hot water usage for other uses	30.8787	29.7558	28.6329	27.5101	26.3872	25.2644	25.2644	26.3872	27.5101	28.6329	29.7558	30.8787	(42c)
Average daily hot water use (litres/day)												118.7332	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.0900	126.4951	123.2432	118.0787	113.9640	109.5088	107.6345	110.8706	114.3066	119.0048	124.2554	128.7236	(44)
Energy conte	204.4470	180.1273	189.4201	161.6438	153.4175	134.6538	130.1746	137.2809	140.9514	161.4884	177.0246	201.5501	(45)
Energy content (annual)										Total = Sum(45)m =		1972.1795	
Distribution loss (46)m = 0.15 x (45)m	30.6670	27.0191	28.4130	24.2466	23.0126	20.1981	19.5262	20.5921	21.1427	24.2233	26.5537	30.2325	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090	(64)
										Total per year (kWh/year) = Sum(64)m =		2572.1795	(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	80.7183	71.3992	75.7219	66.0753	63.7510	57.1012	56.0228	58.3856	59.1951	66.4346	71.1894	79.7551	(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	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.8821	22.9882	18.6953	14.1535	10.5799	8.9320	9.6514	12.5452	16.8381	21.3799	24.9535	26.6014	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	206.0467	208.1849	202.7969	191.3265	176.8471	163.2386	154.1473	152.0092	157.3972	168.8676	183.3469	196.9554	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	(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)	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)
Water heating gains (Table 5)	108.4924	106.2488	101.7768	91.7713	85.6869	79.3072	75.2994	78.4753	82.2154	89.2938	98.8742	107.1977	(72)
Total internal gains	421.2601	418.2608	404.1079	378.0902	353.9529	329.3167	316.9370	320.8686	334.2897	360.3803	388.0135	411.5935	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	3.3000	46.7521	0.7200	0.7000	0.7700	53.8863	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	53.8863	88.2519	112.4173	127.0559	132.4001	127.4171	124.4943	120.9012	117.4331	95.1880	63.8737	46.5627	(83)
Total gains	475.1465	506.5127	516.5251	505.1461	486.3530	456.7339	441.4313	441.7698	451.7228	455.5682	451.8872	458.1562	(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	103.7513	104.0899	104.4307	106.1689	106.5235	108.3326	108.3326	108.7019	107.6017	106.5235	105.8166	105.1191	
alpha	7.9168	7.9393	7.9620	8.0779	8.1016	8.2222	8.2222	8.2468	8.1734	8.1016	8.0544	8.0079	
util living area	0.9507	0.9194	0.8649	0.7684	0.6292	0.4573	0.3256	0.3389	0.5014	0.7371	0.9017	0.9586	(86)
MIT	20.7283	20.8117	20.8972	20.9650	20.9933	20.9996	21.0000	21.0000	20.9991	20.9777	20.8674	20.7082	(87)
Th 2	20.3108	20.3129	20.3150	20.3255	20.3276	20.3381	20.3381	20.3402	20.3339	20.3276	20.3234	20.3192	(88)
util rest of house	0.9393	0.9026	0.8401	0.7333	0.5859	0.4102	0.2766	0.2903	0.4534	0.6960	0.8797	0.9487	(89)
MIT 2	20.0808	20.1588	20.2361	20.3015	20.3238	20.3380	20.3381	20.3402	20.3335	20.3135	20.2201	20.0698	(90)
Living area fraction									fLA = Living area / (4) =			0.8717	(91)
MIT	20.6453	20.7279	20.8124	20.8799	20.9074	20.9147	20.9151	20.9153	20.9137	20.8925	20.7844	20.6263	(92)
Temperature adjustment												-0.1500	
adjusted MIT	20.4953	20.5779	20.6624	20.7299	20.7574	20.7647	20.7651	20.7653	20.7637	20.7425	20.6344	20.4763	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9426	0.9094	0.8531	0.7547	0.6138	0.4406	0.3082	0.3217	0.4844	0.7217	0.8903	0.9511	(94)
Useful gains	447.8541	460.6138	440.6383	381.2112	298.4993	201.2282	136.0410	142.0956	218.8337	328.7797	402.2932	435.7739	(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	552.3568	532.9726	479.8808	394.2827	300.8736	201.3623	136.0469	142.1039	219.1394	336.9174	452.5945	547.8986	(97)
Space heating kWh	77.7501	48.6251	29.1964	9.4115	1.7665	0.0000	0.0000	0.0000	0.0000	6.0544	36.2170	83.4207	(98a)
Space heating requirement - total per year (kWh/year)												292.4417	
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	77.7501	48.6251	29.1964	9.4115	1.7665	0.0000	0.0000	0.0000	0.0000	6.0544	36.2170	83.4207	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												292.4417	
Space heating per m2											(98c) / (4) =	6.2945	(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 %) 89.5000 (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	77.7501	48.6251	29.1964	9.4115	1.7665	0.0000	0.0000	0.0000	0.0000	6.0544	36.2170	83.4207	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	86.8716	54.3297	32.6217	10.5156	1.9737	0.0000	0.0000	0.0000	0.0000	6.7647	40.4659	93.2075	(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	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	285.3697	252.6868	268.5799	235.7082	228.3535	205.5518	202.3838	210.3239	212.5883	237.3713	252.8934	282.1329	(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	14.5562	13.1475	14.5562	14.0866	14.5562	14.0866	14.5562	14.5562	14.0866	14.5562	14.0866	14.5562	(231)
Lighting	22.6544	18.1742	16.3639	11.9889	9.2605	7.5659	8.4478	10.9807	14.2629	18.7137	21.1371	23.2840	(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	326.7504	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2873.9436	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)		
mechanical ventilation fans (SFP = 0.6050)	85.3874	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	171.3874	(231)
Electricity for lighting (calculated in Appendix L)	182.8340	(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	3554.9154	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	326.7504	3.6400	11.8937	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2873.9436	3.6400	104.6115	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	171.3874	16.4900	28.2618	(249)
Energy for lighting	182.8340	16.4900	30.1493	(250)
Additional standing charges			92.0000	(251)
Total energy cost			266.9164	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0506	(257)
SAP value		82.9694	
SAP rating (Section 12)		83	(258)
SAP band		B	

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	326.7504	0.2100	68.6176	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2873.9436	0.2100	603.5281	(264)
Space and water heating			672.1457	(265)
Pumps, fans and electric keep-hot	171.3874	0.1387	23.7735	(267)
Energy for lighting	182.8340	0.1443	26.3886	(268)
Total CO2, kg/year			722.3079	(272)
CO2 emissions per m2			15.5500	(273)
EI value			89.4173	
EI rating			89	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	46.4600	(1b)	x 2.4900	(2b) =	115.6854	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 46.4600						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		115.6854	(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		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000	(22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750	(22a)
Adj infilt rate													
	0.1337	0.1250	0.1279	0.1162	0.1162	0.1017	0.1046	0.1104	0.1075	0.1133	0.1133	0.1250	(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) =	81.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2287	0.2200	0.2229	0.2112	0.2112	0.1967	0.1996	0.2054	0.2025	0.2083	0.2083	0.2200	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			3.3000	1.1450	3.7786			(27)
exposed upper			2.5600	0.1300	0.3328	20.0000	51.2000	(28b)
over commercial			43.9000	0.1300	5.7070	20.0000	878.0000	(28b)
External Wall 1	12.7000	3.3000	9.4000	0.1300	1.2220	70.0000	658.0000	(29a)
sheltered	16.9300	2.1000	14.8300	0.1300	1.9279	70.0000	1038.1000	(29a)
Total net area of external elements Aum(A, m2)			76.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.9083			(33)
Party Wall 1			20.6600	0.0000	0.0000	180.0000	3718.8000	(32)
Party Wall 2 to existing			24.1500	0.0000	0.0000	180.0000	4347.0000	(32)
Party Ceiling 1			62.8800			30.0000	1886.4000	(32b)
Internal Wall 1			17.9200			9.0000	161.2800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12738.7800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	274.1881 (35)

List of Thermal Bridges

	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	2.9400	0.0600	0.1764
E3 Sill	1.9400	0.0400	0.0776
E4 Jamb	11.0000	0.0200	0.2200
E7 Party floor between dwellings (in blocks of flats)	9.7000	0.0000	0.0000
E20 Exposed floor (normal)	4.8000	0.3200	1.5360
E21 Exposed floor (inverted)	4.2000	0.3200	1.3440
E7 Party floor between dwellings (in blocks of flats)	13.6000	0.2000	2.7200
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E16 Corner (normal)	2.4900	0.1800	0.4482
E17 Corner (inverted - internal area greater than external area)	2.4900	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	31.9000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.9126 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 24.8209 (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	8.7304	8.3976	8.5085	8.0647	8.0647	7.5100	7.6209	7.8428	7.7319	7.9538	7.9538	8.3976	(38)
Heat transfer coeff													
	33.5513	33.2185	33.3294	32.8856	32.8856	32.3309	32.4418	32.6637	32.5528	32.7747	32.7747	33.2185	(39)
Average = Sum(39)m / 12 =												32.8856	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7222	0.7150	0.7174	0.7078	0.7078	0.6959	0.6983	0.7031	0.7007	0.7054	0.7054	0.7150	(40)
HLP (average)												0.7078	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.5866 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
76.2330	75.0873	73.4179	70.2238	67.8666	65.2379	63.7438	65.4006	67.2167	70.0391	73.3018	75.9409	(42a)

Hot water usage for baths

21.9783	21.6519	21.1923	20.3448	19.7102	19.0065	18.6264	19.0828	19.5798	20.3328	21.1977	21.9040	(42b)

Hot water usage for other uses

30.8787	29.7558	28.6329	27.5101	26.3872	25.2644	25.2644	26.3872	27.5101	28.6329	29.7558	30.8787	(42c)

Average daily hot water use (litres/day)	118.7332 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	129.0900	126.4951	123.2432	118.0787	113.9640	109.5088	107.6345	110.8706	114.3066	119.0048	124.2554	128.7236	(44)
Energy conte	204.4470	180.1273	189.4201	161.6438	153.4175	134.6538	130.1746	137.2809	140.9514	161.4884	177.0246	201.5501	(45)
Energy content (annual)										Total = Sum(45)m =		1972.1795	
Distribution loss (46)m = 0.15 x (45)m													
	30.6670	27.0191	28.4130	24.2466	23.0126	20.1981	19.5262	20.5921	21.1427	24.2233	26.5537	30.2325	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													

	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090	(64)
										Total per year (kWh/year) = Sum(64)m =		2572.1795	(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													
	80.7183	71.3992	75.7219	66.0753	63.7510	57.1012	56.0228	58.3856	59.1951	66.4346	71.1894	79.7551	(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	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	25.8821	22.9882	18.6953	14.1535	10.5799	8.9320	9.6514	12.5452	16.8381	21.3799	24.9535	26.6014	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	206.0467	208.1849	202.7969	191.3265	176.8471	163.2386	154.1473	152.0092	157.3972	168.8676	183.3469	196.9554	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	(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)													
	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)
Water heating gains (Table 5)													
	108.4924	106.2488	101.7768	91.7713	85.6869	79.3072	75.2994	78.4753	82.2154	89.2938	98.8742	107.1977	(72)
Total internal gains													
	421.2601	418.2608	404.1079	378.0902	353.9529	329.3167	316.9370	320.8686	334.2897	360.3803	388.0135	411.5935	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	3.3000	49.2853	0.7200	0.7000	0.7700	56.8062	(78)

Solar gains	56.8062	83.2866	106.2897	125.2016	126.9757	131.5883	128.6913	126.8625	122.9379	98.0057	69.4731	50.3319	(83)
Total gains	478.0663	501.5474	510.3976	503.2919	480.9286	460.9050	445.6283	447.7311	457.2276	458.3860	457.4867	461.9254	(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	105.4667	106.5235	106.1689	107.6017	107.6017	109.4479	109.0736	108.3326	108.7019	107.9659	107.9659	106.5235	
alpha	8.0311	8.1016	8.0779	8.1734	8.1734	8.2965	8.2716	8.2222	8.2468	8.1977	8.1977	8.1016	
util living area													
	0.9251	0.8931	0.8136	0.6874	0.5185	0.3227	0.1820	0.1970	0.3844	0.6306	0.8447	0.9340	(86)
MIT	20.8125	20.8681	20.9429	20.9863	20.9987	21.0000	21.0000	21.0000	20.9999	20.9939	20.9310	20.7993	(87)
Th 2	20.3213	20.3276	20.3255	20.3339	20.3339	20.3445	20.3424	20.3381	20.3402	20.3360	20.3360	20.3276	(88)
util rest of house													
	0.9086	0.8722	0.7829	0.6483	0.4736	0.2767	0.1341	0.1487	0.3375	0.5857	0.8149	0.9190	(89)
MIT 2	20.1683	20.2232	20.2842	20.3254	20.3333	20.3445	20.3424	20.3381	20.3402	20.3327	20.2858	20.1625	(90)
Living area fraction									fLA = Living area / (4) =			0.8717	(91)
MIT	20.7299	20.7854	20.8584	20.9015	20.9133	20.9159	20.9156	20.9151	20.9153	20.9090	20.8482	20.7176	(92)
Temperature adjustment												-0.1500	
adjusted MIT	20.5799	20.6354	20.7084	20.7515	20.7633	20.7659	20.7656	20.7651	20.7653	20.7590	20.6982	20.5676	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9153	0.8821	0.8007	0.6730	0.5026	0.3062	0.1649	0.1798	0.3677	0.6144	0.8316	0.9247	(94)
Useful gains	437.5590	442.4379	408.6603	338.7294	241.7058	141.1478	73.5014	80.5192	168.1165	281.6488	380.4558	427.1299	(95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000	(96)
Heat loss rate W													
	509.3055	492.8096	430.2284	343.7057	242.1475	141.1531	73.5014	80.5192	168.1443	283.7973	406.3472	503.8449	(97)
Space heating kWh													
	53.3794	33.8498	16.0467	3.5829	0.3286	0.0000	0.0000	0.0000	0.0000	1.5985	18.6418	57.0760	(98a)
Space heating requirement - total per year (kWh/year)												184.5036	
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													
	53.3794	33.8498	16.0467	3.5829	0.3286	0.0000	0.0000	0.0000	0.0000	1.5985	18.6418	57.0760	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												184.5036	
Space heating per m2											(98c) / (4) =	3.9712	(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 %)												89.5000	(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													
	53.3794	33.8498	16.0467	3.5829	0.3286	0.0000	0.0000	0.0000	0.0000	1.5985	18.6418	57.0760	(98)

Space heating efficiency (main heating system 1)

	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000 (210)

Space heating fuel (main heating system)

	59.6418	37.8210	17.9292	4.0033	0.3672	0.0000	0.0000	0.0000	0.0000	1.7861	20.8288	63.7720 (211)

Space heating efficiency (main heating system 2)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)

Space heating fuel (main heating system 2)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)

Space heating fuel (secondary)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)

Water heating

Water heating requirement

	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090 (64)

Efficiency of water heater

												89.5000 (216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000 (217)

Fuel for water heating, kWh/month

	285.3697	252.6868	268.5799	235.7082	228.3535	205.5518	202.3838	210.3239	212.5883	237.3713	252.8934	282.1329 (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	14.5562	13.1475	14.5562	14.0866	14.5562	14.0866	14.5562	14.5562	14.0866	14.5562	14.0866	14.5562 (231)
Lighting	22.6544	18.1742	16.3639	11.9889	9.2605	7.5659	8.4478	10.9807	14.2629	18.7137	21.1371	23.2840 (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	206.1493 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	89.5000
Water heating fuel used	2873.9436 (219)
Space cooling fuel	0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)

mechanical ventilation fans (SFP = 0.6050)	85.3874 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	171.3874 (231)
Electricity for lighting (calculated in Appendix L)	182.8340 (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	3434.3143 (238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	206.1493	6.1900	12.7606	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2873.9436	6.1900	177.8971	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	171.3874	25.1600	43.1211	(249)
Energy for lighting	182.8340	25.1600	46.0010	(250)
Additional standing charges			102.0000	(251)
Total energy cost			381.7799	(255)

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	206.1493	0.2100	43.2914	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2873.9436	0.2100	603.5281	(264)
Space and water heating			646.8195	(265)
Pumps, fans and electric keep-hot	171.3874	0.1387	23.7735	(267)
Energy for lighting	182.8340	0.1443	26.3886	(268)
Total CO2, kg/year			696.9817	(272)

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	206.1493	1.1300	232.9487	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2873.9436	1.1300	3247.5562	(278)
Space and water heating			3480.5050	(279)
Pumps, fans and electric keep-hot	171.3874	1.5128	259.2748	(281)
Energy for lighting	182.8340	1.5338	280.4370	(282)
Total Primary energy kWh/year			4020.2168	(286)

SAP 10 EPC IMPROVEMENTS

Be Lean

Current energy efficiency rating: B 83
Current environmental impact rating: B 89

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: B 83
Potential environmental impact rating: B 89

Fuel prices for cost data on this page from database revision number 538 TEST (29 Feb 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£89	£89	£0
Mains gas	£293	£293	£0
Space heating	£158	£158	£0
Water heating	£178	£178	£0
Lighting	£46	£46	£0
Total cost of fuels	£382	£382	£0
Total cost of uses	£382	£382	£0
Delivered energy	74 kWh/m²	74 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m²	15 kg/m²	15 kg/m²	0 kg/m²
Primary energy	87 kWh/m²	87 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	46.4600	(1b)	x 2.4900	(2b) =	115.6854	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		115.6854	(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		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(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) =	81.0000 (23c)

Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316	(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	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			3.3000	1.1450	3.7786			(27)
exposed upper			2.5600	0.1300	0.3328	20.0000	51.2000	(28b)
over commercial			43.9000	0.1300	5.7070	20.0000	878.0000	(28b)
External Wall 1	12.7000	3.3000	9.4000	0.1300	1.2220	70.0000	658.0000	(29a)
sheltered	16.9300	2.1000	14.8300	0.1300	1.9279	70.0000	1038.1000	(29a)
Total net area of external elements Aum(A, m2)			76.0900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.9083			(33)
Party Wall 1			20.6600	0.0000	0.0000	180.0000	3718.8000	(32)
Party Wall 2 to existing			24.1500	0.0000	0.0000	180.0000	4347.0000	(32)
Party Ceiling 1			62.8800			30.0000	1886.4000	(32b)
Internal Wall 1			17.9200			9.0000	161.2800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12738.7800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		274.1881 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	2.9400	0.0600	0.1764
E3 Sill	1.9400	0.0400	0.0776
E4 Jamb	11.0000	0.0200	0.2200
E7 Party floor between dwellings (in blocks of flats)	9.7000	0.0000	0.0000
E20 Exposed floor (normal)	4.8000	0.3200	1.5360
E21 Exposed floor (inverted)	4.2000	0.3200	1.3440
E7 Party floor between dwellings (in blocks of flats)	13.6000	0.2000	2.7200
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E16 Corner (normal)	2.4900	0.1800	0.4482
E17 Corner (inverted - internal area greater than external area)	2.4900	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	31.9000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		8.9126 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.8209 (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	9.2852	9.1742	9.0633	8.5085	8.3976	7.8428	7.8428	7.7319	8.0647	8.3976	8.6195	8.8414	(38)
Heat transfer coeff	34.1061	33.9951	33.8842	33.3294	33.2185	32.6637	32.6637	32.5528	32.8856	33.2185	33.4404	33.6623	(39)
Average = Sum(39)m / 12 =												33.3017	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7341	0.7317	0.7293	0.7174	0.7150	0.7031	0.7031	0.7007	0.7078	0.7150	0.7198	0.7245	(40)
HLP (average)												0.7168	
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												1.5866	(42)
Hot water usage for mixer showers	76.2330	75.0873	73.4179	70.2238	67.8666	65.2379	63.7438	65.4006	67.2167	70.0391	73.3018	75.9409	(42a)
Hot water usage for baths	21.9783	21.6519	21.1923	20.3448	19.7102	19.0065	18.6264	19.0828	19.5798	20.3328	21.1977	21.9040	(42b)
Hot water usage for other uses	30.8787	29.7558	28.6329	27.5101	26.3872	25.2644	25.2644	26.3872	27.5101	28.6329	29.7558	30.8787	(42c)
Average daily hot water use (litres/day)												118.7332	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.0900	126.4951	123.2432	118.0787	113.9640	109.5088	107.6345	110.8706	114.3066	119.0048	124.2554	128.7236	(44)
Energy conte	204.4470	180.1273	189.4201	161.6438	153.4175	134.6538	130.1746	137.2809	140.9514	161.4884	177.0246	201.5501	(45)
Energy content (annual)										Total = Sum(45)m =		1972.1795	
Distribution loss (46)m = 0.15 x (45)m	30.6670	27.0191	28.4130	24.2466	23.0126	20.1981	19.5262	20.5921	21.1427	24.2233	26.5537	30.2325	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090	(64)
										Total per year (kWh/year) = Sum(64)m =		2572.1795	(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	80.7183	71.3992	75.7219	66.0753	63.7510	57.1012	56.0228	58.3856	59.1951	66.4346	71.1894	79.7551	(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	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.8821	22.9882	18.6953	14.1535	10.5799	8.9320	9.6514	12.5452	16.8381	21.3799	24.9535	26.6014	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	206.0467	208.1849	202.7969	191.3265	176.8471	163.2386	154.1473	152.0092	157.3972	168.8676	183.3469	196.9554	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	(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)													
	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)
Water heating gains (Table 5)													
	108.4924	106.2488	101.7768	91.7713	85.6869	79.3072	75.2994	78.4753	82.2154	89.2938	98.8742	107.1977	(72)
Total internal gains													
	421.2601	418.2608	404.1079	378.0902	353.9529	329.3167	316.9370	320.8686	334.2897	360.3803	388.0135	411.5935	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	3.3000	46.7521	0.7200	0.7000	0.7700	53.8863	(78)

Solar gains	53.8863	88.2519	112.4173	127.0559	132.4001	127.4171	124.4943	120.9012	117.4331	95.1880	63.8737	46.5627	(83)
Total gains	475.1465	506.5127	516.5251	505.1461	486.3530	456.7339	441.4313	441.7698	451.7228	455.5682	451.8872	458.1562	(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	103.7513	104.0899	104.4307	106.1689	106.5235	108.3326	108.3326	108.7019	107.6017	106.5235	105.8166	105.1191	
alpha	7.9168	7.9393	7.9620	8.0779	8.1016	8.2222	8.2222	8.2468	8.1734	8.1016	8.0544	8.0079	
util living area													
	0.9507	0.9194	0.8649	0.7684	0.6292	0.4573	0.3256	0.3389	0.5014	0.7371	0.9017	0.9586	(86)
MIT	20.7283	20.8117	20.8972	20.9650	20.9933	20.9996	21.0000	21.0000	20.9991	20.9777	20.8674	20.7082	(87)
Th 2	20.3108	20.3129	20.3150	20.3255	20.3276	20.3381	20.3381	20.3402	20.3339	20.3276	20.3234	20.3192	(88)
util rest of house													
	0.9393	0.9026	0.8401	0.7333	0.5859	0.4102	0.2766	0.2903	0.4534	0.6960	0.8797	0.9487	(89)
MIT 2	20.0808	20.1588	20.2361	20.3015	20.3238	20.3380	20.3381	20.3402	20.3335	20.3135	20.2201	20.0698	(90)
Living area fraction									fLA = Living area / (4) =			0.8717	(91)
MIT	20.6453	20.7279	20.8124	20.8799	20.9074	20.9147	20.9151	20.9153	20.9137	20.8925	20.7844	20.6263	(92)
Temperature adjustment												-0.1500	
adjusted MIT	20.4953	20.5779	20.6624	20.7299	20.7574	20.7647	20.7651	20.7653	20.7637	20.7425	20.6344	20.4763	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9426	0.9094	0.8531	0.7547	0.6138	0.4406	0.3082	0.3217	0.4844	0.7217	0.8903	0.9511	(94)
Useful gains	447.8541	460.6138	440.6383	381.2112	298.4993	201.2282	136.0410	142.0956	218.8337	328.7797	402.2932	435.7739	(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													
	552.3568	532.9726	479.8808	394.2827	300.8736	201.3623	136.0469	142.1039	219.1394	336.9174	452.5945	547.8986	(97)
Space heating kWh													
	77.7501	48.6251	29.1964	9.4115	1.7665	0.0000	0.0000	0.0000	0.0000	6.0544	36.2170	83.4207	(98a)
Space heating requirement - total per year (kWh/year)												292.4417	
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													
	77.7501	48.6251	29.1964	9.4115	1.7665	0.0000	0.0000	0.0000	0.0000	6.0544	36.2170	83.4207	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												292.4417	
Space heating per m2											(98c) / (4) =	6.2945	(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 %)	89.5000	(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													
	77.7501	48.6251	29.1964	9.4115	1.7665	0.0000	0.0000	0.0000	0.0000	6.0544	36.2170	83.4207	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	86.8716	54.3297	32.6217	10.5156	1.9737	0.0000	0.0000	0.0000	0.0000	6.7647	40.4659	93.2075	(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													
	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	285.3697	252.6868	268.5799	235.7082	228.3535	205.5518	202.3838	210.3239	212.5883	237.3713	252.8934	282.1329	(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	14.5562	13.1475	14.5562	14.0866	14.5562	14.0866	14.5562	14.5562	14.0866	14.5562	14.0866	14.5562	(231)
Lighting	22.6544	18.1742	16.3639	11.9889	9.2605	7.5659	8.4478	10.9807	14.2629	18.7137	21.1371	23.2840	(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	326.7504	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2873.9436	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)		
mechanical ventilation fans (SFP = 0.6050)	85.3874	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	171.3874	(231)
Electricity for lighting (calculated in Appendix L)	182.8340	(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	3554.9154	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	326.7504	3.6400	11.8937	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2873.9436	3.6400	104.6115	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	171.3874	16.4900	28.2618	(249)
Energy for lighting	182.8340	16.4900	30.1493	(250)
Additional standing charges			92.0000	(251)
Total energy cost			266.9164	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0506	(257)
SAP value		82.9694	
SAP rating (Section 12)		83	(258)
SAP band		B	

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	326.7504	0.2100	68.6176	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2873.9436	0.2100	603.5281	(264)
Space and water heating			672.1457	(265)
Pumps, fans and electric keep-hot	171.3874	0.1387	23.7735	(267)
Energy for lighting	182.8340	0.1443	26.3886	(268)
Total CO2, kg/year			722.3079	(272)
CO2 emissions per m2			15.5500	(273)
EI value			89.4173	
EI rating			89	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	46.4600	(1b)	x 2.4900	(2b) =	115.6854	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		115.6854	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000	(22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750	(22a)
Adj infilt rate	0.1337	0.1250	0.1279	0.1162	0.1162	0.1017	0.1046	0.1104	0.1075	0.1133	0.1133	0.1250	(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) =	81.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2287	0.2200	0.2229	0.2112	0.2112	0.1967	0.1996	0.2054	0.2025	0.2083	0.2083	0.2200	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			3.3000	1.1450	3.7786			(27)
exposed upper			2.5600	0.1300	0.3328	20.0000	51.2000	(28b)
over commercial			43.9000	0.1300	5.7070	20.0000	878.0000	(28b)
External Wall 1	12.7000	3.3000	9.4000	0.1300	1.2220	70.0000	658.0000	(29a)
sheltered	16.9300	2.1000	14.8300	0.1300	1.9279	70.0000	1038.1000	(29a)
Total net area of external elements Aum(A, m2)			76.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.9083			(33)
Party Wall 1			20.6600	0.0000	0.0000	180.0000	3718.8000	(32)
Party Wall 2 to existing			24.1500	0.0000	0.0000	180.0000	4347.0000	(32)
Party Ceiling 1			62.8800			30.0000	1886.4000	(32b)
Internal Wall 1			17.9200			9.0000	161.2800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12738.7800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	274.1881 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	2.9400	0.0600	0.1764
E3 Sill	1.9400	0.0400	0.0776
E4 Jamb	11.0000	0.0200	0.2200
E7 Party floor between dwellings (in blocks of flats)	9.7000	0.0000	0.0000
E20 Exposed floor (normal)	4.8000	0.3200	1.5360
E21 Exposed floor (inverted)	4.2000	0.3200	1.3440
E7 Party floor between dwellings (in blocks of flats)	13.6000	0.2000	2.7200
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E16 Corner (normal)	2.4900	0.1800	0.4482
E17 Corner (inverted - internal area greater than external area)	2.4900	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	31.9000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.9126 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 24.8209 (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	8.7304	8.3976	8.5085	8.0647	8.0647	7.5100	7.6209	7.8428	7.7319	7.9538	7.9538	8.3976	(38)
Heat transfer coeff	33.5513	33.2185	33.3294	32.8856	32.8856	32.3309	32.4418	32.6637	32.5528	32.7747	32.7747	33.2185	(39)
Average = Sum(39)m / 12 =												32.8856	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7222	0.7150	0.7174	0.7078	0.7078	0.6959	0.6983	0.7031	0.7007	0.7054	0.7054	0.7150	(40)
HLP (average)												0.7078	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.5866 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	76.2330	75.0873	73.4179	70.2238	67.8666	65.2379	63.7438	65.4006	67.2167	70.0391	73.3018	75.9409	(42a)
Hot water usage for baths	21.9783	21.6519	21.1923	20.3448	19.7102	19.0065	18.6264	19.0828	19.5798	20.3328	21.1977	21.9040	(42b)
Hot water usage for other uses	30.8787	29.7558	28.6329	27.5101	26.3872	25.2644	25.2644	26.3872	27.5101	28.6329	29.7558	30.8787	(42c)
Average daily hot water use (litres/day)												118.7332	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.0900	126.4951	123.2432	118.0787	113.9640	109.5088	107.6345	110.8706	114.3066	119.0048	124.2554	128.7236	(44)
Energy conte	204.4470	180.1273	189.4201	161.6438	153.4175	134.6538	130.1746	137.2809	140.9514	161.4884	177.0246	201.5501	(45)
Energy content (annual)										Total = Sum(45)m =		1972.1795	

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

	30.6670	27.0191	28.4130	24.2466	23.0126	20.1981	19.5262	20.5921	21.1427	24.2233	26.5537	30.2325 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h												
	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090 (64)
									Total per year (kWh/year) = Sum(64)m =			2572.1795 (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												
	80.7183	71.3992	75.7219	66.0753	63.7510	57.1012	56.0228	58.3856	59.1951	66.4346	71.1894	79.7551 (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	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	25.8821	22.9882	18.6953	14.1535	10.5799	8.9320	9.6514	12.5452	16.8381	21.3799	24.9535	26.6014	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	206.0467	208.1849	202.7969	191.3265	176.8471	163.2386	154.1473	152.0092	157.3972	168.8676	183.3469	196.9554	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	(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)													
	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)
Water heating gains (Table 5)													
	108.4924	106.2488	101.7768	91.7713	85.6869	79.3072	75.2994	78.4753	82.2154	89.2938	98.8742	107.1977	(72)
Total internal gains													
	421.2601	418.2608	404.1079	378.0902	353.9529	329.3167	316.9370	320.8686	334.2897	360.3803	388.0135	411.5935	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	3.3000	49.2853	0.7200	0.7000	0.7700	56.8062	(78)

Solar gains	56.8062	83.2866	106.2897	125.2016	126.9757	131.5883	128.6913	126.8625	122.9379	98.0057	69.4731	50.3319	(83)
Total gains	478.0663	501.5474	510.3976	503.2919	480.9286	460.9050	445.6283	447.7311	457.2276	458.3860	457.4867	461.9254	(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	105.4667	106.5235	106.1689	107.6017	107.6017	109.4479	109.0736	108.3326	108.7019	107.9659	107.9659	106.5235	
alpha	8.0311	8.1016	8.0779	8.1734	8.1734	8.2965	8.2716	8.2222	8.2468	8.1977	8.1977	8.1016	
util living area													
	0.9251	0.8931	0.8136	0.6874	0.5185	0.3227	0.1820	0.1970	0.3844	0.6306	0.8447	0.9340	(86)
MIT	20.8125	20.8681	20.9429	20.9863	20.9987	21.0000	21.0000	21.0000	20.9999	20.9939	20.9310	20.7993	(87)
Th 2	20.3213	20.3276	20.3255	20.3339	20.3339	20.3445	20.3424	20.3381	20.3402	20.3360	20.3360	20.3276	(88)
util rest of house													
	0.9086	0.8722	0.7829	0.6483	0.4736	0.2767	0.1341	0.1487	0.3375	0.5857	0.8149	0.9190	(89)
MIT 2	20.1683	20.2232	20.2842	20.3254	20.3333	20.3445	20.3424	20.3381	20.3402	20.3327	20.2858	20.1625	(90)
Living area fraction										fLA = Living area / (4) =		0.8717	(91)
MIT	20.7299	20.7854	20.8584	20.9015	20.9133	20.9159	20.9156	20.9151	20.9153	20.9090	20.8482	20.7176	(92)
Temperature adjustment												-0.1500	
adjusted MIT	20.5799	20.6354	20.7084	20.7515	20.7633	20.7659	20.7656	20.7651	20.7653	20.7590	20.6982	20.5676	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9153	0.8821	0.8007	0.6730	0.5026	0.3062	0.1649	0.1798	0.3677	0.6144	0.8316	0.9247	(94)
Useful gains	437.5590	442.4379	408.6603	338.7294	241.7058	141.1478	73.5014	80.5192	168.1165	281.6488	380.4558	427.1299	(95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000	(96)
Heat loss rate W													
	509.3055	492.8096	430.2284	343.7057	242.1475	141.1531	73.5014	80.5192	168.1443	283.7973	406.3472	503.8449	(97)
Space heating kWh													
	53.3794	33.8498	16.0467	3.5829	0.3286	0.0000	0.0000	0.0000	0.0000	1.5985	18.6418	57.0760	(98a)
Space heating requirement - total per year (kWh/year)												184.5036	
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													
	53.3794	33.8498	16.0467	3.5829	0.3286	0.0000	0.0000	0.0000	0.0000	1.5985	18.6418	57.0760	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												184.5036	
Space heating per m2											(98c) / (4) =	3.9712	(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 %)												89.5000	(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													
	53.3794	33.8498	16.0467	3.5829	0.3286	0.0000	0.0000	0.0000	0.0000	1.5985	18.6418	57.0760	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	59.6418	37.8210	17.9292	4.0033	0.3672	0.0000	0.0000	0.0000	0.0000	1.7861	20.8288	63.7720	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	285.3697	252.6868	268.5799	235.7082	228.3535	205.5518	202.3838	210.3239	212.5883	237.3713	252.8934	282.1329	(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	14.5562	13.1475	14.5562	14.0866	14.5562	14.0866	14.5562	14.5562	14.0866	14.5562	14.0866	14.5562	(231)
Lighting	22.6544	18.1742	16.3639	11.9889	9.2605	7.5659	8.4478	10.9807	14.2629	18.7137	21.1371	23.2840	(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												206.1493	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												2873.9436	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)													
mechanical ventilation fans (SFP = 0.6050)												85.3874	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												171.3874	(231)
Electricity for lighting (calculated in Appendix L)												182.8340	(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												3434.3143	(238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	206.1493	6.1900	12.7606	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2873.9436	6.1900	177.8971	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	171.3874	25.1600	43.1211	(249)
Energy for lighting	182.8340	25.1600	46.0010	(250)
Additional standing charges			102.0000	(251)
Total energy cost			381.7799	(255)

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	206.1493	0.2100	43.2914	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2873.9436	0.2100	603.5281	(264)
Space and water heating			646.8195	(265)
Pumps, fans and electric keep-hot	171.3874	0.1387	23.7735	(267)
Energy for lighting	182.8340	0.1443	26.3886	(268)
Total CO2, kg/year			696.9817	(272)

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	206.1493	1.1300	232.9487 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2873.9436	1.1300	3247.5562 (278)
Space and water heating			3480.5050 (279)
Pumps, fans and electric keep-hot	171.3874	1.5128	259.2748 (281)
Energy for lighting	182.8340	1.5338	280.4370 (282)
Total Primary energy kWh/year			4020.2168 (286)

Full SAP Calculation Printout

Property Reference	Flat 4 Block A	**Issued on Date**	13/03/2024
Assessment Reference	Be Lean	**Prop Type Ref**	
Property	Flat 4 Block A, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	83 B	**DER**	14.96	**TER**	13.98
Environmental	89 B	**% DER < TER**			-7.01
CO_2 Emissions (t/year)	0.86	**DFEE**	32.73	**TFEE**	35.12
Compliance Check	See BREL	**% DFEE < TFEE**			6.79
% DPER < TPER	-15.65	**DPER**	85.54	**TPER**	73.96

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client	KGH, Kurt Gander - Howe		

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	62.8800	(1b)	x 2.5000	(2b) =	157.2000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		157.2000	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(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) =												81.0000	(23c)
Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316	(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	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			7.4900	1.1450	8.5763			(27)
exposed bin store			12.6000	0.1300	1.6380	20.0000	252.0000	(28b)
over commercial			50.2800	0.1300	6.5364	20.0000	1005.6000	(28b)
External Wall 1	55.2500	7.4900	47.7600	0.1300	6.2088	70.0000	3343.2000	(29a)
sheltered	9.7500	2.1000	7.6500	0.1300	0.9945	70.0000	535.5000	(29a)
Total net area of external elements Aum(A, m2)			127.8800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.8940			(33)
Party Wall 1			21.0000	0.0000	0.0000	180.0000	3780.0000	(32)
Party Ceiling 1			62.8800			20.0000	1257.6000	(32b)
Internal Wall 1			108.3400			9.0000	975.0600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11148.9600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		177.3053 (35)
List of Thermal Bridges		

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	5.6500	0.0600	0.3390	
E3 Sill	4.6500	0.0400	0.1860	
E4 Jamb	20.4000	0.0200	0.4080	
E7 Party floor between dwellings (in blocks of flats)	9.8000	0.0000	0.0000	
E20 Exposed floor (normal)	10.0000	0.3200	3.2000	
E21 Exposed floor (inverted)	4.8000	0.3200	1.5360	
E7 Party floor between dwellings (in blocks of flats)	12.6000	0.2000	2.5200	
E16 Corner (normal)	2.4900	0.0500	0.1245	
E18 Party wall between dwellings	4.9800	0.2400	1.1952	
E16 Corner (normal)	2.4900	0.1800	0.4482	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.4000	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.9569	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	36.8509	(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	12.6172	12.4665	12.3157	11.5619	11.4111	10.6573	10.6573	10.5065	10.9588	11.4111	11.7126	12.0142	(38)
Heat transfer coeff	49.4682	49.3174	49.1666	48.4128	48.2620	47.5082	47.5082	47.3574	47.8097	48.2620	48.5636	48.8651	(39)
Average = Sum(39)m / 12 =												48.3751	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7867	0.7843	0.7819	0.7699	0.7675	0.7555	0.7555	0.7531	0.7603	0.7675	0.7723	0.7771	(40)
HLP (average)												0.7693	
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 2.0618 (42)

Hot water usage for mixer showers

88.1834	86.8581	84.9270	81.2322	78.5055	75.4647	73.7363	75.6528	77.7537	81.0185	84.7927	87.8455	(42a)

Hot water usage for baths

25.4044	25.0271	24.4958	23.5162	22.7826	21.9692	21.5299	22.0575	22.6319	23.5023	24.5021	25.3185	(42b)

Hot water usage for other uses

35.7447	34.4449	33.1451	31.8453	30.5455	29.2457	29.2457	30.5455	31.8453	33.1451	34.4449	35.7447	(42c)

Average daily hot water use (litres/day) 137.3512 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.3325	146.3301	142.5679	136.5936	131.8336	126.6796	124.5119	128.2558	132.2309	137.6659	143.7397	148.9087	(44)
Energy conte	236.5061	208.3722	219.1216	186.9899	177.4734	155.7674	150.5864	158.8075	163.0539	186.8114	204.7836	233.1551	(45)
Energy content (annual)										Total = Sum(45)m =		2281.4282	
Distribution loss (46)m = 0.15 x (45)m	35.4759	31.2558	32.8682	28.0485	26.6210	23.3651	22.5880	23.8211	24.4581	28.0217	30.7175	34.9733	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140	(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	287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140	(64)
										Total per year (kWh/year) = Sum(64)m =		2881.4282	(64)
12Total per year (kWh/year)												2881	(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	91.3780	80.7906	85.5976	74.5029	71.7496	64.1214	62.8097	65.5432	66.5442	74.8545	80.4193	90.2638	(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	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	101.0207	111.8444	101.0207	104.3881	101.0207	104.3881	101.0207	101.0207	104.3881	101.0207	104.3881	101.0207	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.1476	182.0169	177.3062	167.2776	154.6182	142.7202	134.7716	132.9023	137.6130	147.6416	160.3010	172.1990	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)
Water heating gains (Table 5)	122.8199	120.2241	115.0506	103.4762	96.4377	89.0575	84.4216	88.0957	92.4225	100.6109	111.6935	121.3223	(72)
Total internal gains	460.9149	471.0121	450.3042	432.0686	409.0033	390.0926	374.1407	375.9454	388.3503	406.2000	433.3093	451.4687	(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	4.8900	10.6334	0.7200	0.7000	0.7700	18.1612	(74)
South	2.6000	46.7521	0.7200	0.7000	0.7700	42.4559	(78)

Solar gains	60.6171	104.2388	147.5468	194.8347	231.9252	236.9995	225.6295	196.4447	163.4309	116.3107	72.7289	51.8259	(83)
Total gains	521.5320	575.2509	597.8510	626.9033	640.9286	627.0921	599.7702	572.3901	551.7812	522.5107	506.0382	503.2946	(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	62.6046	62.7960	62.9885	63.9693	64.1691	65.1873	65.1873	65.3949	64.7762	64.1691	63.7707	63.3772	
alpha	5.1736	5.1864	5.1992	5.2646	5.2779	5.3458	5.3458	5.3597	5.3184	5.2779	5.2514	5.2251	
util living area	0.9637	0.9401	0.9027	0.8106	0.6644	0.4796	0.3477	0.3793	0.5816	0.8233	0.9340	0.9685	(86)
MIT	20.2166	20.3863	20.5799	20.8111	20.9441	20.9919	20.9988	20.9981	20.9782	20.8255	20.5080	20.1903	(87)
Th 2	20.2649	20.2670	20.2690	20.2795	20.2816	20.2920	20.2920	20.2941	20.2878	20.2816	20.2774	20.2732	(88)
util rest of house	0.9570	0.9295	0.8860	0.7816	0.6218	0.4285	0.2922	0.3217	0.5269	0.7903	0.9207	0.9625	(89)
MIT 2	19.5610	19.7262	19.9119	20.1312	20.2435	20.2878	20.2916	20.2934	20.2754	20.1494	19.8544	19.5425	(90)
Living area fraction										fLA = Living area / (4) =		0.3639	(91)
MIT	19.7995	19.9664	20.1550	20.3786	20.4984	20.5440	20.5489	20.5498	20.5311	20.3954	20.0922	19.7782	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7995	19.9664	20.1550	20.3786	20.4984	20.5440	20.5489	20.5498	20.5311	20.3954	20.0922	19.7782	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9520	0.9247	0.8831	0.7858	0.6350	0.4468	0.3124	0.3426	0.5460	0.7958	0.9169	0.9578	(94)
Useful gains	496.4999	531.9088	527.9884	492.5955	406.9853	280.1950	187.3485	196.1064	301.2452	415.8386	464.0014	482.0493	(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	766.7339	743.0360	671.3696	555.7123	424.6304	282.3903	187.6069	196.5261	307.4715	472.7442	630.9490	761.2323	(97)
Space heating kWh	201.0541	141.8775	106.6756	45.4441	13.1279	0.0000	0.0000	0.0000	0.0000	42.3378	120.2023	207.7121	(98a)
Space heating requirement - total per year (kWh/year)												878.4313	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	201.0541	141.8775	106.6756	45.4441	13.1279	0.0000	0.0000	0.0000	0.0000	42.3378	120.2023	207.7121	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												878.4313	
Space heating per m2											(98c) / (4) =	13.9700	(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 %) 89.5000 (206)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	201.0541	141.8775	106.6756	45.4441	13.1279	0.0000	0.0000	0.0000	0.0000	42.3378	120.2023	207.7121	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	224.6414	158.5224	119.1906	50.7755	14.6681	0.0000	0.0000	0.0000	0.0000	47.3048	134.3042	232.0805	(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	287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	321.1900	284.2453	301.7659	264.0279	255.2316	229.1424	225.1902	234.3758	237.2838	265.6651	283.9091	317.4458	(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	17.1587	15.4981	17.1587	16.6051	17.1587	16.6051	17.1587	17.1587	16.6051	17.1587	16.6051	17.1587	(231)
Lighting	26.3258	21.1196	19.0158	13.9318	10.7613	8.7921	9.8168	12.7603	16.5744	21.7465	24.5626	27.0575	(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 1 981.4875 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 89.5000

Water heating fuel used 3219.4729 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)

mechanical ventilation fans (SFP = 0.6050) 116.0293 (230a)

central heating pump 41.0000 (230c)

main heating flue fan 45.0000 (230e)

Total electricity for the above, kWh/year 202.0293 (231)

Electricity for lighting (calculated in Appendix L)	212.4646	(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	4615.4543	(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	981.4875	0.2100	206.1124	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3219.4729	0.2100	676.0893	(264)
Space and water heating			882.2017	(265)
Pumps, fans and electric keep-hot	202.0293	0.1387	28.0240	(267)
Energy for lighting	212.4646	0.1443	30.6652	(268)
Total CO2, kg/year			940.8908	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.9600	(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	981.4875	1.1300	1109.0809	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3219.4729	1.1300	3638.0044	(278)
Space and water heating			4747.0853	(279)
Pumps, fans and electric keep-hot	202.0293	1.5128	305.6300	(281)
Energy for lighting	212.4646	1.5338	325.8853	(282)
Total Primary energy kWh/year			5378.6005	(286)
Dwelling Primary energy Rate (DPER)			85.5400	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.8800 (1b)	x	2.5000 (2b)	=	157.2000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	157.2000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	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) =	0.1272	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3772	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2924	(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	0.3727	0.3654	0.3581	0.3216	0.3143	0.2777	0.2777	0.2704	0.2924	0.3143	0.3289	0.3435	(22b)
Effective ac	0.5695	0.5668	0.5641	0.5517	0.5494	0.5386	0.5386	0.5366	0.5427	0.5494	0.5541	0.5590	(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			2.1000	1.0000	2.1000	(26)
TER Opening Type (Uw = 1.20)			7.4900	1.1450	8.5763	(27)
exposed bin store			12.6000	0.1300	1.6380	(28b)
over commercial			50.2800	0.1300	6.5364	(28b)
External Wall 1	55.2500	7.4900	47.7600	0.1800	8.5968	(29a)
sheltered	9.7500	2.1000	7.6500	0.1800	1.3770	(29a)
Total net area of external elements Aum(A, m2)			127.8800			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.8245	(33)
Party Wall 1			21.0000	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 187.3053 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6500	0.0500	0.2825
E3 Sill	4.6500	0.0500	0.2325
E4 Jamb	20.4000	0.0500	1.0200
E7 Party floor between dwellings (in blocks of flats)	9.8000	0.0700	0.6860
E20 Exposed floor (normal)	10.0000	0.3200	3.2000
E21 Exposed floor (inverted)	4.8000	0.3200	1.5360
E7 Party floor between dwellings (in blocks of flats)	12.6000	0.0700	0.8820
E16 Corner (normal)	2.4900	0.0900	0.2241
E18 Party wall between dwellings	4.9800	0.0600	0.2988
E16 Corner (normal)	2.4900	0.0900	0.2241
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.4000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.5860 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 37.4105 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.5418	29.4019	29.2647	28.6204	28.4999	27.9387	27.9387	27.8348	28.1549	28.4999	28.7438	28.9987	(38)
Heat transfer coeff	66.9524	66.8124	66.6753	66.0310	65.9104	65.3493	65.3493	65.2454	65.5654	65.9104	66.1543	66.4092	(39)

Average = Sum(39)m / 12 = 66.0304

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0648	1.0625	1.0604	1.0501	1.0482	1.0393	1.0393	1.0376	1.0427	1.0482	1.0521	1.0561	(40)
HLP (average)												1.0501	
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 2.0618 (42)

Hot water usage for mixer showers

58.7889	57.9054	56.6180	54.1548	52.3370	50.3098	49.1576	50.4352	51.8358	54.0124	56.5285	58.5637	(42a)

Hot water usage for baths

25.4044	25.0271	24.4958	23.5162	22.7826	21.9692	21.5299	22.0575	22.6319	23.5023	24.5021	25.3185	(42b)

Hot water usage for other uses

35.7447	34.4449	33.1451	31.8453	30.5455	29.2457	29.2457	30.5455	31.8453	33.1451	34.4449	35.7447	(42c)

Average daily hot water use (litres/day) 110.2505 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	119.9380	117.3774	114.2589	109.5162	105.6651	101.5247	99.9331	103.0382	106.3130	110.6597	115.4755	119.6269	(44)
Energy conte	189.9525	167.1439	175.6117	149.9223	142.2455	124.8365	120.8605	127.5828	131.0946	150.1642	164.5160	187.3068	(45)
Energy content (annual)										Total = Sum(45)m =		1831.2372	
Distribution loss (46)m = 0.15 x (45)m	28.4929	25.0716	26.3418	22.4883	21.3368	18.7255	18.1291	19.1374	19.6642	22.5246	24.6774	28.0960	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9248	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	240.9114	213.1713	226.5706	199.2373	193.2044	174.1516	171.7853	178.5417	180.4096	201.1231	213.8311	238.2657	(62)
WWHRS	-26.8758	-23.7692	-24.8897	-20.6097	-19.2075	-16.4360	-15.4061	-16.3829	-17.0053	-20.0474	-22.7113	-26.3781	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.0356	189.4021	201.6808	178.6276	173.9970	157.7156	156.3792	162.1588	163.4043	181.0757	191.1198	211.8876	(64)
									Total per year (kWh/year) = Sum(64)m =			2181.4841	(64)
12Total per year (kWh/year)												2181	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	75.8989	67.0822	71.1306	62.1779	60.0364	53.8369	52.9173	55.1610	55.9177	62.6693	67.0303	75.0192	(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	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	101.0207	111.8444	101.0207	104.3881	101.0207	104.3881	101.0207	101.0207	104.3881	101.0207	104.3881	101.0207	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.1476	182.0169	177.3062	167.2776	154.6182	142.7202	134.7716	132.9023	137.6130	147.6416	160.3010	172.1990	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)
Water heating gains (Table 5)	102.0147	99.8247	95.6057	86.3582	80.6940	74.7735	71.1254	74.1411	77.6635	84.2330	93.0977	100.8323	(72)
Total internal gains	440.1097	450.6127	430.8593	414.9506	393.2597	375.8085	360.8445	361.9909	373.5913	389.8221	414.7135	430.9787	(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	4.8900	10.6334	0.6300	0.7000	0.7700	15.8910	(74)
South	2.6000	46.7521	0.6300	0.7000	0.7700	37.1489	(78)

Solar gains	53.0399	91.2089	129.1035	170.4803	202.9346	207.3746	197.4258	171.8891	143.0020	101.7719	63.6378	45.3476	(83)
Total gains	493.1496	541.8216	559.9627	585.4309	596.1943	583.1831	558.2703	533.8800	516.5933	491.5939	478.3512	476.3263	(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	48.8646	48.9669	49.0677	49.5464	49.6371	50.0633	50.0633	50.1430	49.8982	49.6371	49.4541	49.2642	
alpha	4.2576	4.2645	4.2712	4.3031	4.3091	4.3376	4.3376	4.3429	4.3265	4.3091	4.2969	4.2843	
util living area	0.9826	0.9726	0.9567	0.9132	0.8227	0.6594	0.5006	0.5410	0.7548	0.9185	0.9701	0.9849	(86)
MIT	19.6263	19.8096	20.0644	20.4248	20.7334	20.9265	20.9824	20.9754	20.8638	20.4908	20.0095	19.5953	(87)
Th 2	20.0297	20.0315	20.0333	20.0418	20.0434	20.0507	20.0507	20.0521	20.0479	20.0434	20.0402	20.0368	(88)
util rest of house	0.9786	0.9663	0.9462	0.8912	0.7775	0.5806	0.3992	0.4388	0.6843	0.8935	0.9621	0.9813	(89)
MIT 2	18.4422	18.6746	18.9959	19.4444	19.8021	20.0015	20.0433	20.0408	19.9459	19.5318	18.9356	18.4079	(90)
Living area fraction									fLA = Living area / (4) =			0.3639	(91)
MIT	18.8731	19.0876	19.3847	19.8012	20.1410	20.3381	20.3850	20.3809	20.2799	19.8808	19.3263	18.8399	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8731	19.0876	19.3847	19.8012	20.1410	20.3381	20.3850	20.3809	20.2799	19.8808	19.3263	18.8399	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9722	0.9584	0.9375	0.8848	0.7826	0.6056	0.4357	0.4753	0.7029	0.8885	0.9544	0.9754	(94)
Useful gains	479.4191	519.2634	524.9589	517.9608	466.5544	353.2038	243.2612	253.7709	363.0968	436.7905	456.5429	464.6282	(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	975.7021	947.9099	859.0877	719.8137	556.3480	374.9786	247.3472	259.7339	405.1875	611.6991	808.8227	972.2275	(97)
Space heating kWh	369.2346	288.0505	248.5918	145.3341	66.8064	0.0000	0.0000	0.0000	0.0000	130.1320	253.6414	377.6539	(98a)
Space heating requirement - total per year (kWh/year)												1879.4447	
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	369.2346	288.0505	248.5918	145.3341	66.8064	0.0000	0.0000	0.0000	0.0000	130.1320	253.6414	377.6539	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1879.4447	
Space heating per m2											(98c) / (4) =	29.8894	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	369.2346	288.0505	248.5918	145.3341	66.8064	0.0000	0.0000	0.0000	0.0000	130.1320	253.6414	377.6539	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	399.6045	311.7429	269.0388	157.2880	72.3013	0.0000	0.0000	0.0000	0.0000	140.8355	274.5037	408.7163	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	214.0356	189.4021	201.6808	178.6276	173.9970	157.7156	156.3792	162.1588	163.4043	181.0757	191.1198	211.8876	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.5383	85.2770	84.8307	83.9430	82.5145	80.3000	80.3000	80.3000	80.3000	83.6852	84.9887	85.6049	(217)
Fuel for water heating, kWh/month	250.2219	222.1022	237.7452	212.7964	210.8682	196.4080	194.7437	201.9413	203.4923	216.3774	224.8768	247.5181	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	20.9901	16.8390	15.1617	11.1081	8.5802	7.0101	7.8272	10.1740	13.2151	17.3389	19.5842	21.5735	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.5109	-31.3628	-46.6025	-54.2280	-60.0693	-56.6639	-55.9959	-52.0977	-45.4534	-36.7079	-24.0242	-18.4802	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.1786	-19.5919	-39.4675	-60.0466	-80.1394	-80.7778	-79.8016	-67.2020	-48.7951	-28.2404	-12.3279	-7.2352	(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												2034.0311	(211)

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2619.0915	(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)	169.4022	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1036.0005	(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	3872.5243	(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	2034.0311	0.2100	427.1465	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2619.0915	0.2100	550.0092	(264)
Space and water heating			977.1557	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	169.4022	0.1443	24.4500	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-503.1966	0.1339	-67.3659	
PV Unit electricity exported	-532.8039	0.1255	-66.8807	
Total			-134.2467	(269)
Total CO2, kg/year			879.2883	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.9800	(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	2034.0311	1.1300	2298.4551	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2619.0915	1.1300	2959.5734	(278)
Space and water heating			5258.0285	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	169.4022	1.5338	259.8347	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-503.1966	1.4947	-752.1494	
PV Unit electricity exported	-532.8039	0.4607	-245.4893	
Total			-997.6387	(283)
Total Primary energy kWh/year			4650.3254	(286)
Target Primary Energy Rate (TPER)			73.9600	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		62.8800	(1b)	x 2.5000	(2b) =	157.2000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		157.2000	(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	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) =	0.1272	(8)	
Pressure test		Yes		
Pressure Test Method		Blower Door		
Measured/design AP50		3.0000	(17)	
Infiltration rate		0.2772	(18)	
Number of sides sheltered		3	(19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)	

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2149 (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	0.2739	0.2686	0.2632	0.2363	0.2310	0.2041	0.2041	0.1987	0.2149	0.2310	0.2417	0.2524	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5375	0.5361	0.5346	0.5279	0.5267	0.5208	0.5208	0.5197	0.5231	0.5267	0.5292	0.5319	(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	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			7.4900	1.1450	8.5763			(27)
exposed bin store			12.6000	0.1300	1.6380	20.0000	252.0000	(28b)
over commercial			50.2800	0.1300	6.5364	20.0000	1005.6000	(28b)
External Wall 1	55.2500	7.4900	47.7600	0.1300	6.2088	70.0000	3343.2000	(29a)
sheltered	9.7500	2.1000	7.6500	0.1300	0.9945	70.0000	535.5000	(29a)
Total net area of external elements Aum(A, m2)			127.8800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.8940			(33)
Party Wall 1			21.0000	0.0000	0.0000	180.0000	3780.0000	(32)
Party Ceiling 1			62.8800			30.0000	1886.4000	(32b)
Internal Wall 1			108.3400			9.0000	975.0600	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11777.7600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 187.3053 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6500	0.0600	0.3390
E3 Sill	4.6500	0.0400	0.1860
E4 Jamb	20.4000	0.0200	0.4080
E7 Party floor between dwellings (in blocks of flats)	9.8000	0.0000	0.0000
E20 Exposed floor (normal)	10.0000	0.3200	3.2000
E21 Exposed floor (inverted)	4.8000	0.3200	1.5360
E7 Party floor between dwellings (in blocks of flats)	12.6000	0.2000	2.5200
E16 Corner (normal)	2.4900	0.0500	0.1245
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E16 Corner (normal)	2.4900	0.1800	0.4482
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.4000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.9569 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.8509 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.8844	27.8088	27.7347	27.3868	27.3216	27.0186	27.0186	26.9625	27.1353	27.3216	27.4534	27.5910	(38)
Heat transfer coeff	64.7353	64.6597	64.5857	64.2377	64.1726	63.8695	63.8695	63.8134	63.9863	64.1726	64.3043	64.4420	(39)

Average = Sum(39)m / 12 = 64.2374

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0295	1.0283	1.0271	1.0216	1.0206	1.0157	1.0157	1.0148	1.0176	1.0206	1.0227	1.0248	(40)
HLP (average)												1.0216	
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 2.0618 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

25.4044	25.0271	24.4958	23.5162	22.7826	21.9692	21.5299	22.0575	22.6319	23.5023	24.5021	25.3185	(42b)

Hot water usage for other uses

35.7447	34.4449	33.1451	31.8453	30.5455	29.2457	29.2457	30.5455	31.8453	33.1451	34.4449	35.7447	(42c)

Average daily hot water use (litres/day) 56.0491 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	61.1491	59.4720	57.6409	55.3614	53.3281	51.2149	50.7756	52.6030	54.4772	56.6474	58.9470	61.0632	(44)
Energy conte	96.8452	84.6873	88.5919	75.7871	71.7899	62.9747	61.4087	65.1335	67.1759	76.8700	83.9808	95.6102	(45)

Energy content (annual) Total = Sum(45)m = 930.8551
Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 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

82.3184	71.9842	75.3031	64.4190	61.0214	53.5285	52.1974	55.3635	57.0995	65.3395	71.3837	81.2687	(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

82.3184	71.9842	75.3031	64.4190	61.0214	53.5285	52.1974	55.3635	57.0995	65.3395	71.3837	81.2687	(64)

Total per year (kWh/year) = Sum(64)m = 791.2268 (64)
12Total per year (kWh/year) 791 (64)
Electric shower(s)

47.0801	41.9488	45.8065	43.7125	44.5328	42.4800	43.8960	44.5328	43.7125	45.8065	44.9451	47.0801	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 535.5336 (64a)
Heat gains from water heating, kWh/month

32.3496	28.4833	30.2774	27.0329	26.3885	24.0021	24.0233	24.9741	25.2030	27.7865	29.0822	32.0872	(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	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	(66)

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

	101.0207	111.8444	101.0207	104.3881	101.0207	104.3881	101.0207	101.0207	104.3881	101.0207	104.3881	101.0207	(67)

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

	180.1476	182.0169	177.3062	167.2776	154.6182	142.7202	134.7716	132.9023	137.6130	147.6416	160.3010	172.1990	(68)

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

	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

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

	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)

Water heating gains (Table 5)

	43.4807	42.3858	40.6954	37.5457	35.4685	33.3363	32.2894	33.5673	35.0042	37.3474	40.3919	43.1280	(72)

Total internal gains

	378.5757	390.1738	372.9490	363.1380	345.0341	334.3713	322.0085	321.4170	330.9320	339.9365	359.0077	370.2744	(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	4.8900	10.6334	0.7200	0.7000	0.7700	18.1612	(74)
South	2.6000	46.7521	0.7200	0.7000	0.7700	42.4559	(78)

Solar gains	60.6171	104.2388	147.5468	194.8347	231.9252	236.9995	225.6295	196.4447	163.4309	116.3107	72.7289	51.8259	(83)
Total gains	439.1928	494.4126	520.4959	557.9727	576.9594	571.3708	547.6380	517.8617	494.3629	456.2472	431.7366	422.1002	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	50.5381	50.5972	50.6552	50.9296	50.9813	51.2232	51.2232	51.2682	51.1297	50.9813	50.8769	50.7681	
alpha	4.3692	4.3731	4.3770	4.3953	4.3988	4.4149	4.4149	4.4179	4.4086	4.3988	4.3918	4.3845	
util living area	0.9883	0.9794	0.9645	0.9211	0.8283	0.6600	0.4997	0.5459	0.7663	0.9319	0.9784	0.9901	(86)
MIT	19.5855	19.7824	20.0497	20.4232	20.7395	20.9305	20.9838	20.9762	20.8626	20.4693	19.9678	19.5453	(87)
Th 2	20.0588	20.0598	20.0608	20.0654	20.0662	20.0702	20.0702	20.0710	20.0687	20.0662	20.0645	20.0627	(88)
util rest of house	0.9855	0.9745	0.9557	0.9007	0.7843	0.5824	0.4002	0.4448	0.6977	0.9102	0.9724	0.9877	(89)
MIT 2	18.7748	18.9699	19.2331	19.5953	19.8814	20.0338	20.0649	20.0624	19.9876	19.6452	19.1583	18.7380	(90)
Living area fraction									fLA = Living area / (4) =			0.3639	(91)
MIT	19.0698	19.2655	19.5302	19.8965	20.1936	20.3601	20.3992	20.3949	20.3060	19.9451	19.4528	19.0317	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0698	19.2655	19.5302	19.8965	20.1936	20.3601	20.3992	20.3949	20.3060	19.9451	19.4528	19.0317	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9817	0.9693	0.9496	0.8965	0.7909	0.6077	0.4362	0.4811	0.7166	0.9068	0.9674	0.9843	(94)
Useful gains	431.1370	479.2300	494.2736	500.2197	456.3071	347.2280	238.8930	249.1515	354.2597	413.7466	417.6669	415.4715	(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	956.1280	928.8710	841.5656	706.3915	545.0581	367.8918	242.6550	254.9282	397.0962	599.6965	794.3404	955.7852	(97)
Space heating kWh	390.5933	302.1587	258.3852	148.4437	66.0307	0.0000	0.0000	0.0000	0.0000	138.3468	271.2049	401.9934	(98a)
Space heating requirement - total per year (kWh/year)												1977.1567	
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	390.5933	302.1587	258.3852	148.4437	66.0307	0.0000	0.0000	0.0000	0.0000	138.3468	271.2049	401.9934	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1977.1567	
Space heating per m2											(98c) / (4) =	31.4433	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	600.3734	472.6344	484.9818	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8300	0.8967	0.8716	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	498.3096	423.8095	422.7171	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	622.8710	597.3828	564.6221	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	89.6842	129.1386	105.5773	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	22.4211	32.2846	26.3943	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												81.1000	(107)
Energy for space heating												31.4433	(99)
Energy for space cooling												1.2898	(108)
Total												32.7331	(109)
Fabric Energy Efficiency (DFEE)												32.7	(109)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.8800 (1b)	x	2.5000 (2b)	=	157.2000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	157.2000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	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) =	0.1272 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3772 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2924 (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	0.3727	0.3654	0.3581	0.3216	0.3143	0.2777	0.2777	0.2704	0.2924	0.3143	0.3289	0.3435	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5695	0.5668	0.5641	0.5517	0.5494	0.5386	0.5386	0.5366	0.5427	0.5494	0.5541	0.5590	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			7.4900	1.1450	8.5763			(27)
exposed bin store			12.6000	0.1300	1.6380			(28b)
over commercial			50.2800	0.1300	6.5364			(28b)
External Wall 1	55.2500	7.4900	47.7600	0.1800	8.5968			(29a)
sheltered	9.7500	2.1000	7.6500	0.1800	1.3770			(29a)
Total net area of external elements Aum(A, m2)			127.8800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.8245			(33)
Party Wall 1			21.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 187.3053 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6500	0.0500	0.2825
E3 Sill	4.6500	0.0500	0.2325
E4 Jamb	20.4000	0.0500	1.0200
E7 Party floor between dwellings (in blocks of flats)	9.8000	0.0700	0.6860
E20 Exposed floor (normal)	10.0000	0.3200	3.2000
E21 Exposed floor (inverted)	4.8000	0.3200	1.5360
E7 Party floor between dwellings (in blocks of flats)	12.6000	0.0700	0.8820
E16 Corner (normal)	2.4900	0.0900	0.2241
E18 Party wall between dwellings	4.9800	0.0600	0.2988
E16 Corner (normal)	2.4900	0.0900	0.2241
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.4000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.5860 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 37.4105 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.5418	29.4019	29.2647	28.6204	28.4999	27.9387	27.9387	27.8348	28.1549	28.4999	28.7438	28.9987	(38)
Heat transfer coeff	66.9524	66.8124	66.6753	66.0310	65.9104	65.3493	65.3493	65.2454	65.5654	65.9104	66.1543	66.4092	(39)
Average = Sum(39)m / 12 =												66.0304	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0648	1.0625	1.0604	1.0501	1.0482	1.0393	1.0393	1.0376	1.0427	1.0482	1.0521	1.0561	(40)
HLP (average)												1.0501	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0618 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

25.4044	25.0271	24.4958	23.5162	22.7826	21.9692	21.5299	22.0575	22.6319	23.5023	24.5021	25.3185	(42b)

Hot water usage for other uses

35.7447	34.4449	33.1451	31.8453	30.5455	29.2457	29.2457	30.5455	31.8453	33.1451	34.4449	35.7447	(42c)

Average daily hot water use (litres/day) 56.0491 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	61.1491	59.4720	57.6409	55.3614	53.3281	51.2149	50.7756	52.6030	54.4772	56.6474	58.9470	61.0632	(44)
Energy conte	96.8452	84.6873	88.5919	75.7871	71.7899	62.9747	61.4087	65.1335	67.1759	76.8700	83.9808	95.6102	(45)
Energy content (annual)										Total = Sum(45)m =		930.8551	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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													
	82.3184	71.9842	75.3031	64.4190	61.0214	53.5285	52.1974	55.3635	57.0995	65.3395	71.3837	81.2687	(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													
	82.3184	71.9842	75.3031	64.4190	61.0214	53.5285	52.1974	55.3635	57.0995	65.3395	71.3837	81.2687	(64)
									Total per year (kWh/year) = Sum(64)m =			791.2268	(64)
12Total per year (kWh/year)												791	(64)
Electric shower(s)													
	47.0801	41.9488	45.8065	43.7125	44.5328	42.4800	43.8960	44.5328	43.7125	45.8065	44.9451	47.0801	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						535.5336	(64a)
Heat gains from water heating, kWh/month													
	32.3496	28.4833	30.2774	27.0329	26.3885	24.0021	24.0233	24.9741	25.2030	27.7865	29.0822	32.0872	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	101.0207	111.8444	101.0207	104.3881	101.0207	104.3881	101.0207	101.0207	104.3881	101.0207	104.3881	101.0207	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	180.1476	182.0169	177.3062	167.2776	154.6182	142.7202	134.7716	132.9023	137.6130	147.6416	160.3010	172.1990	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)
Water heating gains (Table 5)													
	43.4807	42.3858	40.6954	37.5457	35.4685	33.3363	32.2894	33.5673	35.0042	37.3474	40.3919	43.1280	(72)
Total internal gains													
	378.5757	390.1738	372.9490	363.1380	345.0341	334.3713	322.0085	321.4170	330.9320	339.9365	359.0077	370.2744	(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	4.8900	10.6334	0.6300	0.7000	0.7700	15.8910	(74)
South	2.6000	46.7521	0.6300	0.7000	0.7700	37.1489	(78)

Solar gains	53.0399	91.2089	129.1035	170.4803	202.9346	207.3746	197.4258	171.8891	143.0020	101.7719	63.6378	45.3476	(83)
Total gains	431.6156	481.3827	502.0525	533.6184	547.9687	541.7459	519.4343	493.3061	473.9340	441.7084	422.6455	415.6220	(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	48.8646	48.9669	49.0677	49.5464	49.6371	50.0633	50.0633	50.1430	49.8982	49.6371	49.4541	49.2642	
alpha	4.2576	4.2645	4.2712	4.3031	4.3091	4.3376	4.3376	4.3429	4.3265	4.3091	4.2969	4.2843	
util living area													
	0.9893	0.9818	0.9698	0.9337	0.8541	0.6955	0.5337	0.5788	0.7929	0.9407	0.9805	0.9908	(86)
MIT	19.5014	19.6917	19.9583	20.3457	20.6845	20.9096	20.9775	20.9681	20.8330	20.4124	19.9015	19.4707	(87)
Th 2	20.0297	20.0315	20.0333	20.0418	20.0434	20.0507	20.0507	20.0521	20.0479	20.0434	20.0402	20.0368	(88)
util rest of house													
	0.9866	0.9774	0.9620	0.9157	0.8131	0.6166	0.4275	0.4722	0.7258	0.9210	0.9750	0.9886	(89)
MIT 2	18.6695	18.8590	19.1231	19.5042	19.8162	20.0024	20.0432	20.0405	19.9476	19.5740	19.0747	18.6445	(90)
Living area fraction									fLA = Living area / (4) =			0.3639	(91)
MIT	18.9722	19.1620	19.4270	19.8104	20.1322	20.3325	20.3832	20.3780	20.2698	19.8791	19.3755	18.9451	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9722	19.1620	19.4270	19.8104	20.1322	20.3325	20.3832	20.3780	20.2698	19.8791	19.3755	18.9451	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9829	0.9723	0.9559	0.9105	0.8173	0.6414	0.4658	0.5103	0.7430	0.9169	0.9701	0.9852	(94)
Useful gains	424.2216	468.0656	479.9305	485.8720	447.8740	347.4991	241.9517	251.7319	352.1195	404.9967	409.9986	409.4705	(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													
	982.3411	952.8806	861.9121	720.4247	555.7668	374.6147	247.2267	259.5467	404.5257	611.5896	812.0787	979.2135	(97)

Space heating kWh

415.2409	325.7957	284.1943	168.8779	80.2723	0.0000	0.0000	0.0000	0.0000	153.7051	289.4977	423.8888	(98a)

Space heating requirement - total per year (kWh/year) 2141.4728
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

415.2409	325.7957	284.1943	168.8779	80.2723	0.0000	0.0000	0.0000	0.0000	153.7051	289.4977	423.8888	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 2141.4728
Space heating per m2 (98c) / (4) = 34.0565 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	614.2832	483.5847	495.8648	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7946	0.8696	0.8430	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	488.1324	420.5282	418.0026	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	588.2444	564.4175	535.9208	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	72.0807	107.0536	87.7312	0.0000	0.0000	0.0000	0.0000	(104)

Cooled fraction fC = cooled area / (4) = 1.0000 (105)
Intermittency factor (Table 10b)

0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)

Space cooling kWh

0.0000	0.0000	0.0000	0.0000	0.0000	18.0202	26.7634	21.9328	0.0000	0.0000	0.0000	0.0000	(107)

Space cooling requirement 66.7164 (107)
Energy for space heating 34.0565 (99)
Energy for space cooling 1.0610 (108)
Total 35.1175 (109)
Fabric Energy Efficiency (TFEE) 35.1 (109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.8800	(1b)	x 2.5000	(2b) =	157.2000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		157.2000	(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		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(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) = 81.0000 (23c)

Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316	(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	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			7.4900	1.1450	8.5763			(27)

exposed bin store			12.6000	0.1300	1.6380	20.0000	252.0000 (28b)
over commercial			50.2800	0.1300	6.5364	20.0000	1005.6000 (28b)
External Wall 1	55.2500	7.4900	47.7600	0.1300	6.2088	70.0000	3343.2000 (29a)
sheltered	9.7500	2.1000	7.6500	0.1300	0.9945	70.0000	535.5000 (29a)
Total net area of external elements Aum(A, m2)			127.8800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.8940		(33)
Party Wall 1			21.0000	0.0000	0.0000	180.0000	3780.0000 (32)
Party Ceiling 1			62.8800			30.0000	1886.4000 (32b)
Internal Wall 1			108.3400			9.0000	975.0600 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11777.7600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 187.3053 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6500	0.0600	0.3390
E3 Sill	4.6500	0.0400	0.1860
E4 Jamb	20.4000	0.0200	0.4080
E7 Party floor between dwellings (in blocks of flats)	9.8000	0.0000	0.0000
E20 Exposed floor (normal)	10.0000	0.3200	3.2000
E21 Exposed floor (inverted)	4.8000	0.3200	1.5360
E7 Party floor between dwellings (in blocks of flats)	12.6000	0.2000	2.5200
E16 Corner (normal)	2.4900	0.0500	0.1245
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E16 Corner (normal)	2.4900	0.1800	0.4482
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.4000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.9569 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.8509 (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	12.6172	12.4665	12.3157	11.5619	11.4111	10.6573	10.6573	10.5065	10.9588	11.4111	11.7126	12.0142	(38)
Heat transfer coeff	49.4682	49.3174	49.1666	48.4128	48.2620	47.5082	47.5082	47.3574	47.8097	48.2620	48.5636	48.8651	(39)
Average = Sum(39)m / 12 =												48.3751	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7867	0.7843	0.7819	0.7699	0.7675	0.7555	0.7555	0.7531	0.7603	0.7675	0.7723	0.7771	(40)
HLP (average)												0.7693	
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 2.0618 (42)
Hot water usage for mixer showers

88.1834	86.8581	84.9270	81.2322	78.5055	75.4647	73.7363	75.6528	77.7537	81.0185	84.7927	87.8455	(42a)

Hot water usage for baths

25.4044	25.0271	24.4958	23.5162	22.7826	21.9692	21.5299	22.0575	22.6319	23.5023	24.5021	25.3185	(42b)

Hot water usage for other uses

35.7447	34.4449	33.1451	31.8453	30.5455	29.2457	29.2457	30.5455	31.8453	33.1451	34.4449	35.7447	(42c)

Average daily hot water use (litres/day) 137.3512 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.3325	146.3301	142.5679	136.5936	131.8336	126.6796	124.5119	128.2558	132.2309	137.6659	143.7397	148.9087	(44)
Energy conte	236.5061	208.3722	219.1216	186.9899	177.4734	155.7674	150.5864	158.8075	163.0539	186.8114	204.7836	233.1551	(45)
Energy content (annual)										Total = Sum(45)m =		2281.4282	
Distribution loss (46)m = 0.15 x (45)m	35.4759	31.2558	32.8682	28.0485	26.6210	23.3651	22.5880	23.8211	24.4581	28.0217	30.7175	34.9733	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140	(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	287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140	(64)
									Total per year (kWh/year) = Sum(64)m =			2881.4282	(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	91.3780	80.7906	85.5976	74.5029	71.7496	64.1214	62.8097	65.5432	66.5442	74.8545	80.4193	90.2638	(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	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.0766	26.7137	21.7251	16.4473	12.2945	10.3796	11.2155	14.5783	19.5670	24.8448	28.9975	30.9125	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	268.8769	271.6670	264.6361	249.6680	230.7735	213.0153	201.1517	198.3616	205.3926	220.3607	239.2552	257.0134	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)
Water heating gains (Table 5)	122.8199	120.2241	115.0506	103.4762	96.4377	89.0575	84.4216	88.0957	92.4225	100.6109	111.6935	121.3223	(72)
Total internal gains	515.4415	512.2730	495.0799	463.2596	433.1738	403.1205	387.4569	391.7038	408.0502	439.4844	473.6143	502.9163	(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	4.8900	10.6334	0.7200	0.7000	0.7700	18.1612	(74)
South	2.6000	46.7521	0.7200	0.7000	0.7700	42.4559	(78)

Solar gains	60.6171	104.2388	147.5468	194.8347	231.9252	236.9995	225.6295	196.4447	163.4309	116.3107	72.7289	51.8259	(83)
Total gains	576.0586	616.5118	642.6267	658.0943	665.0990	640.1200	613.0865	588.1484	571.4810	555.7951	546.3432	554.7421	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	66.1355	66.3377	66.5411	67.5772	67.7883	68.8639	68.8639	69.0831	68.4296	67.7883	67.3674	66.9517	
alpha	5.4090	5.4225	5.4361	5.5051	5.5192	5.5909	5.5909	5.6055	5.5620	5.5192	5.4912	5.4634	
util living area	0.9522	0.9294	0.8849	0.7931	0.6477	0.4711	0.3404	0.3695	0.5654	0.8004	0.9201	0.9586	(86)
MIT	20.3566	20.4875	20.6653	20.8514	20.9580	20.9942	20.9992	20.9988	20.9843	20.8671	20.5991	20.3283	(87)
Th 2	20.2649	20.2670	20.2690	20.2795	20.2816	20.2920	20.2920	20.2941	20.2878	20.2816	20.2774	20.2732	(88)
util rest of house	0.9434	0.9171	0.8657	0.7624	0.6047	0.4205	0.2859	0.3132	0.5112	0.7648	0.9044	0.9509	(89)
MIT 2	19.6940	19.8206	19.9891	20.1650	20.2537	20.2891	20.2918	20.2937	20.2792	20.1834	19.9381	19.6740	(90)
Living area fraction									fLA = Living area / (4) =			0.3639	(91)
MIT	19.9351	20.0633	20.2352	20.4147	20.5099	20.5456	20.5492	20.5502	20.5357	20.4321	20.1786	19.9121	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9351	20.0633	20.2352	20.4147	20.5099	20.5456	20.5492	20.5502	20.5357	20.4321	20.1786	19.9121	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9389	0.9133	0.8648	0.7684	0.6186	0.4387	0.3057	0.3337	0.5303	0.7727	0.9020	0.9464	(94)
Useful gains	540.8653	563.0441	555.7353	505.6785	411.4615	280.8304	187.4449	196.2639	303.0738	429.4399	492.7867	525.0336	(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	773.4416	747.8125	675.3121	557.4603	425.1853	282.4661	187.6186	196.5449	307.6908	474.5194	635.1458	767.7716	(97)
Space heating kWh	173.0368	124.1644	88.9652	37.2829	10.2106	0.0000	0.0000	0.0000	0.0000	33.5391	102.4986	180.5971	(98a)
Space heating requirement - total per year (kWh/year)												750.2945	
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	173.0368	124.1644	88.9652	37.2829	10.2106	0.0000	0.0000	0.0000	0.0000	33.5391	102.4986	180.5971	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												750.2945	
Space heating per m2											(98c) / (4) =	11.9322	(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 %)	89.5000 (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	173.0368	124.1644	88.9652	37.2829	10.2106	0.0000	0.0000	0.0000	0.0000	33.5391	102.4986	180.5971	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	193.3372	138.7312	99.4024	41.6568	11.4085	0.0000	0.0000	0.0000	0.0000	37.4738	114.5235	201.7844	(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	287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	321.1900	284.2453	301.7659	264.0279	255.2316	229.1424	225.1902	234.3758	237.2838	265.6651	283.9091	317.4458	(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	17.1587	15.4981	17.1587	16.6051	17.1587	16.6051	17.1587	17.1587	16.6051	17.1587	16.6051	17.1587	(231)
Lighting	26.3258	21.1196	19.0158	13.9318	10.7613	8.7921	9.8168	12.7603	16.5744	21.7465	24.5626	27.0575	(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												838.3179	(211)

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	3219.4729	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)		
mechanical ventilation fans (SFP = 0.6050)	116.0293	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	202.0293	(231)
Electricity for lighting (calculated in Appendix L)	212.4646	(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	4472.2847	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	838.3179	3.6400	30.5148	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3219.4729	3.6400	117.1888	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	202.0293	16.4900	33.3146	(249)
Energy for lighting	212.4646	16.4900	35.0354	(250)
Additional standing charges			92.0000	(251)
Total energy cost			308.0536	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0280	(257)
SAP value		83.3363	
SAP rating (Section 12)		83	(258)
SAP band		B	

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	838.3179	0.2100	176.0468	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3219.4729	0.2100	676.0893	(264)
Space and water heating			852.1361	(265)
Pumps, fans and electric keep-hot	202.0293	0.1387	28.0240	(267)
Energy for lighting	212.4646	0.1443	30.6652	(268)
Total CO2, kg/year			910.8252	(272)
CO2 emissions per m2			14.4900	(273)
EI value			88.6864	
EI rating			89	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		62.8800 (1b)	x	2.5000 (2b)	=	157.2000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	157.2000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	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												3.0000	(17)
Infiltration rate												0.1500	(18)
Number of sides sheltered												3	(19)
Shelter factor										(20) = 1 - [0.075 x (19)] =		0.7750	(20)
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =		0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000	(22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750	(22a)
Adj infilt rate													
	0.1337	0.1250	0.1279	0.1162	0.1162	0.1017	0.1046	0.1104	0.1075	0.1133	0.1133	0.1250	(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) =	81.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2287	0.2200	0.2229	0.2112	0.2112	0.1967	0.1996	0.2054	0.2025	0.2083	0.2083	0.2200	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			7.4900	1.1450	8.5763			(27)
exposed bin store			12.6000	0.1300	1.6380	20.0000	252.0000	(28b)
over commercial			50.2800	0.1300	6.5364	20.0000	1005.6000	(28b)
External Wall 1	55.2500	7.4900	47.7600	0.1300	6.2088	70.0000	3343.2000	(29a)
sheltered	9.7500	2.1000	7.6500	0.1300	0.9945	70.0000	535.5000	(29a)
Total net area of external elements Aum(A, m2)			127.8800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.8940			(33)
Party Wall 1			21.0000	0.0000	0.0000	180.0000	3780.0000	(32)
Party Ceiling 1			62.8800			30.0000	1886.4000	(32b)
Internal Wall 1			108.3400			9.0000	975.0600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 11777.7600	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	187.3053	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6500	0.0600	0.3390
E3 Sill	4.6500	0.0400	0.1860
E4 Jamb	20.4000	0.0200	0.4080
E7 Party floor between dwellings (in blocks of flats)	9.8000	0.0000	0.0000
E20 Exposed floor (normal)	10.0000	0.3200	3.2000
E21 Exposed floor (inverted)	4.8000	0.3200	1.5360
E7 Party floor between dwellings (in blocks of flats)	12.6000	0.2000	2.5200
E16 Corner (normal)	2.4900	0.0500	0.1245
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E16 Corner (normal)	2.4900	0.1800	0.4482
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.4000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	9.9569	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	36.8509	(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	11.8634	11.4111	11.5619	10.9588	10.9588	10.2050	10.3557	10.6573	10.5065	10.8080	10.8080	11.4111	(38)
Heat transfer coeff	48.7143	48.2620	48.4128	47.8097	47.8097	47.0559	47.2067	47.5082	47.3574	47.6590	47.6590	48.2620	(39)
Average = Sum(39)m / 12 =												47.8097	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7747	0.7675	0.7699	0.7603	0.7603	0.7483	0.7507	0.7555	0.7531	0.7579	0.7579	0.7675	(40)
HLP (average)												0.7603	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0618	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	88.1834	86.8581	84.9270	81.2322	78.5055	75.4647	73.7363	75.6528	77.7537	81.0185	84.7927	87.8455	(42a)
Hot water usage for baths	25.4044	25.0271	24.4958	23.5162	22.7826	21.9692	21.5299	22.0575	22.6319	23.5023	24.5021	25.3185	(42b)
Hot water usage for other uses	35.7447	34.4449	33.1451	31.8453	30.5455	29.2457	29.2457	30.5455	31.8453	33.1451	34.4449	35.7447	(42c)
Average daily hot water use (litres/day)												137.3512	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.3325	146.3301	142.5679	136.5936	131.8336	126.6796	124.5119	128.2558	132.2309	137.6659	143.7397	148.9087	(44)
Energy conte	236.5061	208.3722	219.1216	186.9899	177.4734	155.7674	150.5864	158.8075	163.0539	186.8114	204.7836	233.1551	(45)
Energy content (annual)										Total = Sum(45)m =		2281.4282	
Distribution loss (46)m = 0.15 x (45)m	35.4759	31.2558	32.8682	28.0485	26.6210	23.3651	22.5880	23.8211	24.4581	28.0217	30.7175	34.9733	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140	(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	287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140	(64)

											Total per year (kWh/year) = Sum(64)m =	2881.4282	(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													
91.3780	80.7906	85.5976	74.5029	71.7496	64.1214	62.8097	65.5432	66.5442	74.8545	80.4193	90.2638		(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	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.0766	26.7137	21.7251	16.4473	12.2945	10.3796	11.2155	14.5783	19.5670	24.8448	28.9975	30.9125	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	268.8769	271.6670	264.6361	249.6680	230.7735	213.0153	201.1517	198.3616	205.3926	220.3607	239.2552	257.0134	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)
Water heating gains (Table 5)													
	122.8199	120.2241	115.0506	103.4762	96.4377	89.0575	84.4216	88.0957	92.4225	100.6109	111.6935	121.3223	(72)
Total internal gains													
	515.4415	512.2730	495.0799	463.2596	433.1738	403.1205	387.4569	391.7038	408.0502	439.4844	473.6143	502.9163	(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	4.8900	11.5821	0.7200	0.7000	0.7700	19.7815	(74)
South	2.6000	49.2853	0.7200	0.7000	0.7700	44.7564	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	64.5378	99.8547	142.7210	197.4612	228.5243	250.9223	239.3695	212.0418	175.5333	121.9142	80.0002	56.5084	(83)
Total gains	579.9794	612.1277	637.8009	660.7208	661.6980	654.0428	626.8264	603.7455	583.5835	561.3986	553.6145	559.4247	(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	67.1589	67.7883	67.5772	68.4296	68.4296	69.5258	69.3037	68.8639	69.0831	68.6460	68.6460	67.7883	
alpha	5.4773	5.5192	5.5051	5.5620	5.5620	5.6351	5.6202	5.5909	5.6055	5.5764	5.5764	5.5192	
util living area													
	0.9348	0.9120	0.8471	0.7225	0.5401	0.3305	0.1883	0.2124	0.4358	0.7096	0.8831	0.9417	(86)
MIT	20.4937	20.5917	20.7701	20.9202	20.9861	20.9993	21.0000	21.0000	20.9967	20.9398	20.7283	20.4736	(87)
Th 2	20.2753	20.2816	20.2795	20.2878	20.2878	20.2983	20.2962	20.2920	20.2941	20.2899	20.2899	20.2816	(88)
util rest of house													
	0.9228	0.8968	0.8225	0.6854	0.4925	0.2803	0.1353	0.1567	0.3799	0.6645	0.8610	0.9307	(89)
MIT 2	19.8349	19.9323	20.0942	20.2303	20.2798	20.2981	20.2962	20.2920	20.2927	20.2497	20.0688	19.8216	(90)
Living area fraction										fLA = Living area / (4) =		0.3639	(91)
MIT	20.0747	20.1723	20.3402	20.4813	20.5368	20.5532	20.5523	20.5496	20.5489	20.5008	20.3088	20.0588	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0747	20.1723	20.3402	20.4813	20.5368	20.5532	20.5523	20.5496	20.5489	20.5008	20.3088	20.0588	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9191	0.8942	0.8247	0.6957	0.5093	0.2986	0.1546	0.1770	0.4001	0.6783	0.8617	0.9269	(94)
Useful gains	533.0539	547.3893	525.9664	459.6955	337.0014	195.2832	96.8799	106.8699	233.5198	380.8196	477.0328	518.5388	(95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000	(96)
Heat loss rate W													
	714.8662	693.6345	607.1042	486.7655	341.2086	195.4348	96.8822	106.8754	234.3650	400.3721	572.3254	707.4637	(97)
Space heating kWh													
	135.2684	98.2768	60.3666	19.4904	3.1302	0.0000	0.0000	0.0000	0.0000	14.5470	68.6107	140.5601	(98a)
Space heating requirement - total per year (kWh/year)												540.2503	
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													
	135.2684	98.2768	60.3666	19.4904	3.1302	0.0000	0.0000	0.0000	0.0000	14.5470	68.6107	140.5601	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												540.2503	
Space heating per m2											(98c) / (4) =	8.5918	(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 %)	89.5000	(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													
	135.2684	98.2768	60.3666	19.4904	3.1302	0.0000	0.0000	0.0000	0.0000	14.5470	68.6107	140.5601	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000		(210)
Space heating fuel (main heating system)													
	151.1379	109.8065	67.4487	21.7770	3.4974	0.0000	0.0000	0.0000	0.0000	16.2537	76.6600	157.0504	(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

287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140	(64)

Efficiency of water heater

											89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)

Fuel for water heating, kWh/month

321.1900	284.2453	301.7659	264.0279	255.2316	229.1424	225.1902	234.3758	237.2838	265.6651	283.9091	317.4458	(219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	17.1587	15.4981	17.1587	16.6051	17.1587	16.6051	17.1587	17.1587	16.6051	17.1587	16.6051	17.1587	(231)
Lighting	26.3258	21.1196	19.0158	13.9318	10.7613	8.7921	9.8168	12.7603	16.5744	21.7465	24.5626	27.0575	(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	603.6316	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	3219.4729	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)

mechanical ventilation fans (SFP = 0.6050)	116.0293	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	202.0293	(231)
Electricity for lighting (calculated in Appendix L)	212.4646	(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	4237.5984	(238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	603.6316	6.1900	37.3648	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3219.4729	6.1900	199.2854	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	202.0293	25.1600	50.8306	(249)
Energy for lighting	212.4646	25.1600	53.4561	(250)
Additional standing charges			102.0000	(251)
Total energy cost			442.9368	(255)

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	603.6316	0.2100	126.7626	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3219.4729	0.2100	676.0893	(264)
Space and water heating			802.8519	(265)
Pumps, fans and electric keep-hot	202.0293	0.1387	28.0240	(267)
Energy for lighting	212.4646	0.1443	30.6652	(268)
Total CO2, kg/year			861.5411	(272)

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	603.6316	1.1300	682.1037	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3219.4729	1.1300	3638.0044	(278)
Space and water heating			4320.1081	(279)
Pumps, fans and electric keep-hot	202.0293	1.5128	305.6300	(281)
Energy for lighting	212.4646	1.5338	325.8853	(282)
Total Primary energy kWh/year			4951.6233	(286)

SAP 10 EPC IMPROVEMENTS

Be Lean

Current energy efficiency rating: B 83
Current environmental impact rating: B 89

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 83
Potential environmental impact rating: B 89

Fuel prices for cost data on this page from database revision number 538 TEST (29 Feb 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£104	£104	£0
Mains gas	£339	£339	£0
Space heating	£190	£190	£0
Water heating	£199	£199	£0
Lighting	£53	£53	£0
Total cost of fuels	£443	£443	£0
Total cost of uses	£442	£442	£0
Delivered energy	67 kWh/m²	67 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m²	14 kg/m²	14 kg/m²	0 kg/m²
Primary energy	79 kWh/m²	79 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.8800 (1b)	x	2.5000 (2b)	=	157.2000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	157.2000	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(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) =	81.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			7.4900	1.1450	8.5763			(27)
exposed bin store			12.6000	0.1300	1.6380	20.0000	252.0000	(28b)
over commercial			50.2800	0.1300	6.5364	20.0000	1005.6000	(28b)
External Wall 1	55.2500	7.4900	47.7600	0.1300	6.2088	70.0000	3343.2000	(29a)
sheltered	9.7500	2.1000	7.6500	0.1300	0.9945	70.0000	535.5000	(29a)
Total net area of external elements Aum(A, m2)			127.8800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.8940			(33)
Party Wall 1			21.0000	0.0000	0.0000	180.0000	3780.0000	(32)
Party Ceiling 1			62.8800			30.0000	1886.4000	(32b)
Internal Wall 1			108.3400			9.0000	975.0600	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11777.7600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 187.3053 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6500	0.0600	0.3390
E3 Sill	4.6500	0.0400	0.1860
E4 Jamb	20.4000	0.0200	0.4080
E7 Party floor between dwellings (in blocks of flats)	9.8000	0.0000	0.0000
E20 Exposed floor (normal)	10.0000	0.3200	3.2000
E21 Exposed floor (inverted)	4.8000	0.3200	1.5360
E7 Party floor between dwellings (in blocks of flats)	12.6000	0.2000	2.5200
E16 Corner (normal)	2.4900	0.0500	0.1245
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E16 Corner (normal)	2.4900	0.1800	0.4482
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.4000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.9569 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.8509 (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	12.6172	12.4665	12.3157	11.5619	11.4111	10.6573	10.6573	10.5065	10.9588	11.4111	11.7126	12.0142	(38)
Heat transfer coeff	49.4682	49.3174	49.1666	48.4128	48.2620	47.5082	47.5082	47.3574	47.8097	48.2620	48.5636	48.8651	(39)
Average = Sum(39)m / 12 =												48.3751	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7867	0.7843	0.7819	0.7699	0.7675	0.7555	0.7555	0.7531	0.7603	0.7675	0.7723	0.7771	(40)
HLP (average)												0.7693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0618 (42)
Hot water usage for mixer showers

88.1834	86.8581	84.9270	81.2322	78.5055	75.4647	73.7363	75.6528	77.7537	81.0185	84.7927	87.8455	(42a)

Hot water usage for baths

25.4044	25.0271	24.4958	23.5162	22.7826	21.9692	21.5299	22.0575	22.6319	23.5023	24.5021	25.3185	(42b)

Hot water usage for other uses

35.7447	34.4449	33.1451	31.8453	30.5455	29.2457	29.2457	30.5455	31.8453	33.1451	34.4449	35.7447	(42c)

Average daily hot water use (litres/day) 137.3512 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.3325	146.3301	142.5679	136.5936	131.8336	126.6796	124.5119	128.2558	132.2309	137.6659	143.7397	148.9087	(44)
Energy conte	236.5061	208.3722	219.1216	186.9899	177.4734	155.7674	150.5864	158.8075	163.0539	186.8114	204.7836	233.1551	(45)
Energy content (annual)										Total = Sum(45)m =		2281.4282	
Distribution loss (46)m = 0.15 x (45)m	35.4759	31.2558	32.8682	28.0485	26.6210	23.3651	22.5880	23.8211	24.4581	28.0217	30.7175	34.9733	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140	(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	287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140	(64)
										Total per year (kWh/year) = Sum(64)m =		2881.4282	(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	91.3780	80.7906	85.5976	74.5029	71.7496	64.1214	62.8097	65.5432	66.5442	74.8545	80.4193	90.2638	(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	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.0766	26.7137	21.7251	16.4473	12.2945	10.3796	11.2155	14.5783	19.5670	24.8448	28.9975	30.9125	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	268.8769	271.6670	264.6361	249.6680	230.7735	213.0153	201.1517	198.3616	205.3926	220.3607	239.2552	257.0134	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)
Water heating gains (Table 5)	122.8199	120.2241	115.0506	103.4762	96.4377	89.0575	84.4216	88.0957	92.4225	100.6109	111.6935	121.3223	(72)
Total internal gains													

	515.4415	512.2730	495.0799	463.2596	433.1738	403.1205	387.4569	391.7038	408.0502	439.4844	473.6143	502.9163	(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	4.8900	10.6334	0.7200	0.7000	0.7700	18.1612	(74)
South	2.6000	46.7521	0.7200	0.7000	0.7700	42.4559	(78)

Solar gains	60.6171	104.2388	147.5468	194.8347	231.9252	236.9995	225.6295	196.4447	163.4309	116.3107	72.7289	51.8259	(83)
Total gains	576.0586	616.5118	642.6267	658.0943	665.0990	640.1200	613.0865	588.1484	571.4810	555.7951	546.3432	554.7421	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	66.1355	66.3377	66.5411	67.5772	67.7883	68.8639	68.8639	69.0831	68.4296	67.7883	67.3674	66.9517	
alpha	5.4090	5.4225	5.4361	5.5051	5.5192	5.5909	5.5909	5.6055	5.5620	5.5192	5.4912	5.4634	
util living area	0.9522	0.9294	0.8849	0.7931	0.6477	0.4711	0.3404	0.3695	0.5654	0.8004	0.9201	0.9586	(86)
MIT	20.3566	20.4875	20.6653	20.8514	20.9580	20.9942	20.9992	20.9988	20.9843	20.8671	20.5991	20.3283	(87)
Th 2	20.2649	20.2670	20.2690	20.2795	20.2816	20.2920	20.2920	20.2941	20.2878	20.2816	20.2774	20.2732	(88)
util rest of house	0.9434	0.9171	0.8657	0.7624	0.6047	0.4205	0.2859	0.3132	0.5112	0.7648	0.9044	0.9509	(89)
MIT 2	19.6940	19.8206	19.9891	20.1650	20.2537	20.2891	20.2918	20.2937	20.2792	20.1834	19.9381	19.6740	(90)
Living area fraction									fLA = Living area / (4) =			0.3639	(91)
MIT	19.9351	20.0633	20.2352	20.4147	20.5099	20.5456	20.5492	20.5502	20.5357	20.4321	20.1786	19.9121	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9351	20.0633	20.2352	20.4147	20.5099	20.5456	20.5492	20.5502	20.5357	20.4321	20.1786	19.9121	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9389	0.9133	0.8648	0.7684	0.6186	0.4387	0.3057	0.3337	0.5303	0.7727	0.9020	0.9464	(94)
Useful gains	540.8653	563.0441	555.7353	505.6785	411.4615	280.8304	187.4449	196.2639	303.0738	429.4399	492.7867	525.0336	(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	773.4416	747.8125	675.3121	557.4603	425.1853	282.4661	187.6186	196.5449	307.6908	474.5194	635.1458	767.7716	(97)
Space heating kWh	173.0368	124.1644	88.9652	37.2829	10.2106	0.0000	0.0000	0.0000	0.0000	33.5391	102.4986	180.5971	(98a)
Space heating requirement - total per year (kWh/year)												750.2945	
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	173.0368	124.1644	88.9652	37.2829	10.2106	0.0000	0.0000	0.0000	0.0000	33.5391	102.4986	180.5971	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												750.2945	
Space heating per m2											(98c) / (4) =	11.9322	(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 %)												89.5000	(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	173.0368	124.1644	88.9652	37.2829	10.2106	0.0000	0.0000	0.0000	0.0000	33.5391	102.4986	180.5971	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	193.3372	138.7312	99.4024	41.6568	11.4085	0.0000	0.0000	0.0000	0.0000	37.4738	114.5235	201.7844	(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	287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	321.1900	284.2453	301.7659	264.0279	255.2316	229.1424	225.1902	234.3758	237.2838	265.6651	283.9091	317.4458	(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	17.1587	15.4981	17.1587	16.6051	17.1587	16.6051	17.1587	17.1587	16.6051	17.1587	16.6051	17.1587	(231)
Lighting	26.3258	21.1196	19.0158	13.9318	10.7613	8.7921	9.8168	12.7603	16.5744	21.7465	24.5626	27.0575	(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	838.3179	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	3219.4729	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)		
mechanical ventilation fans (SFP = 0.6050)	116.0293	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	202.0293	(231)
Electricity for lighting (calculated in Appendix L)	212.4646	(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	4472.2847	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	838.3179	3.6400	30.5148	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3219.4729	3.6400	117.1888	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	202.0293	16.4900	33.3146	(249)
Energy for lighting	212.4646	16.4900	35.0354	(250)
Additional standing charges			92.0000	(251)
Total energy cost			308.0536	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0280	(257)
SAP value		83.3363	
SAP rating (Section 12)		83	(258)
SAP band		B	

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	838.3179	0.2100	176.0468	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3219.4729	0.2100	676.0893	(264)
Space and water heating			852.1361	(265)
Pumps, fans and electric keep-hot	202.0293	0.1387	28.0240	(267)
Energy for lighting	212.4646	0.1443	30.6652	(268)
Total CO2, kg/year			910.8252	(272)
CO2 emissions per m2			14.4900	(273)
EI value			88.6864	
EI rating			89	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		62.8800 (1b)	x	2.5000 (2b)	=	157.2000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	157.2000	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000	(22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750	(22a)
Adj infilt rate	0.1337	0.1250	0.1279	0.1162	0.1162	0.1017	0.1046	0.1104	0.1075	0.1133	0.1133	0.1250	(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) =		81.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2287	0.2200	0.2229	0.2112	0.2112	0.1967	0.1996	0.2054	0.2025	0.2083	0.2083	0.2200	(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	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			7.4900	1.1450	8.5763			(27)
exposed bin store			12.6000	0.1300	1.6380	20.0000	252.0000	(28b)
over commercial			50.2800	0.1300	6.5364	20.0000	1005.6000	(28b)
External Wall 1	55.2500	7.4900	47.7600	0.1300	6.2088	70.0000	3343.2000	(29a)
sheltered	9.7500	2.1000	7.6500	0.1300	0.9945	70.0000	535.5000	(29a)
Total net area of external elements Aum(A, m2)			127.8800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.8940			(33)
Party Wall 1			21.0000	0.0000	0.0000	180.0000	3780.0000	(32)
Party Ceiling 1			62.8800			30.0000	1886.4000	(32b)
Internal Wall 1			108.3400			9.0000	975.0600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11777.7600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		187.3053 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6500	0.0600	0.3390
E3 Sill	4.6500	0.0400	0.1860
E4 Jamb	20.4000	0.0200	0.4080
E7 Party floor between dwellings (in blocks of flats)	9.8000	0.0000	0.0000
E20 Exposed floor (normal)	10.0000	0.3200	3.2000
E21 Exposed floor (inverted)	4.8000	0.3200	1.5360
E7 Party floor between dwellings (in blocks of flats)	12.6000	0.2000	2.5200
E16 Corner (normal)	2.4900	0.0500	0.1245
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E16 Corner (normal)	2.4900	0.1800	0.4482
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.4000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		9.9569 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	36.8509 (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	11.8634	11.4111	11.5619	10.9588	10.9588	10.2050	10.3557	10.6573	10.5065	10.8080	10.8080	11.4111	(38)
Heat transfer coeff	48.7143	48.2620	48.4128	47.8097	47.8097	47.0559	47.2067	47.5082	47.3574	47.6590	47.6590	48.2620	(39)
Average = Sum(39)m / 12 =												47.8097	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7747	0.7675	0.7699	0.7603	0.7603	0.7483	0.7507	0.7555	0.7531	0.7579	0.7579	0.7675	(40)
HLP (average)												0.7603	
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		2.0618 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
88.1834	86.8581	84.9270	81.2322	78.5055	75.4647	73.7363	75.6528	77.7537	81.0185	84.7927	87.8455	(42a)

Hot water usage for baths

25.4044	25.0271	24.4958	23.5162	22.7826	21.9692	21.5299	22.0575	22.6319	23.5023	24.5021	25.3185	(42b)

Hot water usage for other uses

35.7447	34.4449	33.1451	31.8453	30.5455	29.2457	29.2457	30.5455	31.8453	33.1451	34.4449	35.7447	(42c)

Average daily hot water use (litres/day)	137.3512 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.3325	146.3301	142.5679	136.5936	131.8336	126.6796	124.5119	128.2558	132.2309	137.6659	143.7397	148.9087	(44)
Energy conte	236.5061	208.3722	219.1216	186.9899	177.4734	155.7674	150.5864	158.8075	163.0539	186.8114	204.7836	233.1551	(45)
Energy content (annual)										Total = Sum(45)m =		2281.4282	
Distribution loss (46)m = 0.15 x (45)m	35.4759	31.2558	32.8682	28.0485	26.6210	23.3651	22.5880	23.8211	24.4581	28.0217	30.7175	34.9733	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													

	287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140	(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													
	287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140	(64)
										Total per year (kWh/year) = Sum(64)m =		2881.4282	(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													
	91.3780	80.7906	85.5976	74.5029	71.7496	64.1214	62.8097	65.5432	66.5442	74.8545	80.4193	90.2638	(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	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.0766	26.7137	21.7251	16.4473	12.2945	10.3796	11.2155	14.5783	19.5670	24.8448	28.9975	30.9125	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	268.8769	271.6670	264.6361	249.6680	230.7735	213.0153	201.1517	198.3616	205.3926	220.3607	239.2552	257.0134	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)
Water heating gains (Table 5)													
	122.8199	120.2241	115.0506	103.4762	96.4377	89.0575	84.4216	88.0957	92.4225	100.6109	111.6935	121.3223	(72)
Total internal gains													
	515.4415	512.2730	495.0799	463.2596	433.1738	403.1205	387.4569	391.7038	408.0502	439.4844	473.6143	502.9163	(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	4.8900	11.5821	0.7200	0.7000	0.7700	19.7815	(74)
South	2.6000	49.2853	0.7200	0.7000	0.7700	44.7564	(78)

Solar gains	64.5378	99.8547	142.7210	197.4612	228.5243	250.9223	239.3695	212.0418	175.5333	121.9142	80.0002	56.5084	(83)
Total gains	579.9794	612.1277	637.8009	660.7208	661.6980	654.0428	626.8264	603.7455	583.5835	561.3986	553.6145	559.4247	(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	67.1589	67.7883	67.5772	68.4296	68.4296	69.5258	69.3037	68.8639	69.0831	68.6460	68.6460	67.7883	
alpha	5.4773	5.5192	5.5051	5.5620	5.5620	5.6351	5.6202	5.5909	5.6055	5.5764	5.5764	5.5192	
util living area													
	0.9348	0.9120	0.8471	0.7225	0.5401	0.3305	0.1883	0.2124	0.4358	0.7096	0.8831	0.9417	(86)
MIT	20.4937	20.5917	20.7701	20.9202	20.9861	20.9993	21.0000	21.0000	20.9967	20.9398	20.7283	20.4736	(87)
Th 2	20.2753	20.2816	20.2795	20.2878	20.2878	20.2983	20.2962	20.2920	20.2941	20.2899	20.2899	20.2816	(88)
util rest of house													
	0.9228	0.8968	0.8225	0.6854	0.4925	0.2803	0.1353	0.1567	0.3799	0.6645	0.8610	0.9307	(89)
MIT 2	19.8349	19.9323	20.0942	20.2303	20.2798	20.2981	20.2962	20.2920	20.2927	20.2497	20.0688	19.8216	(90)
Living area fraction										fLA = Living area / (4) =		0.3639	(91)
MIT	20.0747	20.1723	20.3402	20.4813	20.5368	20.5532	20.5523	20.5496	20.5489	20.5008	20.3088	20.0588	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0747	20.1723	20.3402	20.4813	20.5368	20.5532	20.5523	20.5496	20.5489	20.5008	20.3088	20.0588	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9191	0.8942	0.8247	0.6957	0.5093	0.2986	0.1546	0.1770	0.4001	0.6783	0.8617	0.9269	(94)
Useful gains	533.0539	547.3893	525.9664	459.6955	337.0014	195.2832	96.8799	106.8699	233.5198	380.8196	477.0328	518.5388	(95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000	(96)
Heat loss rate W													
	714.8662	693.6345	607.1042	486.7655	341.2086	195.4348	96.8822	106.8754	234.3650	400.3721	572.3254	707.4637	(97)
Space heating kWh													
	135.2684	98.2768	60.3666	19.4904	3.1302	0.0000	0.0000	0.0000	0.0000	14.5470	68.6107	140.5601	(98a)
Space heating requirement - total per year (kWh/year)												540.2503	
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													
	135.2684	98.2768	60.3666	19.4904	3.1302	0.0000	0.0000	0.0000	0.0000	14.5470	68.6107	140.5601	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												540.2503	
Space heating per m2											(98c) / (4) =	8.5918	(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 %)	89.5000	(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												

	135.2684	98.2768	60.3666	19.4904	3.1302	0.0000	0.0000	0.0000	0.0000	14.5470	68.6107	140.5601 (98)
Space heating efficiency (main heating system 1)												
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000 (210)
Space heating fuel (main heating system)												
	151.1379	109.8065	67.4487	21.7770	3.4974	0.0000	0.0000	0.0000	0.0000	16.2537	76.6600	157.0504 (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												
	287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140 (64)
Efficiency of water heater												89.5000 (216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000 (217)
Fuel for water heating, kWh/month												
	321.1900	284.2453	301.7659	264.0279	255.2316	229.1424	225.1902	234.3758	237.2838	265.6651	283.9091	317.4458 (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	17.1587	15.4981	17.1587	16.6051	17.1587	16.6051	17.1587	17.1587	16.6051	17.1587	16.6051	17.1587 (231)
Lighting	26.3258	21.1196	19.0158	13.9318	10.7613	8.7921	9.8168	12.7603	16.5744	21.7465	24.5626	27.0575 (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	603.6316 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	89.5000
Water heating fuel used	3219.4729 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)	
mechanical ventilation fans (SFP = 0.6050)	116.0293 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	202.0293 (231)
Electricity for lighting (calculated in Appendix L)	212.4646 (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	4237.5984 (238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	603.6316	6.1900	37.3648	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3219.4729	6.1900	199.2854	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	202.0293	25.1600	50.8306	(249)
Energy for lighting	212.4646	25.1600	53.4561	(250)
Additional standing charges			102.0000	(251)
Total energy cost			442.9368	(255)

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	603.6316	0.2100	126.7626	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3219.4729	0.2100	676.0893	(264)
Space and water heating			802.8519	(265)
Pumps, fans and electric keep-hot	202.0293	0.1387	28.0240	(267)
Energy for lighting	212.4646	0.1443	30.6652	(268)
Total CO2, kg/year			861.5411	(272)

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	603.6316	1.1300	682.1037	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3219.4729	1.1300	3638.0044	(278)
Space and water heating			4320.1081	(279)
Pumps, fans and electric keep-hot	202.0293	1.5128	305.6300	(281)
Energy for lighting	212.4646	1.5338	325.8853	(282)
Total Primary energy kWh/year			4951.6233	(286)

Full SAP Calculation Printout

Property Reference	Flat 5 Block A	**Issued on Date**	13/03/2024
Assessment Reference	Be Lean	**Prop Type Ref**	
Property	Flat 3 Block A, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	84 B	**DER**	14.40	**TER**	11.50
Environmental	90 B	**% DER < TER**			-25.22
CO_2 Emissions (t/year)	0.66	**DFEE**	16.70	**TFEE**	14.56
Compliance Check	See BREL	**% DFEE < TFEE**			-14.69
% DPER < TPER	-36.15	**DPER**	83.30	**TPER**	61.18

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client	KGH, Kurt Gander - Howe		

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	46.4600	(1b)	x 2.3000	(2b) =	106.8580	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.8580	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(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) =	81.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316	(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	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			2.5200	1.1450	2.8855			(27)
External Wall 1	11.6800	2.5200	9.1600	0.1300	1.1908	70.0000	641.2000	(29a)
sheltered	15.5700	2.1000	13.4700	0.1300	1.7511	70.0000	942.9000	(29a)
void	4.3000		4.3000	0.1043	0.4483	9.0000	38.7000	(30)
Total net area of external elements Aum(A, m2)			31.5500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		9.2157			(33)
Party Wall 1			19.0000	0.0000	0.0000	180.0000	3420.0000	(32)
Party Wall 2 to existing			22.1800	0.0000	0.0000	180.0000	3992.4000	(32)
Party Floor 1			46.4600			30.0000	1393.8000	(32d)
Party Ceiling 1			62.8800			20.0000	1257.6000	(32b)
Internal Wall 1			16.4800			9.0000	148.3200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 11834.9200	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	254.7335	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	2.9400	0.0600	0.1764
E3 Sill	1.9400	0.0400	0.0776
E4 Jamb	9.4000	0.0200	0.1880
E7 Party floor between dwellings (in blocks of flats)	7.3000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	14.0000	0.2000	2.8000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	35.8000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	3.2000	0.1500	0.4800
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E17 Corner (inverted - internal area greater than external area)	2.4900	0.0000	0.0000
E16 Corner (normal)	2.4900	0.1800	0.4482

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5606 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 15.7763 (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	8.5767	8.4742	8.3717	7.8593	7.7568	7.2444	7.2444	7.1419	7.4493	7.7568	7.9618	8.1667	(38)
Heat transfer coeff	24.3530	24.2505	24.1480	23.6356	23.5331	23.0207	23.0207	22.9182	23.2257	23.5331	23.7381	23.9431	(39)
Average = Sum(39)m / 12 =												23.6100	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5242	0.5220	0.5198	0.5087	0.5065	0.4955	0.4955	0.4933	0.4999	0.5065	0.5109	0.5153	(40)
HLP (average)												0.5082	
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 1.5866 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	76.2330	75.0873	73.4179	70.2238	67.8666	65.2379	63.7438	65.4006	67.2167	70.0391	73.3018	75.9409	(42a)
Hot water usage for baths	21.9783	21.6519	21.1923	20.3448	19.7102	19.0065	18.6264	19.0828	19.5798	20.3328	21.1977	21.9040	(42b)
Hot water usage for other uses	30.8787	29.7558	28.6329	27.5101	26.3872	25.2644	25.2644	26.3872	27.5101	28.6329	29.7558	30.8787	(42c)
Average daily hot water use (litres/day)												118.7332	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.0900	126.4951	123.2432	118.0787	113.9640	109.5088	107.6345	110.8706	114.3066	119.0048	124.2554	128.7236	(44)
Energy conte	204.4470	180.1273	189.4201	161.6438	153.4175	134.6538	130.1746	137.2809	140.9514	161.4884	177.0246	201.5501	(45)
Energy content (annual)										Total = Sum(45)m =		1972.1795	
Distribution loss (46)m = 0.15 x (45)m	30.6670	27.0191	28.4130	24.2466	23.0126	20.1981	19.5262	20.5921	21.1427	24.2233	26.5537	30.2325	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090	(64)
										Total per year (kWh/year) = Sum(64)m =		2572.1795	(64)
12Total per year (kWh/year)												2572	(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	80.7183	71.3992	75.7219	66.0753	63.7510	57.1012	56.0228	58.3856	59.1951	66.4346	71.1894	79.7551	(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	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	89.5294	99.1218	89.5294	92.5137	89.5294	92.5137	89.5294	89.5294	92.5137	89.5294	92.5137	89.5294	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	138.0513	139.4839	135.8739	128.1887	118.4876	109.3699	103.2787	101.8461	105.4561	113.1413	122.8424	131.9601	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	(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)	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)
Water heating gains (Table 5)	108.4924	106.2488	101.7768	91.7713	85.6869	79.3072	75.2994	78.4753	82.2154	89.2938	98.8742	107.1977	(72)
Total internal gains	385.8725	394.6539	376.9795	362.2731	343.5033	327.9901	314.9069	316.6503	326.9847	341.7639	364.0297	378.4867	(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	
South	2.5200	46.7521	0.7200	0.7000	0.7700	41.1496	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	41.1496	67.3924	85.8459	97.0245	101.1056	97.3003	95.0684	92.3245	89.6762	72.6890	48.7763	35.5570	(83)
Total gains	427.0221	462.0462	462.8254	459.2977	444.6088	425.2905	409.9753	408.9748	416.6608	414.4529	412.8060	414.0437	(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	134.9928	135.5632	136.1386	139.0900	139.6958	142.8052	142.8052	143.4438	141.5450	139.6958	138.4895	137.3040	
alpha	9.9995	10.0375	10.0759	10.2727	10.3131	10.5203	10.5203	10.5629	10.4363	10.3131	10.2326	10.1536	
util living area	0.8853	0.8164	0.7449	0.6209	0.4921	0.3464	0.2471	0.2578	0.3846	0.5895	0.7817	0.8966	(86)
MIT	20.9267	20.9661	20.9862	20.9979	20.9998	21.0000	21.0000	21.0000	21.0000	20.9989	20.9813	20.9205	(87)
Th 2	20.4987	20.5007	20.5028	20.5128	20.5149	20.5250	20.5250	20.5270	20.5209	20.5149	20.5108	20.5068	(88)
util rest of house	0.8690	0.7964	0.7220	0.5964	0.4665	0.3207	0.2204	0.2313	0.3579	0.5623	0.7581	0.8813	(89)
MIT 2	20.4388	20.4742	20.4926	20.5114	20.5147	20.5250	20.5250	20.5270	20.5209	20.5142	20.4970	20.4413	(90)

Living area fraction fLA = Living area / (4) = 0.8717 (91)

MIT	20.8641	20.9030	20.9229	20.9355	20.9376	20.9391	20.9391	20.9393	20.9385	20.9367	20.9192	20.8590	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.8641	20.9030	20.9229	20.9355	20.9376	20.9391	20.9391	20.9393	20.9385	20.9367	20.9192	20.8590	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8811	0.8126	0.7414	0.6176	0.4888	0.3431	0.2436	0.2544	0.3812	0.5859	0.7779	0.8924	(94)
Useful gains	376.2407	375.4563	343.1524	283.6725	217.3199	145.9284	99.8882	104.0331	158.8253	242.8411	321.1041	369.4927	(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	403.3853	388.0814	348.2847	284.4652	217.3892	145.9296	99.8883	104.0332	158.8295	243.2546	328.0409	398.8671	(97)
Space heating kWh	20.1956	8.4840	3.8184	0.5708	0.0516	0.0000	0.0000	0.0000	0.0000	0.3077	4.9945	21.8545	(98a)

Space heating requirement - total per year (kWh/year) 60.2772

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	20.1956	8.4840	3.8184	0.5708	0.0516	0.0000	0.0000	0.0000	0.0000	0.3077	4.9945	21.8545	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 60.2772

Space heating per m2 (98c) / (4) = 1.2974 (99)

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

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

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

Efficiency of main space heating system 1 (in %) 84.5000 (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	20.1956	8.4840	3.8184	0.5708	0.0516	0.0000	0.0000	0.0000	0.0000	0.3077	4.9945	21.8545	(98)
Space heating efficiency (main heating system 1)	84.5000	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000	(210)
Space heating fuel (main heating system)	23.9001	10.0403	4.5189	0.6755	0.0611	0.0000	0.0000	0.0000	0.0000	0.3641	5.9106	25.8633	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	285.3697	252.6868	268.5799	235.7082	228.3535	205.5518	202.3838	210.3239	212.5883	237.3713	252.8934	282.1329	(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	14.0028	12.6477	14.0028	13.5511	14.0028	13.5511	14.0028	14.0028	13.5511	14.0028	13.5511	14.0028	(231)
Lighting	23.6228	18.9510	17.0633	12.5013	9.6564	7.8893	8.8089	11.4501	14.8726	19.5136	22.0406	24.2793	(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 71.3340 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 89.5000

Water heating fuel used 2873.9436 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)

mechanical ventilation fans (SFP = 0.6050) 78.8719 (230a)

central heating pump 41.0000 (230c)

main heating flue fan 45.0000 (230e)

Total electricity for the above, kWh/year 164.8719 (231)

Electricity for lighting (calculated in Appendix L)	190.6491	(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	3300.7985	(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	71.3340	0.2100	14.9801	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2873.9436	0.2100	603.5281	(264)
Space and water heating			618.5083	(265)
Pumps, fans and electric keep-hot	164.8719	0.1387	22.8698	(267)
Energy for lighting	190.6491	0.1443	27.5166	(268)
Total CO2, kg/year			668.8946	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.4000	(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	71.3340	1.1300	80.6074	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2873.9436	1.1300	3247.5562	(278)
Space and water heating			3328.1636	(279)
Pumps, fans and electric keep-hot	164.8719	1.5128	249.4182	(281)
Energy for lighting	190.6491	1.5338	292.4240	(282)
Total Primary energy kWh/year			3870.0058	(286)
Dwelling Primary energy Rate (DPER)			83.3000	(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	46.4600	(1b) x	2.3000	(2b) =	106.8580	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.8580	(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) =	0.1872	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4372	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3388	(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	0.4320	0.4235	0.4150	0.3727	0.3642	0.3219	0.3219	0.3134	0.3388	0.3642	0.3812	0.3981	(22b)
Effective ac	0.5933	0.5897	0.5861	0.5694	0.5663	0.5518	0.5518	0.5491	0.5574	0.5663	0.5726	0.5792	(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			2.1000	1.0000	2.1000	(26)
TER Opening Type (Uw = 1.20)			2.5200	1.1450	2.8855	(27)
External Wall 1	11.6800	2.5200	9.1600	0.1800	1.6488	(29a)
sheltered	15.5700	2.1000	13.4700	0.1800	2.4246	(29a)
void	4.3000		4.3000	0.1100	0.4730	(30)
Total net area of external elements Aum(A, m2)			31.5500			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		9.5319	(33)
Party Wall 1			19.0000	0.0000	0.0000	(32)
Party Wall 2 to existing			22.1800	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 268.2678 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	2.9400	0.0500	0.1470
E3 Sill	1.9400	0.0500	0.0970
E4 Jamb	9.4000	0.0500	0.4700
E7 Party floor between dwellings (in blocks of flats)	7.3000	0.0700	0.5110
E7 Party floor between dwellings (in blocks of flats)	14.0000	0.0700	0.9800
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	35.8000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	3.2000	0.0400	0.1280
E18 Party wall between dwellings	4.9800	0.0600	0.2988
E18 Party wall between dwellings	4.9800	0.0600	0.2988
E17 Corner (inverted - internal area greater than external area)	2.4900	-0.0900	-0.2241
E16 Corner (normal)	2.4900	0.0900	0.2241

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 2.9306 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 12.4625 (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	20.9216	20.7939	20.6686	20.0805	19.9704	19.4581	19.4581	19.3632	19.6554	19.9704	20.1930	20.4258	(38)
Heat transfer coeff	33.3841	33.2564	33.1311	32.5430	32.4329	31.9206	31.9206	31.8257	32.1179	32.4329	32.6555	32.8883	(39)

Average = Sum(39)m / 12 = 32.5424

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7186	0.7158	0.7131	0.7005	0.6981	0.6871	0.6871	0.6850	0.6913	0.6981	0.7029	0.7079	(40)
HLP (average)												0.7004	
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 1.5866 (42)

Hot water usage for mixer showers	50.8220	50.0582	48.9453	46.8159	45.2444	43.4920	42.4958	43.6004	44.8111	46.6927	48.8679	50.6273 (42a)
Hot water usage for baths	21.9783	21.6519	21.1923	20.3448	19.7102	19.0065	18.6264	19.0828	19.5798	20.3328	21.1977	21.9040 (42b)
Hot water usage for other uses	30.8787	29.7558	28.6329	27.5101	26.3872	25.2644	25.2644	26.3872	27.5101	28.6329	29.7558	30.8787 (42c)

Average daily hot water use (litres/day) 95.3051 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.6790	101.4660	98.7705	94.6707	91.3418	87.7628	86.3866	89.0704	91.9010	95.6584	99.8214	103.4100	(44)
Energy conte	164.2022	144.4862	151.8066	129.5995	122.9636	107.9146	104.4771	110.2878	113.3231	129.8076	142.2139	161.9150	(45)
Energy content (annual)										Total = Sum(45)m =		1582.9972	
Distribution loss (46)m = 0.15 x (45)m	24.6303	21.6729	22.7710	19.4399	18.4445	16.1872	15.6716	16.5432	16.9985	19.4711	21.3321	24.2873	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.3324	46.6869	46.5468	43.2803	44.0217	45.3893	45.3210	48.7465	49.2270	50.9589	(61)
Total heat required for water heating calculated for each month	215.1611	190.5136	202.1390	176.2864	169.5104	151.1949	148.4987	155.6771	158.6442	178.5541	191.4409	212.8739	(62)
WWHRS	-23.2337	-20.5481	-21.5168	-17.8167	-16.6045	-14.2086	-13.3183	-14.1627	-14.7008	-17.3306	-19.6335	-22.8034	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	191.9274	169.9655	180.6222	158.4697	152.9059	136.9862	135.1804	141.5144	143.9434	161.2235	171.8074	190.0705	(64)
									Total per year (kWh/year) = Sum(64)m =			1934.6165	(64)
12Total per year (kWh/year)												1935	(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	67.3370	59.5485	63.0588	54.7636	52.5221	46.7017	45.7440	48.0180	49.0102	55.3477	59.5929	66.5765	(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	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	89.5294	99.1218	89.5294	92.5137	89.5294	92.5137	89.5294	89.5294	92.5137	89.5294	92.5137	89.5294	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	138.0513	139.4839	135.8739	128.1887	118.4876	109.3699	103.2787	101.8461	105.4561	113.1413	122.8424	131.9601	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	(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)	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)
Water heating gains (Table 5)	90.5067	88.6138	84.7564	76.0605	70.5942	64.8634	61.4839	64.5403	68.0697	74.3920	82.7679	89.4845	(72)
Total internal gains	367.8868	377.0189	359.9591	346.5623	328.4106	313.5464	301.0914	302.7153	312.8389	326.8621	347.9234	360.7734	(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	
South	2.5200	46.7521	0.6300	0.7000	0.7700	36.0059	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	36.0059	58.9683	75.1152	84.8965	88.4674	85.1378	83.1848	80.7840	78.4667	63.6029	42.6792	31.1124	(83)
Total gains	403.8926	435.9873	435.0743	431.4588	416.8780	398.6842	384.2762	383.4992	391.3056	390.4649	390.6026	391.8858	(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	103.7063	104.1047	104.4982	106.3869	106.7479	108.4611	108.4611	108.7844	107.7947	106.7479	106.0201	105.2699	
alpha	7.9138	7.9403	7.9665	8.0925	8.1165	8.2307	8.2307	8.2523	8.1863	8.1165	8.0680	8.0180	
util living area	0.9772	0.9568	0.9272	0.8452	0.7083	0.5114	0.3654	0.3817	0.5640	0.8152	0.9442	0.9806	(86)
MIT	20.6163	20.7211	20.8184	20.9312	20.9849	20.9990	20.9999	20.9999	20.9978	20.9550	20.7989	20.6028	(87)
Th 2	20.6407	20.6421	20.6434	20.6498	20.6510	20.6565	20.6565	20.6575	20.6543	20.6510	20.6486	20.6461	(88)
util rest of house	0.9742	0.9514	0.9185	0.8293	0.6847	0.4843	0.3369	0.3533	0.5364	0.7954	0.9367	0.9780	(89)
MIT 2	20.2824	20.3858	20.4808	20.5917	20.6395	20.6559	20.6564	20.6575	20.6529	20.6145	20.4676	20.2739	(90)
Living area fraction									fLA = Living area / (4) =			0.8717	(91)
MIT	20.5735	20.6781	20.7751	20.8877	20.9406	20.9550	20.9559	20.9560	20.9536	20.9114	20.7564	20.5606	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.5735	20.6781	20.7751	20.8877	20.9406	20.9550	20.9559	20.9560	20.9536	20.9114	20.7564	20.5606	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9736	0.9520	0.9218	0.8403	0.7043	0.5079	0.3618	0.3780	0.5603	0.8103	0.9391	0.9773	(94)
Useful gains	393.2122	415.0574	401.0670	362.5337	293.6158	202.4722	139.0218	144.9683	219.2508	316.3825	366.8053	382.9950	(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	543.2764	524.7229	472.9503	390.1145	299.7005	202.8559	139.0424	144.9978	220.1227	334.4274	445.9563	538.0722	(97)
Space heating kWh	111.6477	73.6952	53.4812	19.8582	4.5270	0.0000	0.0000	0.0000	0.0000	13.4254	56.9887	115.3775	(98a)
Space heating requirement - total per year (kWh/year)												449.0008	
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	111.6477	73.6952	53.4812	19.8582	4.5270	0.0000	0.0000	0.0000	0.0000	13.4254	56.9887	115.3775	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												449.0008	
Space heating per m2											(98c) / (4) =	9.6642	(99)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	111.6477	73.6952	53.4812	19.8582	4.5270	0.0000	0.0000	0.0000	0.0000	13.4254	56.9887	115.3775	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	120.8309	79.7567	57.8801	21.4916	4.8993	0.0000	0.0000	0.0000	0.0000	14.5296	61.6761	124.8674	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	191.9274	169.9655	180.6222	158.4697	152.9059	136.9862	135.1804	141.5144	143.9434	161.2235	171.8074	190.0705	(64)
Efficiency of water heater												80.3000	(216)
(217)m	83.2623	82.7203	82.1147	81.1745	80.5240	80.3000	80.3000	80.3000	80.3000	80.9016	82.2826	83.3455	(217)
Fuel for water heating, kWh/month	230.5094	205.4702	219.9632	195.2211	189.8886	170.5931	168.3442	176.2321	179.2570	199.2834	208.8016	228.0512	(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	18.6024	14.9236	13.4370	9.8445	7.6042	6.2127	6.9368	9.0167	11.7118	15.3666	17.3565	19.1195	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-16.1018	-23.5804	-35.1900	-41.1359	-45.7435	-43.2384	-42.7673	-39.7353	-34.5478	-27.7278	-18.0335	-13.8243	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.5737	-14.0684	-28.4043	-43.2978	-57.8521	-58.3129	-57.5691	-48.4114	-35.0893	-20.2604	-8.8259	-5.1760	(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												485.9316	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2371.6151	(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)	150.1323	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-765.4673	(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	2328.2118	(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	485.9316	0.2100	102.0456	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2371.6151	0.2100	498.0392	(264)
Space and water heating			600.0848	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	150.1323	0.1443	21.6687	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-381.6261	0.1338	-51.0505	
PV Unit electricity exported	-383.8412	0.1255	-48.1665	
Total			-99.2169	(269)
Total CO2, kg/year			534.4659	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5000	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	485.9316	1.1300	549.1028	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2371.6151	1.1300	2679.9251	(278)
Space and water heating			3229.0278	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	150.1323	1.5338	230.2780	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-381.6261	1.4943	-570.2825	
PV Unit electricity exported	-383.8412	0.4606	-176.7971	
Total			-747.0796	(283)
Total Primary energy kWh/year			2842.3270	(286)
Target Primary Energy Rate (TPER)			61.1800	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		46.4600 (1b)	x	2.3000 (2b)	=	106.8580	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.8580	(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	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) =	0.1872	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3372	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2613	(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													
	0.3332	0.3266	0.3201	0.2874	0.2809	0.2482	0.2482	0.2417	0.2613	0.2809	0.2940	0.3070	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5555	0.5533	0.5512	0.5413	0.5395	0.5308	0.5308	0.5292	0.5341	0.5395	0.5432	0.5471	(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	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			2.5200	1.1450	2.8855			(27)
External Wall 1	11.6800	2.5200	9.1600	0.1300	1.1908	70.0000	641.2000	(29a)
sheltered	15.5700	2.1000	13.4700	0.1300	1.7511	70.0000	942.9000	(29a)
void	4.3000		4.3000	0.1043	0.4483	9.0000	38.7000	(30)
Total net area of external elements Aum(A, m2)			31.5500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		9.2157			(33)
Party Wall 1			19.0000	0.0000	0.0000	180.0000	3420.0000	(32)
Party Wall 2 to existing			22.1800	0.0000	0.0000	180.0000	3992.4000	(32)
Party Floor 1			46.4600			30.0000	1393.8000	(32d)
Party Ceiling 1			62.8800			30.0000	1886.4000	(32b)
Internal Wall 1			16.4800			9.0000	148.3200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12463.7200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		268.2678 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	2.9400	0.0600	0.1764
E3 Sill	1.9400	0.0400	0.0776
E4 Jamb	9.4000	0.0200	0.1880
E7 Party floor between dwellings (in blocks of flats)	7.3000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	14.0000	0.2000	2.8000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	35.8000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	3.2000	0.1500	0.4800
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E17 Corner (inverted - internal area greater than external area)	2.4900	0.0000	0.0000
E16 Corner (normal)	2.4900	0.1800	0.4482

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.5606 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	15.7763 (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	19.5886	19.5126	19.4381	19.0882	19.0228	18.7181	18.7181	18.6616	18.8354	19.0228	19.1552	19.2937	(38)
Heat transfer coeff													
	35.3649	35.2889	35.2145	34.8646	34.7991	34.4944	34.4944	34.4380	34.6118	34.7991	34.9315	35.0700	(39)
Average = Sum(39)m / 12 =												34.8643	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7612	0.7596	0.7580	0.7504	0.7490	0.7425	0.7425	0.7412	0.7450	0.7490	0.7519	0.7548	(40)
HLP (average)												0.7504	
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		1.5866 (42)
Hot water usage for mixer showers		
	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	(42a)
Hot water usage for baths		
	21.9783 21.6519 21.1923 20.3448 19.7102 19.0065 18.6264 19.0828 19.5798 20.3328 21.1977 21.9040	(42b)
Hot water usage for other uses		
	30.8787 29.7558 28.6329 27.5101 26.3872 25.2644 25.2644 26.3872 27.5101 28.6329 29.7558 30.8787	(42c)
Average daily hot water use (litres/day)		48.4489 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	52.8570	51.4077	49.8252	47.8548	46.0974	44.2708	43.8907	45.4700	47.0899	48.9657	50.9535	52.7827	(44)
Energy conte	83.7126	73.2039	76.5795	65.5109	62.0559	54.4362	53.0820	56.3014	58.0665	66.4460	72.5926	82.6450	(45)
Energy content (annual)										Total = Sum(45)m =		804.6325	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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													
	71.1557	62.2233	65.0926	55.6843	52.7475	46.2707	45.1197	47.8562	49.3565	56.4791	61.7037	70.2482	(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													
	71.1557	62.2233	65.0926	55.6843	52.7475	46.2707	45.1197	47.8562	49.3565	56.4791	61.7037	70.2482	(64)
									Total per year (kWh/year) = Sum(64)m =			683.9376	(64)
12Total per year (kWh/year)												684	(64)
Electric shower(s)													
	40.6999	36.2640	39.5989	37.7887	38.4978	36.7232	37.9473	38.4978	37.7887	39.5989	38.8543	40.6999	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			462.9595	(64a)
Heat gains from water heating, kWh/month													
	27.9639	24.6218	26.1729	23.3682	22.8113	20.7485	20.7668	21.5885	21.7863	24.0195	25.1395	27.7370	(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	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	89.5294	99.1218	89.5294	92.5137	89.5294	92.5137	89.5294	89.5294	92.5137	89.5294	92.5137	89.5294	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	138.0513	139.4839	135.8739	128.1887	118.4876	109.3699	103.2787	101.8461	105.4561	113.1413	122.8424	131.9601	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)
Water heating gains (Table 5)													
	37.5859	36.6396	35.1786	32.4559	30.6604	28.8173	27.9123	29.0168	30.2588	32.2843	34.9160	37.2810	(72)
Total internal gains													
	311.9660	322.0447	307.3813	299.9577	285.4768	277.5003	267.5198	267.1917	275.0280	281.7543	297.0715	305.5699	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	2.5200	46.7521	0.7200	0.7000	0.7700	41.1496	(78)

Solar gains	41.1496	67.3924	85.8459	97.0245	101.1056	97.3003	95.0684	92.3245	89.6762	72.6890	48.7763	35.5570	(83)
Total gains	353.1156	389.4371	393.2272	396.9823	386.5823	374.8007	362.5881	359.5163	364.7042	354.4433	345.8478	341.1269	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	97.8977	98.1085	98.3160	99.3026	99.4894	100.3683	100.3683	100.5328	100.0279	99.4894	99.1123	98.7210	
alpha	7.5265	7.5406	7.5544	7.6202	7.6326	7.6912	7.6912	7.7022	7.6685	7.6326	7.6075	7.5814	
util living area													
	0.9915	0.9810	0.9642	0.9090	0.7924	0.5848	0.4183	0.4402	0.6458	0.8932	0.9770	0.9933	(86)
MIT	20.4378	20.5648	20.6925	20.8571	20.9595	20.9963	20.9997	20.9996	20.9923	20.8938	20.6542	20.4140	(87)
Th 2	20.2871	20.2885	20.2899	20.2965	20.2977	20.3035	20.3035	20.3045	20.3013	20.2977	20.2952	20.2926	(88)
util rest of house													
	0.9889	0.9755	0.9538	0.8844	0.7462	0.5232	0.3523	0.3739	0.5843	0.8613	0.9693	0.9912	(89)
MIT 2	19.7817	19.9070	20.0313	20.1882	20.2726	20.3019	20.3034	20.3044	20.2977	20.2223	20.0009	19.7631	(90)
Living area fraction										fLA = Living area / (4) =		0.8717	(91)
MIT	20.3537	20.4804	20.6077	20.7713	20.8713	20.9073	20.9104	20.9104	20.9032	20.8076	20.5704	20.3305	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3537	20.4804	20.6077	20.7713	20.8713	20.9073	20.9104	20.9104	20.9032	20.8076	20.5704	20.3305	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9892	0.9771	0.9588	0.9016	0.7844	0.5767	0.4098	0.4317	0.6375	0.8851	0.9726	0.9913	(94)
Useful gains	349.3059	380.5369	377.0156	357.9031	303.2182	216.1606	148.5929	155.1929	232.4901	313.7256	336.3695	338.1622	(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													
	567.7364	549.8159	496.7944	413.8876	319.1547	217.5649	148.6853	155.3305	235.4700	355.2170	470.5417	565.6978	(97)
Space heating kWh													
	162.5123	113.7555	89.1154	40.3088	11.8568	0.0000	0.0000	0.0000	0.0000	30.8696	96.6040	169.2865	(98a)
Space heating requirement - total per year (kWh/year)												714.3088	
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													
	162.5123	113.7555	89.1154	40.3088	11.8568	0.0000	0.0000	0.0000	0.0000	30.8696	96.6040	169.2865	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												714.3088	
Space heating per m2											(98c) / (4) =	15.3747	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	324.2473	255.2585	261.7285	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9499	0.9840	0.9810	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	308.0150	251.1702	256.7646	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	391.4560	379.4817	377.7790	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	60.0775	95.4638	90.0347	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	15.0194	23.8659	22.5087	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												61.3940	(107)
Energy for space heating												15.3747	(99)
Energy for space cooling												1.3214	(108)
Total												16.6961	(109)
Fabric Energy Efficiency (DFEE)												16.7	(109)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	46.4600	(1b)	x 2.3000	(2b) =	106.8580	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.8580	(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) =	0.1872	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4372	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3388	(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	0.4320	0.4235	0.4150	0.3727	0.3642	0.3219	0.3219	0.3134	0.3388	0.3642	0.3812	0.3981	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5933	0.5897	0.5861	0.5694	0.5663	0.5518	0.5518	0.5491	0.5574	0.5663	0.5726	0.5792	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			2.5200	1.1450	2.8855			(27)
External Wall 1	11.6800	2.5200	9.1600	0.1800	1.6488			(29a)
sheltered	15.5700	2.1000	13.4700	0.1800	2.4246			(29a)
void	4.3000		4.3000	0.1100	0.4730			(30)
Total net area of external elements Aum(A, m2)			31.5500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		9.5319			(33)
Party Wall 1			19.0000	0.0000	0.0000			(32)
Party Wall 2 to existing			22.1800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 268.2678 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	2.9400	0.0500	0.1470
E3 Sill	1.9400	0.0500	0.0970
E4 Jamb	9.4000	0.0500	0.4700
E7 Party floor between dwellings (in blocks of flats)	7.3000	0.0700	0.5110
E7 Party floor between dwellings (in blocks of flats)	14.0000	0.0700	0.9800
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	35.8000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	3.2000	0.0400	0.1280
E18 Party wall between dwellings	4.9800	0.0600	0.2988
E18 Party wall between dwellings	4.9800	0.0600	0.2988
E17 Corner (inverted - internal area greater than external area)	2.4900	-0.0900	-0.2241
E16 Corner (normal)	2.4900	0.0900	0.2241

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		2.9306 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.4625 (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	20.9216	20.7939	20.6686	20.0805	19.9704	19.4581	19.4581	19.3632	19.6554	19.9704	20.1930	20.4258	(38)
Heat transfer coeff	33.3841	33.2564	33.1311	32.5430	32.4329	31.9206	31.9206	31.8257	32.1179	32.4329	32.6555	32.8883	(39)
Average = Sum(39)m / 12 =												32.5424	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7186	0.7158	0.7131	0.7005	0.6981	0.6871	0.6871	0.6850	0.6913	0.6981	0.7029	0.7079	(40)
HLP (average)												0.7004	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.5866 (42)
Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	21.9783	21.6519	21.1923	20.3448	19.7102	19.0065	18.6264	19.0828	19.5798	20.3328	21.1977	21.9040	(42b)
Hot water usage for other uses													
	30.8787	29.7558	28.6329	27.5101	26.3872	25.2644	25.2644	26.3872	27.5101	28.6329	29.7558	30.8787	(42c)
Average daily hot water use (litres/day)												48.4489	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	52.8570	51.4077	49.8252	47.8548	46.0974	44.2708	43.8907	45.4700	47.0899	48.9657	50.9535	52.7827	(44)
Energy conte	83.7126	73.2039	76.5795	65.5109	62.0559	54.4362	53.0820	56.3014	58.0665	66.4460	72.5926	82.6450	(45)
Energy content (annual)										Total = Sum(45)m =		804.6325	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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													
	71.1557	62.2233	65.0926	55.6843	52.7475	46.2707	45.1197	47.8562	49.3565	56.4791	61.7037	70.2482	(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													
	71.1557	62.2233	65.0926	55.6843	52.7475	46.2707	45.1197	47.8562	49.3565	56.4791	61.7037	70.2482	(64)
										Total per year (kWh/year) = Sum(64)m =		683.9376	(64)
12Total per year (kWh/year)												684	(64)
Electric shower(s)													
	40.6999	36.2640	39.5989	37.7887	38.4978	36.7232	37.9473	38.4978	37.7887	39.5989	38.8543	40.6999	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		462.9595	(64a)
Heat gains from water heating, kWh/month													
	27.9639	24.6218	26.1729	23.3682	22.8113	20.7485	20.7668	21.5885	21.7863	24.0195	25.1395	27.7370	(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	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	89.5294	99.1218	89.5294	92.5137	89.5294	92.5137	89.5294	89.5294	92.5137	89.5294	92.5137	89.5294	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	138.0513	139.4839	135.8739	128.1887	118.4876	109.3699	103.2787	101.8461	105.4561	113.1413	122.8424	131.9601	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)
Water heating gains (Table 5)													
	37.5859	36.6396	35.1786	32.4559	30.6604	28.8173	27.9123	29.0168	30.2588	32.2843	34.9160	37.2810	(72)
Total internal gains													
	311.9660	322.0447	307.3813	299.9577	285.4768	277.5003	267.5198	267.1917	275.0280	281.7543	297.0715	305.5699	(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	
South	2.5200	46.7521	0.6300	0.7000	0.7700	36.0059	(78)

Solar gains	36.0059	58.9683	75.1152	84.8965	88.4674	85.1378	83.1848	80.7840	78.4667	63.6029	42.6792	31.1124	(83)
Total gains	347.9719	381.0130	382.4965	384.8542	373.9441	362.6381	350.7046	347.9757	353.4947	345.3572	339.7507	336.6823	(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	103.7063	104.1047	104.4982	106.3869	106.7479	108.4611	108.4611	108.7844	107.7947	106.7479	106.0201	105.2699	
alpha	7.9138	7.9403	7.9665	8.0925	8.1165	8.2307	8.2307	8.2523	8.1863	8.1165	8.0680	8.0180	
util living area													
	0.9908	0.9797	0.9619	0.8999	0.7749	0.5612	0.4004	0.4205	0.6217	0.8795	0.9738	0.9926	(86)
MIT	20.4987	20.6177	20.7347	20.8879	20.9719	20.9981	20.9999	20.9998	20.9957	20.9206	20.7092	20.4845	(87)
Th 2	20.3245	20.3269	20.3293	20.3404	20.3425	20.3523	20.3523	20.3541	20.3485	20.3425	20.3383	20.3339	(88)
util rest of house													
	0.9881	0.9739	0.9511	0.8747	0.7301	0.5054	0.3415	0.3616	0.5653	0.8468	0.9655	0.9903	(89)
MIT 2	19.8741	19.9922	20.1066	20.2561	20.3253	20.3515	20.3523	20.3540	20.3465	20.2869	20.0918	19.8683	(90)
Living area fraction										fLA = Living area / (4) =		0.8717	(91)
MIT	20.4186	20.5375	20.6541	20.8068	20.8890	20.9152	20.9168	20.9170	20.9124	20.8393	20.6300	20.4054	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4186	20.5375	20.6541	20.8068	20.8890	20.9152	20.9168	20.9170	20.9124	20.8393	20.6300	20.4054	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9885	0.9759	0.9567	0.8930	0.7676	0.5539	0.3928	0.4130	0.6143	0.8721	0.9694	0.9906	(94)
Useful gains	343.9863	371.8287	365.9213	343.6840	287.0469	200.8678	137.7570	143.6995	217.1369	301.1801	329.3657	333.5133	(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													
	538.1057	520.0453	468.9423	387.4831	298.0253	201.5838	137.7953	143.7568	218.7997	332.0913	441.8290	532.9686	(97)
Space heating kWh													
	144.4248	99.6016	76.6476	31.5354	8.1679	0.0000	0.0000	0.0000	0.0000	22.9979	80.9736	148.3948	(98a)

Space heating requirement - total per year (kWh/year)												612.7436	
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													
	144.4248	99.6016	76.6476	31.5354	8.1679	0.0000	0.0000	0.0000	0.0000	22.9979	80.9736	148.3948	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												612.7436	
Space heating per m2											(98c) / (4) =	13.1886	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	300.0538	236.2125	241.8757	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9646	0.9901	0.9883	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	289.4423	233.8757	239.0430	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	377.2401	365.5919	364.2900	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	63.2144	97.9968	93.1838	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction											fC = cooled area / (4) =	1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	15.8036	24.4992	23.2960	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												63.5988	(107)
Energy for space heating												13.1886	(99)
Energy for space cooling												1.3689	(108)
Total												14.5575	(109)
Fabric Energy Efficiency (TFEE)												14.6	(109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	46.4600	(1b) x	2.3000	(2b) =	106.8580	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.8580	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(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													
	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(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) =												81.0000	(23c)
Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316	(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	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			2.5200	1.1450	2.8855			(27)
External Wall 1	11.6800	2.5200	9.1600	0.1300	1.1908	70.0000	641.2000	(29a)
sheltered	15.5700	2.1000	13.4700	0.1300	1.7511	70.0000	942.9000	(29a)

void	4.3000	4.3000	0.1043	0.4483	9.0000	38.7000 (30)
Total net area of external elements Aum(A, m2)		31.5500				(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		9.2157		(33)
Party Wall 1		19.0000	0.0000	0.0000	180.0000	3420.0000 (32)
Party Wall 2 to existing		22.1800	0.0000	0.0000	180.0000	3992.4000 (32)
Party Floor 1		46.4600			30.0000	1393.8000 (32d)
Party Ceiling 1		62.8800			30.0000	1886.4000 (32b)
Internal Wall 1		16.4800			9.0000	148.3200 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12463.7200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 268.2678 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	2.9400	0.0600	0.1764
E3 Sill	1.9400	0.0400	0.0776
E4 Jamb	9.4000	0.0200	0.1880
E7 Party floor between dwellings (in blocks of flats)	7.3000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	14.0000	0.2000	2.8000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	35.8000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	3.2000	0.1500	0.4800
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E17 Corner (inverted - internal area greater than external area)	2.4900	0.0000	0.0000
E16 Corner (normal)	2.4900	0.1800	0.4482

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5606 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 15.7763 (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	8.5767	8.4742	8.3717	7.8593	7.7568	7.2444	7.2444	7.1419	7.4493	7.7568	7.9618	8.1667	(38)
Heat transfer coeff	24.3530	24.2505	24.1480	23.6356	23.5331	23.0207	23.0207	22.9182	23.2257	23.5331	23.7381	23.9431	(39)
Average = Sum(39)m / 12 =												23.6100	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5242	0.5220	0.5198	0.5087	0.5065	0.4955	0.4955	0.4933	0.4999	0.5065	0.5109	0.5153	(40)
HLP (average)												0.5082	
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 1.5866 (42)
Hot water usage for mixer showers

76.2330	75.0873	73.4179	70.2238	67.8666	65.2379	63.7438	65.4006	67.2167	70.0391	73.3018	75.9409	(42a)

Hot water usage for baths

21.9783	21.6519	21.1923	20.3448	19.7102	19.0065	18.6264	19.0828	19.5798	20.3328	21.1977	21.9040	(42b)

Hot water usage for other uses

30.8787	29.7558	28.6329	27.5101	26.3872	25.2644	25.2644	26.3872	27.5101	28.6329	29.7558	30.8787	(42c)

Average daily hot water use (litres/day) 118.7332 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.0900	126.4951	123.2432	118.0787	113.9640	109.5088	107.6345	110.8706	114.3066	119.0048	124.2554	128.7236	(44)
Energy conte	204.4470	180.1273	189.4201	161.6438	153.4175	134.6538	130.1746	137.2809	140.9514	161.4884	177.0246	201.5501	(45)
Energy content (annual)										Total = Sum(45)m =		1972.1795	
Distribution loss (46)m = 0.15 x (45)m	30.6670	27.0191	28.4130	24.2466	23.0126	20.1981	19.5262	20.5921	21.1427	24.2233	26.5537	30.2325	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090	(64)
									Total per year (kWh/year) = Sum(64)m =			2572.1795	(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	80.7183	71.3992	75.7219	66.0753	63.7510	57.1012	56.0228	58.3856	59.1951	66.4346	71.1894	79.7551	(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	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.9884	23.9708	19.4944	14.7585	11.0322	9.3138	10.0639	13.0814	17.5579	22.2938	26.0201	27.7384	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	206.0467	208.1849	202.7969	191.3265	176.8471	163.2386	154.1473	152.0092	157.3972	168.8676	183.3469	196.9554	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	(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)	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)
Water heating gains (Table 5)	108.4924	106.2488	101.7768	91.7713	85.6869	79.3072	75.2994	78.4753	82.2154	89.2938	98.8742	107.1977	(72)
Total internal gains	422.3665	419.2434	404.9070	378.6952	354.4051	329.6985	317.3496	321.4049	335.0094	361.2941	389.0802	412.7306	(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	
South	2.5200	46.7521	0.7200	0.7000	0.7700	41.1496	(78)

Solar gains	41.1496	67.3924	85.8459	97.0245	101.1056	97.3003	95.0684	92.3245	89.6762	72.6890	48.7763	35.5570	(83)
Total gains	463.5160	486.6358	490.7529	475.7197	455.5107	426.9989	412.4179	413.7294	424.6856	433.9831	437.8564	448.2876	(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	142.1650	142.7658	143.3717	146.4800	147.1179	150.3926	150.3926	151.0651	149.0654	147.1179	145.8476	144.5991	
alpha	10.4777	10.5177	10.5581	10.7653	10.8079	11.0262	11.0262	11.0710	10.9377	10.8079	10.7232	10.6399	
util living area	0.8423	0.7853	0.7076	0.6002	0.4804	0.3450	0.2456	0.2548	0.3773	0.5634	0.7443	0.8567	(86)
MIT	20.9602	20.9798	20.9929	20.9988	20.9999	21.0000	21.0000	21.0000	21.0000	20.9995	20.9900	20.9554	(87)
Th 2	20.4987	20.5007	20.5028	20.5128	20.5149	20.5250	20.5250	20.5270	20.5209	20.5149	20.5108	20.5068	(88)
util rest of house	0.8233	0.7645	0.6848	0.5763	0.4554	0.3194	0.2191	0.2286	0.3512	0.5373	0.7204	0.8386	(89)
MIT 2	20.4673	20.4853	20.4976	20.5121	20.5148	20.5250	20.5250	20.5270	20.5209	20.5145	20.5037	20.4713	(90)
Living area fraction										fLA = Living area / (4) =		0.8717	(91)
MIT	20.8969	20.9164	20.9294	20.9364	20.9377	20.9391	20.9391	20.9393	20.9385	20.9373	20.9277	20.8933	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.8969	20.9164	20.9294	20.9364	20.9377	20.9391	20.9391	20.9393	20.9385	20.9373	20.9277	20.8933	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8385	0.7819	0.7044	0.5971	0.4772	0.3418	0.2422	0.2515	0.3740	0.5601	0.7408	0.8529	(94)
Useful gains	388.6395	380.4968	345.6705	284.0349	217.3529	145.9289	99.8883	104.0332	158.8275	243.0626	324.3701	382.3483	(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	404.1848	388.4048	348.4409	284.4873	217.3912	145.9296	99.8883	104.0332	158.8296	243.2679	328.2421	399.6896	(97)
Space heating kWh	11.5657	5.3142	2.0611	0.3257	0.0285	0.0000	0.0000	0.0000	0.0000	0.1528	2.7878	12.9019	(98a)
Space heating requirement - total per year (kWh/year)												35.1378	
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	11.5657	5.3142	2.0611	0.3257	0.0285	0.0000	0.0000	0.0000	0.0000	0.1528	2.7878	12.9019	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												35.1378	
Space heating per m2											(98c) / (4) =	0.7563	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	84.5000	(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	11.5657	5.3142	2.0611	0.3257	0.0285	0.0000	0.0000	0.0000	0.0000	0.1528	2.7878	12.9019	(98)
Space heating efficiency (main heating system 1)	84.5000	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000	(210)
Space heating fuel (main heating system)	13.6872	6.2889	2.4392	0.3855	0.0337	0.0000	0.0000	0.0000	0.0000	0.1808	3.2992	15.2685	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	285.3697	252.6868	268.5799	235.7082	228.3535	205.5518	202.3838	210.3239	212.5883	237.3713	252.8934	282.1329	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.0028	12.6477	14.0028	13.5511	14.0028	13.5511	14.0028	14.0028	13.5511	14.0028	13.5511	14.0028	(231)
Lighting	23.6228	18.9510	17.0633	12.5013	9.6564	7.8893	8.8089	11.4501	14.8726	19.5136	22.0406	24.2793	(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												41.5832	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	89.5000	
Water heating fuel used	2873.9436	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)		
mechanical ventilation fans (SFP = 0.6050)	78.8719	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	164.8719	(231)
Electricity for lighting (calculated in Appendix L)	190.6491	(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	3271.0478	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	41.5832	3.6400	1.5136	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2873.9436	3.6400	104.6115	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	164.8719	16.4900	27.1874	(249)
Energy for lighting	190.6491	16.4900	31.4380	(250)
Additional standing charges			92.0000	(251)
Total energy cost			256.7506	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0106	(257)
SAP value		83.6180	
SAP rating (Section 12)		84	(258)
SAP band		B	

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	41.5832	0.2100	8.7325	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2873.9436	0.2100	603.5281	(264)
Space and water heating			612.2606	(265)
Pumps, fans and electric keep-hot	164.8719	0.1387	22.8698	(267)
Energy for lighting	190.6491	0.1443	27.5166	(268)
Total CO2, kg/year			662.6469	(272)
CO2 emissions per m2			14.2600	(273)
EI value			90.2914	
EI rating			90	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	46.4600 (1b)	x	2.3000 (2b)	=	106.8580	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 46.4600						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.8580	(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	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000	(22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750	(22a)
Adj infilt rate	0.1337	0.1250	0.1279	0.1162	0.1162	0.1017	0.1046	0.1104	0.1075	0.1133	0.1133	0.1250	(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) =	81.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2287	0.2200	0.2229	0.2112	0.2112	0.1967	0.1996	0.2054	0.2025	0.2083	0.2083	0.2200	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			2.5200	1.1450	2.8855			(27)
External Wall 1	11.6800	2.5200	9.1600	0.1300	1.1908	70.0000	641.2000	(29a)
sheltered	15.5700	2.1000	13.4700	0.1300	1.7511	70.0000	942.9000	(29a)
void	4.3000		4.3000	0.1043	0.4483	9.0000	38.7000	(30)
Total net area of external elements Aum(A, m2)			31.5500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		9.2157			(33)
Party Wall 1			19.0000	0.0000	0.0000	180.0000	3420.0000	(32)
Party Wall 2 to existing			22.1800	0.0000	0.0000	180.0000	3992.4000	(32)
Party Floor 1			46.4600			30.0000	1393.8000	(32d)
Party Ceiling 1			62.8800			30.0000	1886.4000	(32b)
Internal Wall 1			16.4800			9.0000	148.3200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12463.7200	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	268.2678	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	2.9400	0.0600	0.1764
E3 Sill	1.9400	0.0400	0.0776
E4 Jamb	9.4000	0.0200	0.1880
E7 Party floor between dwellings (in blocks of flats)	7.3000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	14.0000	0.2000	2.8000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	35.8000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	3.2000	0.1500	0.4800
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E17 Corner (inverted - internal area greater than external area)	2.4900	0.0000	0.0000
E16 Corner (normal)	2.4900	0.1800	0.4482

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.5606	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	15.7763	(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	8.0642	7.7568	7.8593	7.4493	7.4493	6.9369	7.0394	7.2444	7.1419	7.3469	7.3469	7.7568	(38)
Heat transfer coeff	23.8406	23.5331	23.6356	23.2257	23.2257	22.7133	22.8157	23.0207	22.9182	23.1232	23.1232	23.5331	(39)
Average = Sum(39)m / 12 =												23.2257	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5131	0.5065	0.5087	0.4999	0.4999	0.4889	0.4911	0.4955	0.4933	0.4977	0.4977	0.5065	(40)
HLP (average)												0.4999	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.5866	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	76.2330	75.0873	73.4179	70.2238	67.8666	65.2379	63.7438	65.4006	67.2167	70.0391	73.3018	75.9409	(42a)
Hot water usage for baths	21.9783	21.6519	21.1923	20.3448	19.7102	19.0065	18.6264	19.0828	19.5798	20.3328	21.1977	21.9040	(42b)
Hot water usage for other uses	30.8787	29.7558	28.6329	27.5101	26.3872	25.2644	25.2644	26.3872	27.5101	28.6329	29.7558	30.8787	(42c)
Average daily hot water use (litres/day)												118.7332	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.0900	126.4951	123.2432	118.0787	113.9640	109.5088	107.6345	110.8706	114.3066	119.0048	124.2554	128.7236	(44)
Energy conte	204.4470	180.1273	189.4201	161.6438	153.4175	134.6538	130.1746	137.2809	140.9514	161.4884	177.0246	201.5501	(45)
Energy content (annual)											Total = Sum(45)m =	1972.1795	
Distribution loss (46)m = 0.15 x (45)m	30.6670	27.0191	28.4130	24.2466	23.0126	20.1981	19.5262	20.5921	21.1427	24.2233	26.5537	30.2325	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090	(64)
										Total per year (kWh/year) = Sum(64)m =		2572.1795	(64)

Electric shower(s)

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

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

Heat gains from water heating, kWh/month

	80.7183	71.3992	75.7219	66.0753	63.7510	57.1012	56.0228	58.3856	59.1951	66.4346	71.1894	79.7551 (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	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	(66)

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

	26.9884	23.9708	19.4944	14.7585	11.0322	9.3138	10.0639	13.0814	17.5579	22.2938	26.0201	27.7384	(67)

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

	206.0467	208.1849	202.7969	191.3265	176.8471	163.2386	154.1473	152.0092	157.3972	168.8676	183.3469	196.9554	(68)

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

	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	(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)

	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)

Water heating gains (Table 5)

	108.4924	106.2488	101.7768	91.7713	85.6869	79.3072	75.2994	78.4753	82.2154	89.2938	98.8742	107.1977	(72)

Total internal gains

	422.3665	419.2434	404.9070	378.6952	354.4051	329.6985	317.3496	321.4049	335.0094	361.2941	389.0802	412.7306	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	2.5200	49.2853	0.7200	0.7000	0.7700	43.3792	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	43.3792	63.6007	81.1667	95.6085	96.9633	100.4856	98.2733	96.8768	93.8799	74.8407	53.0522	38.4353	(83)
Total gains	465.7457	482.8441	486.0737	474.3037	451.3684	430.1841	415.6229	418.2817	428.8893	436.1349	442.1324	451.1659	(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	145.2207	147.1179	146.4800	149.0654	149.0654	152.4283	151.7437	150.3926	151.0651	149.7261	149.7261	147.1179	
alpha	10.6814	10.8079	10.7653	10.9377	10.9377	11.1619	11.1162	11.0262	11.0710	10.9817	10.9817	10.8079	
util living area	0.7829	0.7331	0.6399	0.5237	0.3911	0.2429	0.1372	0.1486	0.2886	0.4718	0.6617	0.7958	(86)
MIT	20.9821	20.9908	20.9977	20.9998	21.0000	21.0000	21.0000	21.0000	21.0000	20.9999	20.9973	20.9802	(87)
Th 2	20.5088	20.5149	20.5128	20.5209	20.5209	20.5310	20.5290	20.5250	20.5270	20.5229	20.5229	20.5149	(88)
util rest of house	0.7615	0.7115	0.6168	0.5004	0.3664	0.2181	0.1114	0.1225	0.2633	0.4465	0.6375	0.7748	(89)
MIT 2	20.4953	20.5081	20.5112	20.5208	20.5209	20.5310	20.5290	20.5250	20.5270	20.5229	20.5211	20.4998	(90)

Living area fraction fLA = Living area / (4) = 0.8717 (91)

MIT	20.9197	20.9289	20.9353	20.9383	20.9385	20.9398	20.9396	20.9391	20.9393	20.9387	20.9362	20.9186	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.9197	20.9289	20.9353	20.9383	20.9385	20.9398	20.9396	20.9391	20.9393	20.9387	20.9362	20.9186	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.7794	0.7300	0.6369	0.5207	0.3879	0.2397	0.1339	0.1452	0.2853	0.4686	0.6585	0.7923	(94)
Useful gains	363.0127	352.4596	309.5562	246.9873	175.0841	103.1146	55.6608	60.7531	122.3677	204.3534	291.1331	357.4797	(95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000	(96)
Heat loss rate W	369.9975	356.0308	310.4601	247.0819	175.0875	103.1146	55.6608	60.7531	122.3678	204.3798	292.1889	365.2003	(97)
Space heating kWh	5.1967	2.3999	0.6725	0.0681	0.0025	0.0000	0.0000	0.0000	0.0000	0.0196	0.7602	5.7442	(98a)

Space heating requirement - total per year (kWh/year) 14.8637

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	5.1967	2.3999	0.6725	0.0681	0.0025	0.0000	0.0000	0.0000	0.0000	0.0196	0.7602	5.7442	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 14.8637

Space heating per m2 (98c) / (4) = 0.3199 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	84.5000 (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	5.1967	2.3999	0.6725	0.0681	0.0025	0.0000	0.0000	0.0000	0.0000	0.0196	0.7602	5.7442	(98)
Space heating efficiency (main heating system 1)	84.5000	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000	(210)
Space heating fuel (main heating system)	6.1500	2.8401	0.7959	0.0806	0.0030	0.0000	0.0000	0.0000	0.0000	0.0232	0.8996	6.7978	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)

Water heating

Water heating requirement

	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090 (64)

Efficiency of water heater 89.5000 (216)

(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000 (217)

Fuel for water heating, kWh/month

	285.3697	252.6868	268.5799	235.7082	228.3535	205.5518	202.3838	210.3239	212.5883	237.3713	252.8934	282.1329 (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	14.0028	12.6477	14.0028	13.5511	14.0028	13.5511	14.0028	14.0028	13.5511	14.0028	13.5511	14.0028 (231)
Lighting	23.6228	18.9510	17.0633	12.5013	9.6564	7.8893	8.8089	11.4501	14.8726	19.5136	22.0406	24.2793 (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	17.5901 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	89.5000
Water heating fuel used	2873.9436 (219)
Space cooling fuel	0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)

mechanical ventilation fans (SFP = 0.6050)	78.8719 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	164.8719 (231)
Electricity for lighting (calculated in Appendix L)	190.6491 (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	3247.0547 (238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	17.5901	6.1900	1.0888	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2873.9436	6.1900	177.8971	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	164.8719	25.1600	41.4818	(249)
Energy for lighting	190.6491	25.1600	47.9673	(250)
Additional standing charges			102.0000	(251)
Total energy cost			370.4350	(255)

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	17.5901	0.2100	3.6939	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2873.9436	0.2100	603.5281	(264)
Space and water heating			607.2221	(265)
Pumps, fans and electric keep-hot	164.8719	0.1387	22.8698	(267)
Energy for lighting	190.6491	0.1443	27.5166	(268)
Total CO2, kg/year			657.6084	(272)

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	17.5901	1.1300	19.8769	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2873.9436	1.1300	3247.5562	(278)
Space and water heating			3267.4331	(279)
Pumps, fans and electric keep-hot	164.8719	1.5128	249.4182	(281)
Energy for lighting	190.6491	1.5338	292.4240	(282)
Total Primary energy kWh/year			3809.2753	(286)

SAP 10 EPC IMPROVEMENTS

Be Lean

Current energy efficiency rating: B 84
Current environmental impact rating: B 90

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: B 84
Potential environmental impact rating: B 90

Fuel prices for cost data on this page from database revision number 538 TEST (29 Feb 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£89	£89	£0
Mains gas	£281	£281	£0
Space heating	£145	£145	£0
Water heating	£178	£178	£0
Lighting	£48	£48	£0
Total cost of fuels	£370	£370	£0
Total cost of uses	£371	£371	£0
Delivered energy	70 kWh/m²	70 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m²	14 kg/m²	14 kg/m²	0 kg/m²
Primary energy	82 kWh/m²	82 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	46.4600	(1b)	x 2.3000	(2b) =	106.8580	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.8580	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(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) =	81.0000	(23c)

Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316	(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	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			2.5200	1.1450	2.8855			(27)
External Wall 1	11.6800	2.5200	9.1600	0.1300	1.1908	70.0000	641.2000	(29a)
sheltered	15.5700	2.1000	13.4700	0.1300	1.7511	70.0000	942.9000	(29a)
void	4.3000		4.3000	0.1043	0.4483	9.0000	38.7000	(30)
Total net area of external elements Aum(A, m2)			31.5500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		9.2157			(33)
Party Wall 1			19.0000	0.0000	0.0000	180.0000	3420.0000	(32)
Party Wall 2 to existing			22.1800	0.0000	0.0000	180.0000	3992.4000	(32)
Party Floor 1			46.4600			30.0000	1393.8000	(32d)
Party Ceiling 1			62.8800			30.0000	1886.4000	(32b)
Internal Wall 1			16.4800			9.0000	148.3200	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12463.7200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 268.2678 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	2.9400	0.0600	0.1764
E3 Sill	1.9400	0.0400	0.0776
E4 Jamb	9.4000	0.0200	0.1880
E7 Party floor between dwellings (in blocks of flats)	7.3000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	14.0000	0.2000	2.8000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	35.8000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	3.2000	0.1500	0.4800
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E17 Corner (inverted - internal area greater than external area)	2.4900	0.0000	0.0000
E16 Corner (normal)	2.4900	0.1800	0.4482

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5606 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 15.7763 (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	8.5767	8.4742	8.3717	7.8593	7.7568	7.2444	7.2444	7.1419	7.4493	7.7568	7.9618	8.1667	(38)
Heat transfer coeff	24.3530	24.2505	24.1480	23.6356	23.5331	23.0207	23.0207	22.9182	23.2257	23.5331	23.7381	23.9431	(39)

Average = Sum(39)m / 12 = 23.6100

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5242	0.5220	0.5198	0.5087	0.5065	0.4955	0.4955	0.4933	0.4999	0.5065	0.5109	0.5153	(40)
HLP (average)												0.5082	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.5866 (42)
Hot water usage for mixer showers

76.2330	75.0873	73.4179	70.2238	67.8666	65.2379	63.7438	65.4006	67.2167	70.0391	73.3018	75.9409	(42a)

Hot water usage for baths

21.9783	21.6519	21.1923	20.3448	19.7102	19.0065	18.6264	19.0828	19.5798	20.3328	21.1977	21.9040	(42b)

Hot water usage for other uses

30.8787	29.7558	28.6329	27.5101	26.3872	25.2644	25.2644	26.3872	27.5101	28.6329	29.7558	30.8787	(42c)

Average daily hot water use (litres/day) 118.7332 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.0900	126.4951	123.2432	118.0787	113.9640	109.5088	107.6345	110.8706	114.3066	119.0048	124.2554	128.7236	(44)
Energy conte	204.4470	180.1273	189.4201	161.6438	153.4175	134.6538	130.1746	137.2809	140.9514	161.4884	177.0246	201.5501	(45)
Energy content (annual)										Total = Sum(45)m =		1972.1795	
Distribution loss (46)m = 0.15 x (45)m	30.6670	27.0191	28.4130	24.2466	23.0126	20.1981	19.5262	20.5921	21.1427	24.2233	26.5537	30.2325	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090	(64)
										Total per year (kWh/year) = Sum(64)m =		2572.1795	(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	80.7183	71.3992	75.7219	66.0753	63.7510	57.1012	56.0228	58.3856	59.1951	66.4346	71.1894	79.7551	(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	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.9884	23.9708	19.4944	14.7585	11.0322	9.3138	10.0639	13.0814	17.5579	22.2938	26.0201	27.7384	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	206.0467	208.1849	202.7969	191.3265	176.8471	163.2386	154.1473	152.0092	157.3972	168.8676	183.3469	196.9554	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	(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)	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)
Water heating gains (Table 5)	108.4924	106.2488	101.7768	91.7713	85.6869	79.3072	75.2994	78.4753	82.2154	89.2938	98.8742	107.1977	(72)
Total internal gains	422.3665	419.2434	404.9070	378.6952	354.4051	329.6985	317.3496	321.4049	335.0094	361.2941	389.0802	412.7306	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	2.5200	46.7521	0.7200	0.7000	0.7700	41.1496	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	41.1496	67.3924	85.8459	97.0245	101.1056	97.3003	95.0684	92.3245	89.6762	72.6890	48.7763	35.5570	(83)
Total gains	463.5160	486.6358	490.7529	475.7197	455.5107	426.9989	412.4179	413.7294	424.6856	433.9831	437.8564	448.2876	(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	142.1650	142.7658	143.3717	146.4800	147.1179	150.3926	150.3926	151.0651	149.0654	147.1179	145.8476	144.5991	
alpha	10.4777	10.5177	10.5581	10.7653	10.8079	11.0262	11.0262	11.0710	10.9377	10.8079	10.7232	10.6399	
util living area	0.8423	0.7853	0.7076	0.6002	0.4804	0.3450	0.2456	0.2548	0.3773	0.5634	0.7443	0.8567	(86)
MIT	20.9602	20.9798	20.9929	20.9988	20.9999	21.0000	21.0000	21.0000	21.0000	20.9995	20.9900	20.9554	(87)
Th 2	20.4987	20.5007	20.5028	20.5128	20.5149	20.5250	20.5250	20.5270	20.5209	20.5149	20.5108	20.5068	(88)
util rest of house	0.8233	0.7645	0.6848	0.5763	0.4554	0.3194	0.2191	0.2286	0.3512	0.5373	0.7204	0.8386	(89)
MIT 2	20.4673	20.4853	20.4976	20.5121	20.5148	20.5250	20.5250	20.5270	20.5209	20.5145	20.5037	20.4713	(90)
Living area fraction									fLA = Living area / (4) =			0.8717	(91)
MIT	20.8969	20.9164	20.9294	20.9364	20.9377	20.9391	20.9391	20.9393	20.9385	20.9373	20.9277	20.8933	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.8969	20.9164	20.9294	20.9364	20.9377	20.9391	20.9391	20.9393	20.9385	20.9373	20.9277	20.8933	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8385	0.7819	0.7044	0.5971	0.4772	0.3418	0.2422	0.2515	0.3740	0.5601	0.7408	0.8529	(94)
Useful gains	388.6395	380.4968	345.6705	284.0349	217.3529	145.9289	99.8883	104.0332	158.8275	243.0626	324.3701	382.3483	(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	404.1848	388.4048	348.4409	284.4873	217.3912	145.9296	99.8883	104.0332	158.8296	243.2679	328.2421	399.6896	(97)
Space heating kWh	11.5657	5.3142	2.0611	0.3257	0.0285	0.0000	0.0000	0.0000	0.0000	0.1528	2.7878	12.9019	(98a)
Space heating requirement - total per year (kWh/year)												35.1378	
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	11.5657	5.3142	2.0611	0.3257	0.0285	0.0000	0.0000	0.0000	0.0000	0.1528	2.7878	12.9019	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												35.1378	
Space heating per m2										(98c) / (4) =		0.7563	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	84.5000 (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	11.5657	5.3142	2.0611	0.3257	0.0285	0.0000	0.0000	0.0000	0.0000	0.1528	2.7878	12.9019	(98)
Space heating efficiency (main heating system 1)	84.5000	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000	(210)
Space heating fuel (main heating system)	13.6872	6.2889	2.4392	0.3855	0.0337	0.0000	0.0000	0.0000	0.0000	0.1808	3.2992	15.2685	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	285.3697	252.6868	268.5799	235.7082	228.3535	205.5518	202.3838	210.3239	212.5883	237.3713	252.8934	282.1329	(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	14.0028	12.6477	14.0028	13.5511	14.0028	13.5511	14.0028	14.0028	13.5511	14.0028	13.5511	14.0028	(231)
Lighting	23.6228	18.9510	17.0633	12.5013	9.6564	7.8893	8.8089	11.4501	14.8726	19.5136	22.0406	24.2793	(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	41.5832	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2873.9436	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)		
mechanical ventilation fans (SFP = 0.6050)	78.8719	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	164.8719	(231)
Electricity for lighting (calculated in Appendix L)	190.6491	(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	3271.0478	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	41.5832	3.6400	1.5136	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2873.9436	3.6400	104.6115	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	164.8719	16.4900	27.1874	(249)
Energy for lighting	190.6491	16.4900	31.4380	(250)
Additional standing charges			92.0000	(251)
Total energy cost			256.7506	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0106	(257)
SAP value		83.6180	
SAP rating (Section 12)		84	(258)
SAP band		B	

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	41.5832	0.2100	8.7325	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2873.9436	0.2100	603.5281	(264)
Space and water heating			612.2606	(265)
Pumps, fans and electric keep-hot	164.8719	0.1387	22.8698	(267)
Energy for lighting	190.6491	0.1443	27.5166	(268)
Total CO2, kg/year			662.6469	(272)
CO2 emissions per m2			14.2600	(273)
EI value			90.2914	
EI rating			90	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		46.4600 (1b)	x	2.3000 (2b)	=	106.8580	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.8580	(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		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000	(22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750	(22a)
Adj infilt rate													
	0.1337	0.1250	0.1279	0.1162	0.1162	0.1017	0.1046	0.1104	0.1075	0.1133	0.1133	0.1250	(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) =	81.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2287	0.2200	0.2229	0.2112	0.2112	0.1967	0.1996	0.2054	0.2025	0.2083	0.2083	0.2200	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			2.5200	1.1450	2.8855			(27)
External Wall 1	11.6800	2.5200	9.1600	0.1300	1.1908	70.0000	641.2000	(29a)
sheltered	15.5700	2.1000	13.4700	0.1300	1.7511	70.0000	942.9000	(29a)
void	4.3000		4.3000	0.1043	0.4483	9.0000	38.7000	(30)
Total net area of external elements Aum(A, m2)			31.5500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	9.2157			(33)
Party Wall 1			19.0000	0.0000	0.0000	180.0000	3420.0000	(32)
Party Wall 2 to existing			22.1800	0.0000	0.0000	180.0000	3992.4000	(32)
Party Floor 1			46.4600			30.0000	1393.8000	(32d)
Party Ceiling 1			62.8800			30.0000	1886.4000	(32b)
Internal Wall 1			16.4800			9.0000	148.3200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12463.7200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	268.2678 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	2.9400	0.0600	0.1764
E3 Sill	1.9400	0.0400	0.0776
E4 Jamb	9.4000	0.0200	0.1880
E7 Party floor between dwellings (in blocks of flats)	7.3000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	14.0000	0.2000	2.8000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	35.8000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	3.2000	0.1500	0.4800
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E17 Corner (inverted - internal area greater than external area)	2.4900	0.0000	0.0000
E16 Corner (normal)	2.4900	0.1800	0.4482

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.5606 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 15.7763 (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	8.0642	7.7568	7.8593	7.4493	7.4493	6.9369	7.0394	7.2444	7.1419	7.3469	7.3469	7.7568	(38)
Heat transfer coeff													
	23.8406	23.5331	23.6356	23.2257	23.2257	22.7133	22.8157	23.0207	22.9182	23.1232	23.1232	23.5331	(39)
Average = Sum(39)m / 12 =												23.2257	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5131	0.5065	0.5087	0.4999	0.4999	0.4889	0.4911	0.4955	0.4933	0.4977	0.4977	0.5065	(40)
HLP (average)												0.4999	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.5866 (42)

Hot water usage for mixer showers

76.2330	75.0873	73.4179	70.2238	67.8666	65.2379	63.7438	65.4006	67.2167	70.0391	73.3018	75.9409	(42a)

Hot water usage for baths

21.9783	21.6519	21.1923	20.3448	19.7102	19.0065	18.6264	19.0828	19.5798	20.3328	21.1977	21.9040	(42b)

Hot water usage for other uses

30.8787	29.7558	28.6329	27.5101	26.3872	25.2644	25.2644	26.3872	27.5101	28.6329	29.7558	30.8787	(42c)

Average daily hot water use (litres/day)	118.7332 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	129.0900	126.4951	123.2432	118.0787	113.9640	109.5088	107.6345	110.8706	114.3066	119.0048	124.2554	128.7236	(44)
Energy conte	204.4470	180.1273	189.4201	161.6438	153.4175	134.6538	130.1746	137.2809	140.9514	161.4884	177.0246	201.5501	(45)
Energy content (annual)										Total = Sum(45)m =		1972.1795	
Distribution loss (46)m = 0.15 x (45)m													
	30.6670	27.0191	28.4130	24.2466	23.0126	20.1981	19.5262	20.5921	21.1427	24.2233	26.5537	30.2325	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090	(62)

WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090	(64)
									Total per year (kWh/year) = Sum(64)m =			2572.1795	(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													
	80.7183	71.3992	75.7219	66.0753	63.7510	57.1012	56.0228	58.3856	59.1951	66.4346	71.1894	79.7551	(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	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	95.1977	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	26.9884	23.9708	19.4944	14.7585	11.0322	9.3138	10.0639	13.0814	17.5579	22.2938	26.0201	27.7384	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	206.0467	208.1849	202.7969	191.3265	176.8471	163.2386	154.1473	152.0092	157.3972	168.8676	183.3469	196.9554	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	46.1064	(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)													
	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)
Water heating gains (Table 5)													
	108.4924	106.2488	101.7768	91.7713	85.6869	79.3072	75.2994	78.4753	82.2154	89.2938	98.8742	107.1977	(72)
Total internal gains													
	422.3665	419.2434	404.9070	378.6952	354.4051	329.6985	317.3496	321.4049	335.0094	361.2941	389.0802	412.7306	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	2.5200	49.2853	0.7200	0.7000	0.7700	43.3792	(78)

Solar gains	43.3792	63.6007	81.1667	95.6085	96.9633	100.4856	98.2733	96.8768	93.8799	74.8407	53.0522	38.4353	(83)
Total gains	465.7457	482.8441	486.0737	474.3037	451.3684	430.1841	415.6229	418.2817	428.8893	436.1349	442.1324	451.1659	(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	145.2207	147.1179	146.4800	149.0654	149.0654	152.4283	151.7437	150.3926	151.0651	149.7261	149.7261	147.1179	
alpha	10.6814	10.8079	10.7653	10.9377	10.9377	11.1619	11.1162	11.0262	11.0710	10.9817	10.9817	10.8079	
util living area													
	0.7829	0.7331	0.6399	0.5237	0.3911	0.2429	0.1372	0.1486	0.2886	0.4718	0.6617	0.7958	(86)
MIT	20.9821	20.9908	20.9977	20.9998	21.0000	21.0000	21.0000	21.0000	21.0000	20.9999	20.9973	20.9802	(87)
Th 2	20.5088	20.5149	20.5128	20.5209	20.5209	20.5310	20.5290	20.5250	20.5270	20.5229	20.5229	20.5149	(88)
util rest of house													
	0.7615	0.7115	0.6168	0.5004	0.3664	0.2181	0.1114	0.1225	0.2633	0.4465	0.6375	0.7748	(89)
MIT 2	20.4953	20.5081	20.5112	20.5208	20.5209	20.5310	20.5290	20.5250	20.5270	20.5229	20.5211	20.4998	(90)
Living area fraction										fLA = Living area / (4) =		0.8717	(91)
MIT	20.9197	20.9289	20.9353	20.9383	20.9385	20.9398	20.9396	20.9391	20.9393	20.9387	20.9362	20.9186	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.9197	20.9289	20.9353	20.9383	20.9385	20.9398	20.9396	20.9391	20.9393	20.9387	20.9362	20.9186	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.7794	0.7300	0.6369	0.5207	0.3879	0.2397	0.1339	0.1452	0.2853	0.4686	0.6585	0.7923	(94)
Useful gains	363.0127	352.4596	309.5562	246.9873	175.0841	103.1146	55.6608	60.7531	122.3677	204.3534	291.1331	357.4797	(95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000	(96)
Heat loss rate W													
	369.9975	356.0308	310.4601	247.0819	175.0875	103.1146	55.6608	60.7531	122.3678	204.3798	292.1889	365.2003	(97)
Space heating kWh													
	5.1967	2.3999	0.6725	0.0681	0.0025	0.0000	0.0000	0.0000	0.0000	0.0196	0.7602	5.7442	(98a)
Space heating requirement - total per year (kWh/year)												14.8637	
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													
	5.1967	2.3999	0.6725	0.0681	0.0025	0.0000	0.0000	0.0000	0.0000	0.0196	0.7602	5.7442	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												14.8637	
Space heating per m2											(98c) / (4) =	0.3199	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												84.5000	(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													
	5.1967	2.3999	0.6725	0.0681	0.0025	0.0000	0.0000	0.0000	0.0000	0.0196	0.7602	5.7442	(98)
Space heating efficiency (main heating system 1)													

	84.5000	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000 (210)
Space heating fuel (main heating system)												
	6.1500	2.8401	0.7959	0.0806	0.0030	0.0000	0.0000	0.0000	0.0000	0.0232	0.8996	6.7978 (211)
Space heating efficiency (main heating system 2)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement												
	255.4059	226.1547	240.3790	210.9589	204.3764	183.9689	181.1335	188.2398	190.2665	212.4473	226.3396	252.5090 (64)
Efficiency of water heater												89.5000 (216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000 (217)
Fuel for water heating, kWh/month												
	285.3697	252.6868	268.5799	235.7082	228.3535	205.5518	202.3838	210.3239	212.5883	237.3713	252.8934	282.1329 (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	14.0028	12.6477	14.0028	13.5511	14.0028	13.5511	14.0028	14.0028	13.5511	14.0028	13.5511	14.0028 (231)
Lighting	23.6228	18.9510	17.0633	12.5013	9.6564	7.8893	8.8089	11.4501	14.8726	19.5136	22.0406	24.2793 (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	17.5901 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	89.5000
Water heating fuel used	2873.9436 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)	
mechanical ventilation fans (SFP = 0.6050)	78.8719 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	164.8719 (231)
Electricity for lighting (calculated in Appendix L)	190.6491 (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	3247.0547 (238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	17.5901	6.1900	1.0888	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2873.9436	6.1900	177.8971	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	164.8719	25.1600	41.4818	(249)
Energy for lighting	190.6491	25.1600	47.9673	(250)
Additional standing charges			102.0000	(251)
Total energy cost			370.4350	(255)

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	17.5901	0.2100	3.6939	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2873.9436	0.2100	603.5281	(264)
Space and water heating			607.2221	(265)
Pumps, fans and electric keep-hot	164.8719	0.1387	22.8698	(267)
Energy for lighting	190.6491	0.1443	27.5166	(268)
Total CO2, kg/year			657.6084	(272)

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	17.5901	1.1300	19.8769	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2873.9436	1.1300	3247.5562	(278)
Space and water heating			3267.4331	(279)
Pumps, fans and electric keep-hot	164.8719	1.5128	249.4182	(281)
Energy for lighting	190.6491	1.5338	292.4240	(282)
Total Primary energy kWh/year			3809.2753	(286)

Full SAP Calculation Printout

Property Reference	Flat 6 Block A	**Issued on Date**	13/03/2024
Assessment Reference	Be Lean	**Prop Type Ref**	
Property	Flat 6 Block A, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	84 B	**DER**	13.19	**TER**	12.08
Environmental	90 B	**% DER < TER**			-9.19
CO_2 Emissions (t/year)	0.78	**DFEE**	21.96	**TFEE**	26.19
Compliance Check	See BREL	**% DFEE < TFEE**			16.15
% DPER < TPER	-20.22	**DPER**	76.61	**TPER**	63.72

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client	KGH, Kurt Gander - Howe		

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	62.8800	(1b)	x 2.3000	(2b) =	144.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	144.6240	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(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) =	81.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
External Wall 1	50.8300	6.9800	43.8500	0.1300	5.7005	70.0000	3069.5000	(29a)
sheltered	8.9700	2.1000	6.8700	0.1300	0.8931	70.0000	480.9000	(29a)
void above	4.3000		4.3000	0.1043	0.4483	9.0000	38.7000	(30)
flat balcony above	13.1100		13.1100	0.1100	1.4421	9.0000	117.9900	(30)
Total net area of external elements Aum(A, m2)			77.2100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4164			(33)
Party Wall 1			19.3200	0.0000	0.0000	180.0000	3477.6000	(32)
Party Floor 1			62.8800			30.0000	1886.4000	(32d)
Party Ceiling 1			49.7700			20.0000	995.4000	(32b)
Internal Wall 1			99.6800			9.0000	897.1200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 10963.6100	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	174.3577	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6500	0.0600	0.3390
E3 Sill	4.6500	0.0400	0.1860
E4 Jamb	19.2000	0.0200	0.3840
E7 Party floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	8.0000	0.2000	1.6000
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E16 Corner (normal)	2.4900	0.0500	0.1245
E16 Corner (normal)	2.4900	0.1800	0.4482
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.0000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	2.7000	0.1500	0.4050
E15 Flat roof with parapet	7.3000	0.3000	2.1900

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8719 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 26.2883 (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	11.6078	11.4691	11.3304	10.6369	10.4982	9.8047	9.8047	9.6660	10.0821	10.4982	10.7756	11.0530	(38)
Heat transfer coeff	37.8961	37.7574	37.6187	36.9252	36.7865	36.0930	36.0930	35.9543	36.3704	36.7865	37.0639	37.3413	(39)
Average = Sum(39)m / 12 =												36.8905	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6027	0.6005	0.5983	0.5872	0.5850	0.5740	0.5740	0.5718	0.5784	0.5850	0.5894	0.5939	(40)
HLP (average)												0.5867	
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 2.0618 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	88.1834	86.8581	84.9270	81.2322	78.5055	75.4647	73.7363	75.6528	77.7537	81.0185	84.7927	87.8455	(42a)
Hot water usage for baths	25.4044	25.0271	24.4958	23.5162	22.7826	21.9692	21.5299	22.0575	22.6319	23.5023	24.5021	25.3185	(42b)
Hot water usage for other uses	35.7447	34.4449	33.1451	31.8453	30.5455	29.2457	29.2457	30.5455	31.8453	33.1451	34.4449	35.7447	(42c)
Average daily hot water use (litres/day)												137.3512	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.3325	146.3301	142.5679	136.5936	131.8336	126.6796	124.5119	128.2558	132.2309	137.6659	143.7397	148.9087	(44)
Energy conte	236.5061	208.3722	219.1216	186.9899	177.4734	155.7674	150.5864	158.8075	163.0539	186.8114	204.7836	233.1551	(45)
Energy content (annual)										Total = Sum(45)m =		2281.4282	
Distribution loss (46)m = 0.15 x (45)m	35.4759	31.2558	32.8682	28.0485	26.6210	23.3651	22.5880	23.8211	24.4581	28.0217	30.7175	34.9733	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140	(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	287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140	(64)
										Total per year (kWh/year) = Sum(64)m =		2881.4282	(64)
12Total per year (kWh/year)												2881	(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	91.3780	80.7906	85.5976	74.5029	71.7496	64.1214	62.8097	65.5432	66.5442	74.8545	80.4193	90.2638	(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	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	102.5991	113.5918	102.5991	106.0191	102.5991	106.0191	102.5991	102.5991	106.0191	102.5991	106.0191	102.5991	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.1476	182.0169	177.3062	167.2776	154.6182	142.7202	134.7716	132.9023	137.6130	147.6416	160.3010	172.1990	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)
Water heating gains (Table 5)	122.8199	120.2241	115.0506	103.4762	96.4377	89.0575	84.4216	88.0957	92.4225	100.6109	111.6935	121.3223	(72)
Total internal gains	462.4933	472.7596	451.8826	433.6996	410.5817	391.7236	375.7191	377.5238	389.9813	407.7784	434.9403	453.0471	(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	4.3800	10.6334	0.7200	0.7000	0.7700	16.2671	(74)
South	2.6000	46.7521	0.7200	0.7000	0.7700	42.4559	(78)

Solar gains	58.7230	100.6190	141.3960	184.9548	218.6162	222.7518	212.3275	185.8912	156.0356	112.0019	70.3922	50.2468	(83)
Total gains	521.2163	573.3786	593.2786	618.6544	629.1979	614.4754	588.0466	563.4150	546.0169	519.7802	505.3325	503.2939	(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	80.3630	80.6582	80.9556	82.4761	82.7870	84.3778	84.3778	84.7033	83.7342	82.7870	82.1674	81.5570	
alpha	6.3575	6.3772	6.3970	6.4984	6.5191	6.6252	6.6252	6.6469	6.5823	6.5191	6.4778	6.4371	
util living area	0.9324	0.8883	0.8259	0.6957	0.5390	0.3756	0.2700	0.2935	0.4581	0.7068	0.8745	0.9406	(86)
MIT	20.6213	20.7458	20.8568	20.9575	20.9923	20.9994	20.9999	20.9999	20.9979	20.9606	20.8103	20.6020	(87)
Th 2	20.4276	20.4296	20.4316	20.4415	20.4435	20.4535	20.4535	20.4555	20.4495	20.4435	20.4395	20.4355	(88)
util rest of house	0.9225	0.8739	0.8058	0.6686	0.5080	0.3436	0.2365	0.2588	0.4221	0.6752	0.8566	0.9316	(89)
MIT 2	20.0914	20.2096	20.3127	20.4090	20.4383	20.4532	20.4534	20.4554	20.4483	20.4146	20.2803	20.0804	(90)
Living area fraction										fLA = Living area / (4) =		0.3639	(91)
MIT	20.2842	20.4047	20.5106	20.6086	20.6399	20.6519	20.6523	20.6535	20.6483	20.6133	20.4731	20.2702	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2842	20.4047	20.5106	20.6086	20.6399	20.6519	20.6523	20.6535	20.6483	20.6133	20.4731	20.2702	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9198	0.8733	0.8087	0.6768	0.5190	0.3552	0.2487	0.2714	0.4351	0.6850	0.8578	0.9288	(94)
Useful gains	479.4029	500.7080	479.7600	418.7298	326.5650	218.2832	146.2486	152.9139	237.5912	356.0630	433.4517	467.4370	(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	605.7411	585.4168	527.0627	432.3433	328.8679	218.4321	146.2595	152.9331	238.1627	368.3535	495.6610	600.0838	(97)
Space heating kWh	93.9956	56.9243	35.1932	9.8017	1.7134	0.0000	0.0000	0.0000	0.0000	9.1441	44.7907	98.6892	(98a)
Space heating requirement - total per year (kWh/year)												350.2523	
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	93.9956	56.9243	35.1932	9.8017	1.7134	0.0000	0.0000	0.0000	0.0000	9.1441	44.7907	98.6892	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												350.2523	
Space heating per m2										(98c) / (4) =		5.5702	(99)

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

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

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

Efficiency of main space heating system 1 (in %) 84.5000 (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	93.9956	56.9243	35.1932	9.8017	1.7134	0.0000	0.0000	0.0000	0.0000	9.1441	44.7907	98.6892	(98)
Space heating efficiency (main heating system 1)	84.5000	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000	(210)
Space heating fuel (main heating system)	111.2374	67.3661	41.6487	11.5997	2.0277	0.0000	0.0000	0.0000	0.0000	10.8215	53.0068	116.7919	(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	287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	321.1900	284.2453	301.7659	264.0279	255.2316	229.1424	225.1902	234.3758	237.2838	265.6651	283.9091	317.4458	(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	21.3155	19.2527	21.3155	20.6279	21.3155	20.6279	21.3155	21.3155	20.6279	21.3155	20.6279	21.3155	(231)
Lighting	26.7372	21.4495	19.3129	14.1495	10.9295	8.9295	9.9702	12.9597	16.8333	22.0863	24.9464	27.4803	(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 1 414.4997 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 89.5000

Water heating fuel used 3219.4729 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.7000, SFP = 0.9350)

mechanical ventilation fans (SFP = 0.9350) 164.9726 (230a)

central heating pump 41.0000 (230c)

main heating flue fan 45.0000 (230e)

Total electricity for the above, kWh/year	250.9726	(231)
Electricity for lighting (calculated in Appendix L)	215.7842	(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	4100.7294	(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	414.4997	0.2100	87.0449	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3219.4729	0.2100	676.0893	(264)
Space and water heating			763.1343	(265)
Pumps, fans and electric keep-hot	250.9726	0.1387	34.8130	(267)
Energy for lighting	215.7842	0.1443	31.1443	(268)
Total CO2, kg/year			829.0916	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.1900	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	414.4997	1.1300	468.3847	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3219.4729	1.1300	3638.0044	(278)
Space and water heating			4106.3891	(279)
Pumps, fans and electric keep-hot	250.9726	1.5128	379.6713	(281)
Energy for lighting	215.7842	1.5338	330.9770	(282)
Total Primary energy kWh/year			4817.0374	(286)
Dwelling Primary energy Rate (DPER)			76.6100	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.8800 (1b)	x	2.3000 (2b)	=	144.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	144.6240	(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) =	0.1383 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3883 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3009 (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	0.3837	0.3762	0.3686	0.3310	0.3235	0.2859	0.2859	0.2784	0.3009	0.3235	0.3385	0.3536	(22b)
Effective ac	0.5736	0.5707	0.5679	0.5548	0.5523	0.5409	0.5409	0.5387	0.5453	0.5523	0.5573	0.5625	(25)

3. Heat losses and heat loss parameter

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

	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
External Wall 1	50.8300	6.9800	43.8500	0.1800	7.8930			(29a)
sheltered	8.9700	2.1000	6.8700	0.1800	1.2366			(29a)
void above	4.3000		4.3000	0.1100	0.4730			(30)
flat balcony above	13.1100		13.1100	0.1100	1.4421			(30)
Total net area of external elements Aum(A, m2)			77.2100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.1371			(33)
Party Wall 1			19.3200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 182.2727 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6500	0.0500	0.2825
E3 Sill	4.6500	0.0500	0.2325
E4 Jamb	19.2000	0.0500	0.9600
E7 Party floor between dwellings (in blocks of flats)	16.0000	0.0700	1.1200
E7 Party floor between dwellings (in blocks of flats)	8.0000	0.0700	0.5600
E18 Party wall between dwellings	4.9800	0.0600	0.2988
E16 Corner (normal)	2.4900	0.0900	0.2241
E16 Corner (normal)	2.4900	0.0900	0.2241
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.0000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	2.7000	0.0400	0.1080
E15 Flat roof with parapet	7.3000	0.5600	4.0880

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.0980 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 29.2351 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.3758	27.2394	27.1057	26.4777	26.3602	25.8132	25.8132	25.7119	26.0239	26.3602	26.5979	26.8464	(38)
Heat transfer coeff	56.6109	56.4745	56.3408	55.7127	55.5952	55.0483	55.0483	54.9470	55.2589	55.5952	55.8329	56.0815	(39)
Average = Sum(39)m / 12 =												55.7122	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9003	0.8981	0.8960	0.8860	0.8841	0.8754	0.8754	0.8738	0.8788	0.8841	0.8879	0.8919	(40)
HLP (average)												0.8860	
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 2.0618 (42)

Hot water usage for mixer showers

58.7889	57.9054	56.6180	54.1548	52.3370	50.3098	49.1576	50.4352	51.8358	54.0124	56.5285	58.5637	(42a)

Hot water usage for baths

25.4044	25.0271	24.4958	23.5162	22.7826	21.9692	21.5299	22.0575	22.6319	23.5023	24.5021	25.3185	(42b)

Hot water usage for other uses

35.7447	34.4449	33.1451	31.8453	30.5455	29.2457	29.2457	30.5455	31.8453	33.1451	34.4449	35.7447	(42c)

Average daily hot water use (litres/day) 110.2505 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	119.9380	117.3774	114.2589	109.5162	105.6651	101.5247	99.9331	103.0382	106.3130	110.6597	115.4755	119.6269	(44)
Energy conte	189.9525	167.1439	175.6117	149.9223	142.2455	124.8365	120.8605	127.5828	131.0946	150.1642	164.5160	187.3068	(45)
Energy content (annual)										Total = Sum(45)m =		1831.2372	
Distribution loss (46)m = 0.15 x (45)m	28.4929	25.0716	26.3418	22.4883	21.3368	18.7255	18.1291	19.1374	19.6642	22.5246	24.6774	28.0960	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9248	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	240.9114	213.1713	226.5706	199.2373	193.2044	174.1516	171.7853	178.5417	180.4096	201.1231	213.8311	238.2657	(62)
WWHRS	-26.8758	-23.7692	-24.8897	-20.6097	-19.2075	-16.4360	-15.4061	-16.3829	-17.0053	-20.0474	-22.7113	-26.3781	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.0356	189.4021	201.6808	178.6276	173.9970	157.7156	156.3792	162.1588	163.4043	181.0757	191.1198	211.8876	(64)
										Total per year (kWh/year) = Sum(64)m =		2181.4841	(64)
12Total per year (kWh/year)												2181	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	75.8989	67.0822	71.1306	62.1779	60.0364	53.8369	52.9173	55.1610	55.9177	62.6693	67.0303	75.0192	(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	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	102.5991	113.5918	102.5991	106.0191	102.5991	106.0191	102.5991	102.5991	106.0191	102.5991	106.0191	102.5991	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.1476	182.0169	177.3062	167.2776	154.6182	142.7202	134.7716	132.9023	137.6130	147.6416	160.3010	172.1990	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)
Water heating gains (Table 5)	102.0147	99.8247	95.6057	86.3582	80.6940	74.7735	71.1254	74.1411	77.6635	84.2330	93.0977	100.8323	(72)
Total internal gains	441.6881	452.3602	432.4377	416.5816	394.8381	377.4395	362.4229	363.5692	375.2223	391.4004	416.3445	432.5571	(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	4.3800	10.6334	0.6300	0.7000	0.7700	14.2337	(74)
South	2.6000	46.7521	0.6300	0.7000	0.7700	37.1489	(78)

Solar gains	51.3826	88.0417	123.7215	161.8355	191.2892	194.9078	185.7865	162.6548	136.5311	98.0016	61.5932	43.9660	(83)
Total gains	493.0707	540.4018	556.1591	578.4171	586.1273	572.3473	548.2094	526.2240	511.7534	489.4021	477.9377	476.5231	(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	56.2383	56.3741	56.5079	57.1449	57.2656	57.8347	57.8347	57.9413	57.6141	57.2656	57.0218	56.7692	
alpha	4.7492	4.7583	4.7672	4.8097	4.8177	4.8556	4.8556	4.8628	4.8409	4.8177	4.8015	4.7846	
util living area	0.9777	0.9641	0.9427	0.8846	0.7724	0.5917	0.4371	0.4732	0.6894	0.8892	0.9601	0.9807	(86)
MIT	19.9332	20.1055	20.3254	20.6246	20.8513	20.9684	20.9940	20.9913	20.9340	20.6694	20.2674	19.9043	(87)
Th 2	20.1672	20.1691	20.1709	20.1794	20.1810	20.1884	20.1884	20.1898	20.1856	20.1810	20.1778	20.1744	(88)
util rest of house	0.9730	0.9567	0.9305	0.8603	0.7276	0.5250	0.3587	0.3931	0.6248	0.8612	0.9506	0.9766	(89)
MIT 2	18.9307	19.1482	19.4234	19.7916	20.0475	20.1671	20.1858	20.1857	20.1365	19.8512	19.3603	18.8997	(90)
Living area fraction									fLA = Living area / (4) =			0.3639	(91)
MIT	19.2955	19.4965	19.7516	20.0947	20.3400	20.4587	20.4799	20.4788	20.4267	20.1489	19.6903	19.2652	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2955	19.4965	19.7516	20.0947	20.3400	20.4587	20.4799	20.4788	20.4267	20.1489	19.6903	19.2652	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9668	0.9494	0.9233	0.8575	0.7369	0.5478	0.3871	0.4220	0.6448	0.8600	0.9438	0.9708	(94)
Useful gains	476.6927	513.0371	513.5048	495.9973	431.8917	313.5088	212.2336	222.0765	329.9732	420.8696	451.0769	462.6017	(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	848.9063	824.3310	746.6070	623.6869	480.3413	322.5097	213.5797	224.1172	349.6056	530.8730	702.9560	844.8809	(97)
Space heating kWh	276.9269	209.1895	173.4280	91.9365	36.0465	0.0000	0.0000	0.0000	0.0000	81.8426	181.3530	284.4157	(98a)
Space heating requirement - total per year (kWh/year)												1335.1387	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	276.9269	209.1895	173.4280	91.9365	36.0465	0.0000	0.0000	0.0000	0.0000	81.8426	181.3530	284.4157	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1335.1387	
Space heating per m2											(98c) / (4) =	21.2331	(99)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	276.9269	209.1895	173.4280	91.9365	36.0465	0.0000	0.0000	0.0000	0.0000	81.8426	181.3530	284.4157	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	299.7045	226.3955	187.6927	99.4984	39.0114	0.0000	0.0000	0.0000	0.0000	88.5742	196.2694	307.8092	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	214.0356	189.4021	201.6808	178.6276	173.9970	157.7156	156.3792	162.1588	163.4043	181.0757	191.1198	211.8876	(64)
Efficiency of water heater												80.3000	(216)
(217)m	84.9344	84.5949	84.0596	83.0293	81.6556	80.3000	80.3000	80.3000	80.3000	82.7932	84.2691	85.0129	(217)
Fuel for water heating, kWh/month	252.0009	223.8930	239.9259	215.1382	213.0863	196.4080	194.7437	201.9413	203.4923	218.7086	226.7969	249.2417	(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	21.3181	17.1021	15.3986	11.2817	8.7143	7.1196	7.9495	10.3330	13.4216	17.6098	19.8902	21.9106	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.5161	-31.3720	-46.6171	-54.2447	-60.0863	-56.6792	-56.0130	-52.1170	-45.4723	-36.7220	-24.0315	-18.4847	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.1734	-19.5827	-39.4528	-60.0298	-80.1223	-80.7625	-79.7845	-67.1827	-48.7761	-28.2263	-12.3207	-7.2307	(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	1444.9553	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2635.3767	(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)	172.0490	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1036.0005	(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	3302.3805	(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	1444.9553	0.2100	303.4406	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2635.3767	0.2100	553.4291	(264)
Space and water heating			856.8697	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	172.0490	0.1443	24.8320	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-503.3560	0.1339	-67.3871	
PV Unit electricity exported	-532.6445	0.1255	-66.8595	
Total			-134.2466	(269)
Total CO2, kg/year			759.3844	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.0800	(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	1444.9553	1.1300	1632.7995	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2635.3767	1.1300	2977.9757	(278)
Space and water heating			4610.7752	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	172.0490	1.5338	263.8945	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-503.3560	1.4947	-752.3870	
PV Unit electricity exported	-532.6445	0.4607	-245.4113	
Total			-997.7983	(283)
Total Primary energy kWh/year			4006.9722	(286)
Target Primary Energy Rate (TPER)			63.7200	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		62.8800 (1b)	x	2.3000 (2b)	=	144.6240 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	144.6240	(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	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) =	0.1383	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2883	(18)
Number of sides sheltered		3	(19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2234 (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	0.2849	0.2793	0.2737	0.2458	0.2402	0.2123	0.2123	0.2067	0.2234	0.2402	0.2514	0.2625	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5406	0.5390	0.5375	0.5302	0.5288	0.5225	0.5225	0.5214	0.5250	0.5288	0.5316	0.5345	(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	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
External Wall 1	50.8300	6.9800	43.8500	0.1300	5.7005	70.0000	3069.5000	(29a)
sheltered	8.9700	2.1000	6.8700	0.1300	0.8931	70.0000	480.9000	(29a)
void above	4.3000		4.3000	0.1043	0.4483	9.0000	38.7000	(30)
flat balcony above	13.1100		13.1100	0.1100	1.4421	9.0000	117.9900	(30)
Total net area of external elements Aum(A, m2)			77.2100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4164			(33)
Party Wall 1			19.3200	0.0000	0.0000	180.0000	3477.6000	(32)
Party Floor 1			62.8800			30.0000	1886.4000	(32d)
Party Ceiling 1			49.7700			30.0000	1493.1000	(32b)
Internal Wall 1			99.6800			9.0000	897.1200	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11461.3100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 182.2727 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6500	0.0600	0.3390
E3 Sill	4.6500	0.0400	0.1860
E4 Jamb	19.2000	0.0200	0.3840
E7 Party floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	8.0000	0.2000	1.6000
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E16 Corner (normal)	2.4900	0.0500	0.1245
E16 Corner (normal)	2.4900	0.1800	0.4482
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.0000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	2.7000	0.1500	0.4050
E15 Flat roof with parapet	7.3000	0.3000	2.1900

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8719 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 26.2883 (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	25.7994	25.7242	25.6505	25.3043	25.2395	24.9380	24.9380	24.8822	25.0542	25.2395	25.3706	25.5076	(38)
Heat transfer coeff	52.0877	52.0125	51.9388	51.5926	51.5279	51.2263	51.2263	51.1705	51.3425	51.5279	51.6589	51.7959	(39)

Average = Sum(39)m / 12 = 51.5923

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8284	0.8272	0.8260	0.8205	0.8195	0.8147	0.8147	0.8138	0.8165	0.8195	0.8215	0.8237	(40)
HLP (average)												0.8205	
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 2.0618 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

25.4044	25.0271	24.4958	23.5162	22.7826	21.9692	21.5299	22.0575	22.6319	23.5023	24.5021	25.3185	(42b)

Hot water usage for other uses

35.7447	34.4449	33.1451	31.8453	30.5455	29.2457	29.2457	30.5455	31.8453	33.1451	34.4449	35.7447	(42c)

Average daily hot water use (litres/day) 56.0491 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	61.1491	59.4720	57.6409	55.3614	53.3281	51.2149	50.7756	52.6030	54.4772	56.6474	58.9470	61.0632	(44)
Energy conte	96.8452	84.6873	88.5919	75.7871	71.7899	62.9747	61.4087	65.1335	67.1759	76.8700	83.9808	95.6102	(45)

Energy content (annual) Total = Sum(45)m = 930.8551
Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 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

82.3184	71.9842	75.3031	64.4190	61.0214	53.5285	52.1974	55.3635	57.0995	65.3395	71.3837	81.2687	(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

82.3184	71.9842	75.3031	64.4190	61.0214	53.5285	52.1974	55.3635	57.0995	65.3395	71.3837	81.2687	(64)

Total per year (kWh/year) = Sum(64)m = 791.2268 (64)
12Total per year (kWh/year) 791 (64)
Electric shower(s)

47.0801	41.9488	45.8065	43.7125	44.5328	42.4800	43.8960	44.5328	43.7125	45.8065	44.9451	47.0801	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 535.5336 (64a)
Heat gains from water heating, kWh/month

32.3496	28.4833	30.2774	27.0329	26.3885	24.0021	24.0233	24.9741	25.2030	27.7865	29.0822	32.0872	(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	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	102.5991	113.5918	102.5991	106.0191	102.5991	106.0191	102.5991	102.5991	106.0191	102.5991	106.0191	102.5991	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	180.1476	182.0169	177.3062	167.2776	154.6182	142.7202	134.7716	132.9023	137.6130	147.6416	160.3010	172.1990	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)
Water heating gains (Table 5)													
	43.4807	42.3858	40.6954	37.5457	35.4685	33.3363	32.2894	33.5673	35.0042	37.3474	40.3919	43.1280	(72)
Total internal gains													
	380.1541	391.9213	374.5274	364.7690	346.6125	336.0023	323.5869	322.9954	332.5630	341.5149	360.6387	371.8528	(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	4.3800	10.6334	0.7200	0.7000	0.7700	16.2671	(74)
South	2.6000	46.7521	0.7200	0.7000	0.7700	42.4559	(78)

Solar gains	58.7230	100.6190	141.3960	184.9548	218.6162	222.7518	212.3275	185.8912	156.0356	112.0019	70.3922	50.2468	(83)
Total gains	438.8770	492.5403	515.9234	549.7239	565.2287	558.7541	535.9144	508.8866	488.5986	453.5167	431.0310	422.0996	(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	61.1218	61.2102	61.2971	61.7084	61.7859	62.1496	62.1496	62.2174	62.0090	61.7859	61.6292	61.4662	
alpha	5.0748	5.0807	5.0865	5.1139	5.1191	5.1433	5.1433	5.1478	5.1339	5.1191	5.1086	5.0977	
util living area													
	0.9844	0.9711	0.9489	0.8847	0.7607	0.5705	0.4177	0.4578	0.6806	0.8978	0.9692	0.9870	(86)
MIT	19.9736	20.1579	20.3818	20.6760	20.8843	20.9787	20.9964	20.9943	20.9489	20.6975	20.2948	19.9355	(87)
Th 2	20.2288	20.2298	20.2309	20.2356	20.2365	20.2406	20.2406	20.2414	20.2390	20.2365	20.2347	20.2328	(88)
util rest of house													
	0.9810	0.9651	0.9381	0.8612	0.7173	0.5086	0.3470	0.3845	0.6192	0.8720	0.9617	0.9841	(89)
MIT 2	19.2931	19.4748	19.6933	19.9739	20.1556	20.2294	20.2394	20.2393	20.2093	19.9990	19.6148	19.2588	(90)
Living area fraction										fLA = Living area / (4) =		0.3639	(91)
MIT	19.5407	19.7234	19.9438	20.2294	20.4207	20.5020	20.5148	20.5140	20.4784	20.2532	19.8622	19.5050	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5407	19.7234	19.9438	20.2294	20.4207	20.5020	20.5148	20.5140	20.4784	20.2532	19.8622	19.5050	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9773	0.9603	0.9334	0.8610	0.7282	0.5303	0.3727	0.4111	0.6393	0.8726	0.9573	0.9808	(94)
Useful gains	428.9095	473.0045	481.5776	473.3034	411.6227	296.3074	199.7411	209.1981	312.3383	395.7594	412.6381	413.9841	(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													
	793.8554	771.0003	698.2565	584.5129	449.3593	302.3394	200.5429	210.5163	327.4849	497.4088	659.2815	792.7372	(97)
Space heating kWh													
	271.5198	200.2532	161.2091	80.0708	28.0761	0.0000	0.0000	0.0000	0.0000	75.6271	177.5832	281.7923	(98a)
Space heating requirement - total per year (kWh/year)												1276.1316	
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													
	271.5198	200.2532	161.2091	80.0708	28.0761	0.0000	0.0000	0.0000	0.0000	75.6271	177.5832	281.7923	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1276.1316	
Space heating per m2											(98c) / (4) =	20.2947	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	481.5275	379.0748	388.8957	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9169	0.9586	0.9451	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	441.5291	363.3760	367.5360	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	606.3559	581.9842	552.4809	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	118.6753	162.6445	137.5990	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	29.6688	40.6611	34.3997	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												104.7297	(107)
Energy for space heating												20.2947	(99)
Energy for space cooling												1.6655	(108)
Total												21.9603	(109)
Fabric Energy Efficiency (DFEE)												22.0	(109)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.8800	(1b)	x 2.3000	(2b) =	144.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		144.6240	(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) =	0.1383 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3883 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3009 (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	0.3837	0.3762	0.3686	0.3310	0.3235	0.2859	0.2859	0.2784	0.3009	0.3235	0.3385	0.3536	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5736	0.5707	0.5679	0.5548	0.5523	0.5409	0.5409	0.5387	0.5453	0.5523	0.5573	0.5625	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
External Wall 1	50.8300	6.9800	43.8500	0.1800	7.8930			(29a)
sheltered	8.9700	2.1000	6.8700	0.1800	1.2366			(29a)
void above	4.3000		4.3000	0.1100	0.4730			(30)
flat balcony above	13.1100		13.1100	0.1100	1.4421			(30)
Total net area of external elements Aum(A, m2)			77.2100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.1371			(33)
Party Wall 1			19.3200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	182.2727	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6500	0.0500	0.2825
E3 Sill	4.6500	0.0500	0.2325
E4 Jamb	19.2000	0.0500	0.9600
E7 Party floor between dwellings (in blocks of flats)	16.0000	0.0700	1.1200
E7 Party floor between dwellings (in blocks of flats)	8.0000	0.0700	0.5600
E18 Party wall between dwellings	4.9800	0.0600	0.2988
E16 Corner (normal)	2.4900	0.0900	0.2241
E16 Corner (normal)	2.4900	0.0900	0.2241
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.0000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	2.7000	0.0400	0.1080
E15 Flat roof with parapet	7.3000	0.5600	4.0880

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.0980	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	29.2351	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.3758	27.2394	27.1057	26.4777	26.3602	25.8132	25.8132	25.7119	26.0239	26.3602	26.5979	26.8464	(38)
Heat transfer coeff	56.6109	56.4745	56.3408	55.7127	55.5952	55.0483	55.0483	54.9470	55.2589	55.5952	55.8329	56.0815	(39)
Average = Sum(39)m / 12 =												55.7122	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9003	0.8981	0.8960	0.8860	0.8841	0.8754	0.8754	0.8738	0.8788	0.8841	0.8879	0.8919	(40)
HLP (average)												0.8860	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0618	(42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	25.4044	25.0271	24.4958	23.5162	22.7826	21.9692	21.5299	22.0575	22.6319	23.5023	24.5021	25.3185	(42b)
Hot water usage for other uses													
	35.7447	34.4449	33.1451	31.8453	30.5455	29.2457	29.2457	30.5455	31.8453	33.1451	34.4449	35.7447	(42c)
Average daily hot water use (litres/day)												56.0491	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	61.1491	59.4720	57.6409	55.3614	53.3281	51.2149	50.7756	52.6030	54.4772	56.6474	58.9470	61.0632	(44)
Energy conte	96.8452	84.6873	88.5919	75.7871	71.7899	62.9747	61.4087	65.1335	67.1759	76.8700	83.9808	95.6102	(45)
Energy content (annual)										Total = Sum(45)m =		930.8551	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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													
	82.3184	71.9842	75.3031	64.4190	61.0214	53.5285	52.1974	55.3635	57.0995	65.3395	71.3837	81.2687	(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													
	82.3184	71.9842	75.3031	64.4190	61.0214	53.5285	52.1974	55.3635	57.0995	65.3395	71.3837	81.2687	(64)
									Total per year (kWh/year) = Sum(64)m =			791.2268	(64)
12Total per year (kWh/year)												791	(64)
Electric shower(s)													
	47.0801	41.9488	45.8065	43.7125	44.5328	42.4800	43.8960	44.5328	43.7125	45.8065	44.9451	47.0801	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							535.5336	(64a)
Heat gains from water heating, kWh/month													
	32.3496	28.4833	30.2774	27.0329	26.3885	24.0021	24.0233	24.9741	25.2030	27.7865	29.0822	32.0872	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	102.5991	113.5918	102.5991	106.0191	102.5991	106.0191	102.5991	102.5991	106.0191	102.5991	106.0191	102.5991	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	180.1476	182.0169	177.3062	167.2776	154.6182	142.7202	134.7716	132.9023	137.6130	147.6416	160.3010	172.1990	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)
Water heating gains (Table 5)													
	43.4807	42.3858	40.6954	37.5457	35.4685	33.3363	32.2894	33.5673	35.0042	37.3474	40.3919	43.1280	(72)
Total internal gains													
	380.1541	391.9213	374.5274	364.7690	346.6125	336.0023	323.5869	322.9954	332.5630	341.5149	360.6387	371.8528	(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	4.3800	10.6334	0.6300	0.7000	0.7700	14.2337	(74)
South	2.6000	46.7521	0.6300	0.7000	0.7700	37.1489	(78)

Solar gains	51.3826	88.0417	123.7215	161.8355	191.2892	194.9078	185.7865	162.6548	136.5311	98.0016	61.5932	43.9660	(83)
Total gains	431.5367	479.9630	498.2489	526.6045	537.9017	530.9101	509.3734	485.6502	469.0941	439.5165	422.2319	415.8187	(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	56.2383	56.3741	56.5079	57.1449	57.2656	57.8347	57.8347	57.9413	57.6141	57.2656	57.0218	56.7692	
alpha	4.7492	4.7583	4.7672	4.8097	4.8177	4.8556	4.8556	4.8628	4.8409	4.8177	4.8015	4.7846	
util living area													
	0.9867	0.9768	0.9608	0.9124	0.8113	0.6301	0.4687	0.5098	0.7333	0.9197	0.9747	0.9887	(86)
MIT	19.8036	19.9854	20.2204	20.5525	20.8136	20.9588	20.9919	20.9880	20.9137	20.5978	20.1581	19.7747	(87)
Th 2	20.1672	20.1691	20.1709	20.1794	20.1810	20.1884	20.1884	20.1898	20.1856	20.1810	20.1778	20.1744	(88)
util rest of house													
	0.9838	0.9717	0.9518	0.8921	0.7694	0.5615	0.3854	0.4248	0.6696	0.8971	0.9683	0.9862	(89)
MIT 2	19.0764	19.2569	19.4886	19.8129	20.0478	20.1663	20.1856	20.1853	20.1342	19.8611	19.4356	19.0535	(90)
Living area fraction									fLA = Living area / (4) =			0.3639	(91)
MIT	19.3410	19.5220	19.7549	20.0820	20.3264	20.4547	20.4790	20.4774	20.4178	20.1292	19.6985	19.3159	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3410	19.5220	19.7549	20.0820	20.3264	20.4547	20.4790	20.4774	20.4178	20.1292	19.6985	19.3159	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9800	0.9669	0.9465	0.8894	0.7774	0.5847	0.4156	0.4555	0.6888	0.8955	0.9636	0.9829	(94)
Useful gains	422.9252	464.0624	471.5758	468.3676	418.1732	310.4317	211.7002	221.2044	323.1185	393.5657	406.8812	408.6897	(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

851.4847	825.7696	746.7902	622.9814	479.5887	322.2897	213.5317	224.0387	349.1173	529.7768	703.4104	847.7224	(97)

Space heating kWh

318.8483	243.0673	204.7595	111.3220	45.6931	0.0000	0.0000	0.0000	0.0000	101.3411	213.5011	326.6403	(98a)

Space heating requirement - total per year (kWh/year) 1565.1726

Solar heating kWh

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

318.8483	243.0673	204.7595	111.3220	45.6931	0.0000	0.0000	0.0000	0.0000	101.3411	213.5011	326.6403	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 1565.1726

Space heating per m2 (98c) / (4) = 24.8914 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	517.4536	407.3571	417.5969	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8691	0.9275	0.9092	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	449.7088	377.8128	379.6654	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	573.8110	550.9623	525.3214	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	89.3536	128.8232	108.3681	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction											fC = cooled area / (4) =	1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	22.3384	32.2058	27.0920	0.0000	0.0000	0.0000	0.0000	(107)

Space cooling requirement 81.6362 (107)
Energy for space heating 24.8914 (99)
Energy for space cooling 1.2983 (108)
Total 26.1897 (109)
Fabric Energy Efficiency (TFEE) 26.2 (109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.8800	(1b)	x 2.3000	(2b) =	144.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		144.6240	(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		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (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													
	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(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) = 81.0000 (23c)

Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316	(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

front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
External Wall 1	50.8300	6.9800	43.8500	0.1300	5.7005	70.0000	3069.5000	(29a)
sheltered	8.9700	2.1000	6.8700	0.1300	0.8931	70.0000	480.9000	(29a)
void above	4.3000		4.3000	0.1043	0.4483	9.0000	38.7000	(30)
flat balcony above	13.1100		13.1100	0.1100	1.4421	9.0000	117.9900	(30)
Total net area of external elements Aum(A, m2)			77.2100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4164			(33)
Party Wall 1			19.3200	0.0000	0.0000	180.0000	3477.6000	(32)
Party Floor 1			62.8800			30.0000	1886.4000	(32d)
Party Ceiling 1			49.7700			30.0000	1493.1000	(32b)
Internal Wall 1			99.6800			9.0000	897.1200	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11461.3100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 182.2727 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6500	0.0600	0.3390
E3 Sill	4.6500	0.0400	0.1860
E4 Jamb	19.2000	0.0200	0.3840
E7 Party floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	8.0000	0.2000	1.6000
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E16 Corner (normal)	2.4900	0.0500	0.1245
E16 Corner (normal)	2.4900	0.1800	0.4482
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.0000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	2.7000	0.1500	0.4050
E15 Flat roof with parapet	7.3000	0.3000	2.1900

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8719 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 26.2883 (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	11.6078	11.4691	11.3304	10.6369	10.4982	9.8047	9.8047	9.6660	10.0821	10.4982	10.7756	11.0530	(38)
Heat transfer coeff	37.8961	37.7574	37.6187	36.9252	36.7865	36.0930	36.0930	35.9543	36.3704	36.7865	37.0639	37.3413	(39)
Average = Sum(39)m / 12 =												36.8905	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6027	0.6005	0.5983	0.5872	0.5850	0.5740	0.5740	0.5718	0.5784	0.5850	0.5894	0.5939	(40)
HLP (average)												0.5867	
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 2.0618 (42)
Hot water usage for mixer showers

88.1834	86.8581	84.9270	81.2322	78.5055	75.4647	73.7363	75.6528	77.7537	81.0185	84.7927	87.8455	(42a)

Hot water usage for baths

25.4044	25.0271	24.4958	23.5162	22.7826	21.9692	21.5299	22.0575	22.6319	23.5023	24.5021	25.3185	(42b)

Hot water usage for other uses

35.7447	34.4449	33.1451	31.8453	30.5455	29.2457	29.2457	30.5455	31.8453	33.1451	34.4449	35.7447	(42c)

Average daily hot water use (litres/day) 137.3512 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.3325	146.3301	142.5679	136.5936	131.8336	126.6796	124.5119	128.2558	132.2309	137.6659	143.7397	148.9087	(44)
Energy conte	236.5061	208.3722	219.1216	186.9899	177.4734	155.7674	150.5864	158.8075	163.0539	186.8114	204.7836	233.1551	(45)
Energy content (annual)										Total = Sum(45)m =		2281.4282	
Distribution loss (46)m = 0.15 x (45)m	35.4759	31.2558	32.8682	28.0485	26.6210	23.3651	22.5880	23.8211	24.4581	28.0217	30.7175	34.9733	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140	(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	287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140	(64)
										Total per year (kWh/year) = Sum(64)m =		2881.4282	(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	91.3780	80.7906	85.5976	74.5029	71.7496	64.1214	62.8097	65.5432	66.5442	74.8545	80.4193	90.2638	(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	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.5465	27.1311	22.0645	16.7043	12.4866	10.5417	11.3907	14.8061	19.8727	25.2329	29.4506	31.3955	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	268.8769	271.6670	264.6361	249.6680	230.7735	213.0153	201.1517	198.3616	205.3926	220.3607	239.2552	257.0134	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)
Water heating gains (Table 5)	122.8199	120.2241	115.0506	103.4762	96.4377	89.0575	84.4216	88.0957	92.4225	100.6109	111.6935	121.3223	(72)
Total internal gains	515.9115	512.6904	495.4193	463.5166	433.3659	403.2827	387.6322	391.9315	408.3559	439.8726	474.0674	503.3993	(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	4.3800	10.6334	0.7200	0.7000	0.7700	16.2671	(74)
South	2.6000	46.7521	0.7200	0.7000	0.7700	42.4559	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	58.7230	100.6190	141.3960	184.9548	218.6162	222.7518	212.3275	185.8912	156.0356	112.0019	70.3922	50.2468	(83)
Total gains	574.6344	613.3094	636.8153	648.4715	651.9821	626.0345	599.9597	577.8227	564.3915	551.8745	544.4596	553.6461	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	84.0111	84.3197	84.6306	86.2201	86.5452	88.2082	88.2082	88.5484	87.5354	86.5452	85.8975	85.2593	
alpha	6.6007	6.6213	6.6420	6.7480	6.7697	6.8805	6.8805	6.9032	6.8357	6.7697	6.7265	6.6840	
util living area	0.9064	0.8649	0.7932	0.6706	0.5215	0.3687	0.2647	0.2862	0.4437	0.6743	0.8453	0.9174	(86)
MIT	20.7217	20.8075	20.8997	20.9703	20.9948	20.9996	21.0000	20.9999	20.9986	20.9740	20.8630	20.7026	(87)
Th 2	20.4276	20.4296	20.4316	20.4415	20.4435	20.4535	20.4535	20.4555	20.4495	20.4435	20.4395	20.4355	(88)
util rest of house	0.8936	0.8485	0.7714	0.6434	0.4912	0.3373	0.2318	0.2523	0.4086	0.6426	0.8250	0.9058	(89)
MIT 2	20.1849	20.2655	20.3499	20.4192	20.4401	20.4533	20.4534	20.4554	20.4487	20.4249	20.3267	20.1746	(90)
Living area fraction										fLA = Living area / (4) =		0.3639	(91)
MIT	20.3802	20.4627	20.5499	20.6197	20.6419	20.6521	20.6523	20.6536	20.6488	20.6247	20.5219	20.3668	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3802	20.4627	20.5499	20.6197	20.6419	20.6521	20.6523	20.6536	20.6488	20.6247	20.5219	20.3668	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8925	0.8495	0.7761	0.6522	0.5021	0.3488	0.2438	0.2647	0.4213	0.6531	0.8281	0.9043	(94)
Useful gains	512.8533	520.9870	494.2155	422.9290	327.3468	218.3355	146.2533	152.9223	237.8042	360.4214	450.8740	500.6531	(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	609.3788	587.6091	528.5402	432.7529	328.9423	218.4370	146.2600	152.9339	238.1828	368.7723	497.4666	603.6884	(97)
Space heating kWh	71.8150	44.7701	25.5376	7.0732	1.1871	0.0000	0.0000	0.0000	0.0000	6.2130	33.5467	76.6583	(98a)
Space heating requirement - total per year (kWh/year)												266.8008	
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	71.8150	44.7701	25.5376	7.0732	1.1871	0.0000	0.0000	0.0000	0.0000	6.2130	33.5467	76.6583	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												266.8008	
Space heating per m2										(98c) / (4) =		4.2430	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	84.5000	(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	71.8150	44.7701	25.5376	7.0732	1.1871	0.0000	0.0000	0.0000	0.0000	6.2130	33.5467	76.6583	(98)
Space heating efficiency (main heating system 1)	84.5000	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000	(210)
Space heating fuel (main heating system)	84.9881	52.9823	30.2220	8.3707	1.4048	0.0000	0.0000	0.0000	0.0000	7.3527	39.7002	90.7198	(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	287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	321.1900	284.2453	301.7659	264.0279	255.2316	229.1424	225.1902	234.3758	237.2838	265.6651	283.9091	317.4458	(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	21.3155	19.2527	21.3155	20.6279	21.3155	20.6279	21.3155	21.3155	20.6279	21.3155	20.6279	21.3155	(231)
Lighting	26.7372	21.4495	19.3129	14.1495	10.9295	8.9295	9.9702	12.9597	16.8333	22.0863	24.9464	27.4803	(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	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	315.7406	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	3219.4729	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.7000, SFP = 0.9350)		
mechanical ventilation fans (SFP = 0.9350)	164.9726	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	250.9726	(231)
Electricity for lighting (calculated in Appendix L)	215.7842	(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	4001.9703	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	315.7406	3.6400	11.4930	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3219.4729	3.6400	117.1888	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	250.9726	16.4900	41.3854	(249)
Energy for lighting	215.7842	16.4900	35.5828	(250)
Additional standing charges			92.0000	(251)
Total energy cost			297.6500	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9933	(257)
SAP value		83.8991	
SAP rating (Section 12)		84	(258)
SAP band		B	

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	315.7406	0.2100	66.3055	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3219.4729	0.2100	676.0893	(264)
Space and water heating			742.3948	(265)
Pumps, fans and electric keep-hot	250.9726	0.1387	34.8130	(267)
Energy for lighting	215.7842	0.1443	31.1443	(268)
Total CO2, kg/year			808.3522	(272)
CO2 emissions per m2			12.8600	(273)
EI value			89.9593	
EI rating			90	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		62.8800 (1b)	x	2.3000 (2b)	=	144.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	144.6240	(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		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000	(22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750	(22a)
Adj infilt rate	0.1337	0.1250	0.1279	0.1162	0.1162	0.1017	0.1046	0.1104	0.1075	0.1133	0.1133	0.1250	(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) =	81.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2287	0.2200	0.2229	0.2112	0.2112	0.1967	0.1996	0.2054	0.2025	0.2083	0.2083	0.2200	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
External Wall 1	50.8300	6.9800	43.8500	0.1300	5.7005	70.0000	3069.5000	(29a)
sheltered	8.9700	2.1000	6.8700	0.1300	0.8931	70.0000	480.9000	(29a)
void above	4.3000		4.3000	0.1043	0.4483	9.0000	38.7000	(30)
flat balcony above	13.1100		13.1100	0.1100	1.4421	9.0000	117.9900	(30)
Total net area of external elements Aum(A, m2)			77.2100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4164			(33)
Party Wall 1			19.3200	0.0000	0.0000	180.0000	3477.6000	(32)
Party Floor 1			62.8800			30.0000	1886.4000	(32d)
Party Ceiling 1			49.7700			30.0000	1493.1000	(32b)
Internal Wall 1			99.6800			9.0000	897.1200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11461.3100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		182.2727 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6500	0.0600	0.3390
E3 Sill	4.6500	0.0400	0.1860
E4 Jamb	19.2000	0.0200	0.3840
E7 Party floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	8.0000	0.2000	1.6000
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E16 Corner (normal)	2.4900	0.0500	0.1245
E16 Corner (normal)	2.4900	0.1800	0.4482
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.0000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	2.7000	0.1500	0.4050
E15 Flat roof with parapet	7.3000	0.3000	2.1900

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.8719 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	26.2883 (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	10.9143	10.4982	10.6369	10.0821	10.0821	9.3886	9.5273	9.8047	9.6660	9.9434	9.9434	10.4982	(38)
Heat transfer coeff	37.2026	36.7865	36.9252	36.3704	36.3704	35.6769	35.8156	36.0930	35.9543	36.2317	36.2317	36.7865	(39)
Average = Sum(39)m / 12 =												36.3704	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5916	0.5850	0.5872	0.5784	0.5784	0.5674	0.5696	0.5740	0.5718	0.5762	0.5762	0.5850	(40)
HLP (average)												0.5784	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.0618 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
88.1834	86.8581	84.9270	81.2322	78.5055	75.4647	73.7363	75.6528	77.7537	81.0185	84.7927	87.8455	(42a)

Hot water usage for baths

25.4044	25.0271	24.4958	23.5162	22.7826	21.9692	21.5299	22.0575	22.6319	23.5023	24.5021	25.3185	(42b)

Hot water usage for other uses

35.7447	34.4449	33.1451	31.8453	30.5455	29.2457	29.2457	30.5455	31.8453	33.1451	34.4449	35.7447	(42c)

Average daily hot water use (litres/day)	137.3512 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.3325	146.3301	142.5679	136.5936	131.8336	126.6796	124.5119	128.2558	132.2309	137.6659	143.7397	148.9087	(44)
Energy conte	236.5061	208.3722	219.1216	186.9899	177.4734	155.7674	150.5864	158.8075	163.0539	186.8114	204.7836	233.1551	(45)
Energy content (annual)										Total = Sum(45)m =		2281.4282	

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

35.4759	31.2558	32.8682	28.0485	26.6210	23.3651	22.5880	23.8211	24.4581	28.0217	30.7175	34.9733	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)

Total heat required for water heating calculated for each month

287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140	(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	287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140	(64)
									Total per year (kWh/year) = Sum(64)m =			2881.4282	(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	91.3780	80.7906	85.5976	74.5029	71.7496	64.1214	62.8097	65.5432	66.5442	74.8545	80.4193	90.2638	(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	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.5465	27.1311	22.0645	16.7043	12.4866	10.5417	11.3907	14.8061	19.8727	25.2329	29.4506	31.3955	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	268.8769	271.6670	264.6361	249.6680	230.7735	213.0153	201.1517	198.3616	205.3926	220.3607	239.2552	257.0134	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)
Water heating gains (Table 5)	122.8199	120.2241	115.0506	103.4762	96.4377	89.0575	84.4216	88.0957	92.4225	100.6109	111.6935	121.3223	(72)
Total internal gains	515.9115	512.6904	495.4193	463.5166	433.3659	403.2827	387.6322	391.9315	408.3559	439.8726	474.0674	503.3993	(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	4.3800	11.5821	0.7200	0.7000	0.7700	17.7184	(74)
South	2.6000	49.2853	0.7200	0.7000	0.7700	44.7564	(78)

Solar gains	62.4747	96.2842	136.5699	187.1551	215.1242	235.5653	224.9793	200.3515	167.3282	117.2525	77.3653	54.7507	(83)
Total gains	578.3862	608.9746	631.9893	650.6717	648.4901	638.8480	612.6115	592.2830	575.6841	557.1251	551.4327	558.1500	(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	85.5772	86.5452	86.2201	87.5354	87.5354	89.2370	88.8914	88.2082	88.5484	87.8705	87.8705	86.5452	
alpha	6.7051	6.7697	6.7480	6.8357	6.8357	6.9491	6.9261	6.8805	6.9032	6.8580	6.8580	6.7697	
util living area	0.8717	0.8312	0.7359	0.5908	0.4255	0.2569	0.1462	0.1645	0.3371	0.5730	0.7818	0.8831	(86)
MIT	20.8102	20.8678	20.9444	20.9881	20.9988	21.0000	21.0000	21.0000	20.9998	20.9919	20.9274	20.7978	(87)
Th 2	20.4375	20.4435	20.4415	20.4495	20.4495	20.4594	20.4574	20.4535	20.4555	20.4515	20.4515	20.4435	(88)
util rest of house	0.8553	0.8121	0.7110	0.5622	0.3949	0.2267	0.1144	0.1312	0.3032	0.5393	0.7570	0.8675	(89)
MIT 2	20.2762	20.3334	20.3979	20.4411	20.4488	20.4594	20.4574	20.4535	20.4554	20.4462	20.3943	20.2708	(90)
Living area fraction									fLA = Living area / (4) =			0.3639	(91)
MIT	20.4705	20.5278	20.5968	20.6401	20.6489	20.6561	20.6549	20.6523	20.6535	20.6447	20.5883	20.4626	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4705	20.5278	20.5968	20.6401	20.6489	20.6561	20.6549	20.6523	20.6535	20.6447	20.5883	20.4626	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8563	0.8151	0.7180	0.5721	0.4060	0.2377	0.1260	0.1433	0.3155	0.5513	0.7633	0.8681	(94)
Useful gains	495.2609	496.3928	453.7986	372.2812	263.3133	151.8398	77.1778	84.9024	181.6510	307.1195	420.9308	484.5297	(95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000	(96)
Heat loss rate W	560.6608	541.7859	472.5234	376.0750	263.6466	151.8452	77.1778	84.9025	181.6943	309.5904	445.2251	554.0995	(97)
Space heating kWh	48.6575	30.5042	13.9312	2.7315	0.2480	0.0000	0.0000	0.0000	0.0000	1.8383	17.4919	51.7599	(98a)
Space heating requirement - total per year (kWh/year)												167.1627	
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	48.6575	30.5042	13.9312	2.7315	0.2480	0.0000	0.0000	0.0000	0.0000	1.8383	17.4919	51.7599	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												167.1627	
Space heating per m2											(98c) / (4) =	2.6584	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												84.5000	(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	48.6575	30.5042	13.9312	2.7315	0.2480	0.0000	0.0000	0.0000	0.0000	1.8383	17.4919	51.7599	(98)
Space heating efficiency (main heating system 1)	84.5000	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000	(210)

Space heating fuel (main heating system)

57.5829	36.0996	16.4867	3.2326	0.2935	0.0000	0.0000	0.0000	0.0000	2.1756	20.7005	61.2544	(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

287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140	(64)

Efficiency of water heater

											89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)

Fuel for water heating, kWh/month

321.1900	284.2453	301.7659	264.0279	255.2316	229.1424	225.1902	234.3758	237.2838	265.6651	283.9091	317.4458	(219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	21.3155	19.2527	21.3155	20.6279	21.3155	20.6279	21.3155	21.3155	20.6279	21.3155	20.6279	21.3155	(231)
Lighting	26.7372	21.4495	19.3129	14.1495	10.9295	8.9295	9.9702	12.9597	16.8333	22.0863	24.9464	27.4803	(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	(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	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	(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	197.8257	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	3219.4729	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.7000, SFP = 0.9350)		
mechanical ventilation fans (SFP = 0.9350)	164.9726	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	250.9726	(231)
Electricity for lighting (calculated in Appendix L)	215.7842	(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	3884.0554	(238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	197.8257	6.1900	12.2454	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3219.4729	6.1900	199.2854	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	250.9726	25.1600	63.1447	(249)
Energy for lighting	215.7842	25.1600	54.2913	(250)
Additional standing charges			102.0000	(251)
Total energy cost			430.9668	(255)

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	197.8257	0.2100	41.5434	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3219.4729	0.2100	676.0893	(264)
Space and water heating			717.6327	(265)
Pumps, fans and electric keep-hot	250.9726	0.1387	34.8130	(267)
Energy for lighting	215.7842	0.1443	31.1443	(268)
Total CO2, kg/year			783.5900	(272)

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	197.8257	1.1300	223.5430	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3219.4729	1.1300	3638.0044	(278)
Space and water heating			3861.5474	(279)
Pumps, fans and electric keep-hot	250.9726	1.5128	379.6713	(281)
Energy for lighting	215.7842	1.5338	330.9770	(282)
Total Primary energy kWh/year			4572.1957	(286)

SAP 10 EPC IMPROVEMENTS

Be Lean

Current energy efficiency rating: B 84
Current environmental impact rating: B 90

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 84
Potential environmental impact rating: B 90

Fuel prices for cost data on this page from database revision number 538 TEST (29 Feb 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£117	£117	£0
Mains gas	£314	£314	£0
Space heating	£177	£177	£0
Water heating	£199	£199	£0
Lighting	£54	£54	£0
Total cost of fuels	£431	£431	£0
Total cost of uses	£430	£430	£0
Delivered energy	62 kWh/m²	62 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.8 tonnes	0.0 tonnes
CO2 emissions per m²	12 kg/m²	12 kg/m²	0 kg/m²
Primary energy	73 kWh/m²	73 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.8800 (1b)	x	2.3000 (2b)	=	144.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	144.6240	(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		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(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) =	81.0000 (23c)

Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
External Wall 1	50.8300	6.9800	43.8500	0.1300	5.7005	70.0000	3069.5000	(29a)
sheltered	8.9700	2.1000	6.8700	0.1300	0.8931	70.0000	480.9000	(29a)
void above	4.3000		4.3000	0.1043	0.4483	9.0000	38.7000	(30)
flat balcony above	13.1100		13.1100	0.1100	1.4421	9.0000	117.9900	(30)
Total net area of external elements Aum(A, m2)			77.2100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4164			(33)
Party Wall 1			19.3200	0.0000	0.0000	180.0000	3477.6000	(32)
Party Floor 1			62.8800			30.0000	1886.4000	(32d)
Party Ceiling 1			49.7700			30.0000	1493.1000	(32b)
Internal Wall 1			99.6800			9.0000	897.1200	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11461.3100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 182.2727 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6500	0.0600	0.3390
E3 Sill	4.6500	0.0400	0.1860
E4 Jamb	19.2000	0.0200	0.3840
E7 Party floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	8.0000	0.2000	1.6000
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E16 Corner (normal)	2.4900	0.0500	0.1245
E16 Corner (normal)	2.4900	0.1800	0.4482
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.0000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	2.7000	0.1500	0.4050
E15 Flat roof with parapet	7.3000	0.3000	2.1900

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8719 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 26.2883 (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	11.6078	11.4691	11.3304	10.6369	10.4982	9.8047	9.8047	9.6660	10.0821	10.4982	10.7756	11.0530	(38)
Heat transfer coeff	37.8961	37.7574	37.6187	36.9252	36.7865	36.0930	36.0930	35.9543	36.3704	36.7865	37.0639	37.3413	(39)
Average = Sum(39)m / 12 =												36.8905	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6027	0.6005	0.5983	0.5872	0.5850	0.5740	0.5740	0.5718	0.5784	0.5850	0.5894	0.5939	(40)
HLP (average)												0.5867	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0618 (42)
Hot water usage for mixer showers
88.1834 86.8581 84.9270 81.2322 78.5055 75.4647 73.7363 75.6528 77.7537 81.0185 84.7927 87.8455 (42a)
Hot water usage for baths
25.4044 25.0271 24.4958 23.5162 22.7826 21.9692 21.5299 22.0575 22.6319 23.5023 24.5021 25.3185 (42b)
Hot water usage for other uses
35.7447 34.4449 33.1451 31.8453 30.5455 29.2457 29.2457 30.5455 31.8453 33.1451 34.4449 35.7447 (42c)
Average daily hot water use (litres/day) 137.3512 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.3325	146.3301	142.5679	136.5936	131.8336	126.6796	124.5119	128.2558	132.2309	137.6659	143.7397	148.9087	(44)
Energy conte	236.5061	208.3722	219.1216	186.9899	177.4734	155.7674	150.5864	158.8075	163.0539	186.8114	204.7836	233.1551	(45)
Energy content (annual)										Total = Sum(45)m =		2281.4282	
Distribution loss (46)m = 0.15 x (45)m	35.4759	31.2558	32.8682	28.0485	26.6210	23.3651	22.5880	23.8211	24.4581	28.0217	30.7175	34.9733	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140	(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	287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140	(64)
										Total per year (kWh/year) = Sum(64)m =		2881.4282	(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	91.3780	80.7906	85.5976	74.5029	71.7496	64.1214	62.8097	65.5432	66.5442	74.8545	80.4193	90.2638	(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	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.5465	27.1311	22.0645	16.7043	12.4866	10.5417	11.3907	14.8061	19.8727	25.2329	29.4506	31.3955	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	268.8769	271.6670	264.6361	249.6680	230.7735	213.0153	201.1517	198.3616	205.3926	220.3607	239.2552	257.0134	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

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

-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)

Water heating gains (Table 5)

122.8199	120.2241	115.0506	103.4762	96.4377	89.0575	84.4216	88.0957	92.4225	100.6109	111.6935	121.3223	(72)

Total internal gains

515.9115	512.6904	495.4193	463.5166	433.3659	403.2827	387.6322	391.9315	408.3559	439.8726	474.0674	503.3993	(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	4.3800	10.6334	0.7200	0.7000	0.7700	16.2671	(74)
South	2.6000	46.7521	0.7200	0.7000	0.7700	42.4559	(78)

Solar gains	58.7230	100.6190	141.3960	184.9548	218.6162	222.7518	212.3275	185.8912	156.0356	112.0019	70.3922	50.2468	(83)
Total gains	574.6344	613.3094	636.8153	648.4715	651.9821	626.0345	599.9597	577.8227	564.3915	551.8745	544.4596	553.6461	(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	84.0111	84.3197	84.6306	86.2201	86.5452	88.2082	88.2082	88.5484	87.5354	86.5452	85.8975	85.2593	
alpha	6.6007	6.6213	6.6420	6.7480	6.7697	6.8805	6.8805	6.9032	6.8357	6.7697	6.7265	6.6840	
util living area													
	0.9064	0.8649	0.7932	0.6706	0.5215	0.3687	0.2647	0.2862	0.4437	0.6743	0.8453	0.9174	(86)
MIT	20.7217	20.8075	20.8997	20.9703	20.9948	20.9996	21.0000	20.9999	20.9986	20.9740	20.8630	20.7026	(87)
Th 2	20.4276	20.4296	20.4316	20.4415	20.4435	20.4535	20.4535	20.4555	20.4495	20.4435	20.4395	20.4355	(88)
util rest of house													
	0.8936	0.8485	0.7714	0.6434	0.4912	0.3373	0.2318	0.2523	0.4086	0.6426	0.8250	0.9058	(89)
MIT 2	20.1849	20.2655	20.3499	20.4192	20.4401	20.4533	20.4534	20.4554	20.4487	20.4249	20.3267	20.1746	(90)
Living area fraction									fLA = Living area / (4) =			0.3639	(91)
MIT	20.3802	20.4627	20.5499	20.6197	20.6419	20.6521	20.6523	20.6536	20.6488	20.6247	20.5219	20.3668	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3802	20.4627	20.5499	20.6197	20.6419	20.6521	20.6523	20.6536	20.6488	20.6247	20.5219	20.3668	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8925	0.8495	0.7761	0.6522	0.5021	0.3488	0.2438	0.2647	0.4213	0.6531	0.8281	0.9043	(94)
Useful gains	512.8533	520.9870	494.2155	422.9290	327.3468	218.3355	146.2533	152.9223	237.8042	360.4214	450.8740	500.6531	(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													
	609.3788	587.6091	528.5402	432.7529	328.9423	218.4370	146.2600	152.9339	238.1828	368.7723	497.4666	603.6884	(97)
Space heating kWh													
	71.8150	44.7701	25.5376	7.0732	1.1871	0.0000	0.0000	0.0000	0.0000	6.2130	33.5467	76.6583	(98a)
Space heating requirement - total per year (kWh/year)												266.8008	
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													
	71.8150	44.7701	25.5376	7.0732	1.1871	0.0000	0.0000	0.0000	0.0000	6.2130	33.5467	76.6583	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												266.8008	
Space heating per m2											(98c) / (4) =	4.2430	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	84.5000 (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													
	71.8150	44.7701	25.5376	7.0732	1.1871	0.0000	0.0000	0.0000	0.0000	6.2130	33.5467	76.6583	(98)
Space heating efficiency (main heating system 1)													
	84.5000	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000	(210)
Space heating fuel (main heating system)													
	84.9881	52.9823	30.2220	8.3707	1.4048	0.0000	0.0000	0.0000	0.0000	7.3527	39.7002	90.7198	(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													
	287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	321.1900	284.2453	301.7659	264.0279	255.2316	229.1424	225.1902	234.3758	237.2838	265.6651	283.9091	317.4458	(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	21.3155	19.2527	21.3155	20.6279	21.3155	20.6279	21.3155	21.3155	20.6279	21.3155	20.6279	21.3155	(231)
Lighting	26.7372	21.4495	19.3129	14.1495	10.9295	8.9295	9.9702	12.9597	16.8333	22.0863	24.9464	27.4803	(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	315.7406	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	3219.4729	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.7000, SFP = 0.9350)		
mechanical ventilation fans (SFP = 0.9350)	164.9726	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	250.9726	(231)
Electricity for lighting (calculated in Appendix L)	215.7842	(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	4001.9703	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	315.7406	3.6400	11.4930	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3219.4729	3.6400	117.1888	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	250.9726	16.4900	41.3854	(249)
Energy for lighting	215.7842	16.4900	35.5828	(250)
Additional standing charges			92.0000	(251)
Total energy cost			297.6500	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9933	(257)
SAP value		83.8991	
SAP rating (Section 12)		84	(258)
SAP band		B	

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	315.7406	0.2100	66.3055	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3219.4729	0.2100	676.0893	(264)
Space and water heating			742.3948	(265)
Pumps, fans and electric keep-hot	250.9726	0.1387	34.8130	(267)
Energy for lighting	215.7842	0.1443	31.1443	(268)
Total CO2, kg/year			808.3522	(272)
CO2 emissions per m2			12.8600	(273)
EI value			89.9593	
EI rating			90	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		62.8800 (1b)	x	2.3000 (2b)	=	144.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	144.6240	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000	(22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750	(22a)
Adj infilt rate	0.1337	0.1250	0.1279	0.1162	0.1162	0.1017	0.1046	0.1104	0.1075	0.1133	0.1133	0.1250	(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) =	81.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2287	0.2200	0.2229	0.2112	0.2112	0.1967	0.1996	0.2054	0.2025	0.2083	0.2083	0.2200	(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	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
External Wall 1	50.8300	6.9800	43.8500	0.1300	5.7005	70.0000	3069.5000	(29a)
sheltered	8.9700	2.1000	6.8700	0.1300	0.8931	70.0000	480.9000	(29a)
void above	4.3000		4.3000	0.1043	0.4483	9.0000	38.7000	(30)
flat balcony above	13.1100		13.1100	0.1100	1.4421	9.0000	117.9900	(30)
Total net area of external elements Aum(A, m2)			77.2100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4164			(33)
Party Wall 1			19.3200	0.0000	0.0000	180.0000	3477.6000	(32)
Party Floor 1			62.8800			30.0000	1886.4000	(32d)
Party Ceiling 1			49.7700			30.0000	1493.1000	(32b)
Internal Wall 1			99.6800			9.0000	897.1200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11461.3100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		182.2727 (35)

List of Thermal Bridges

	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6500	0.0600	0.3390
E3 Sill	4.6500	0.0400	0.1860
E4 Jamb	19.2000	0.0200	0.3840
E7 Party floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	8.0000	0.2000	1.6000
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E16 Corner (normal)	2.4900	0.0500	0.1245
E16 Corner (normal)	2.4900	0.1800	0.4482
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.0000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	2.7000	0.1500	0.4050
E15 Flat roof with parapet	7.3000	0.3000	2.1900

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.8719 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	26.2883 (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	10.9143	10.4982	10.6369	10.0821	10.0821	9.3886	9.5273	9.8047	9.6660	9.9434	9.9434	10.4982	(38)
Heat transfer coeff	37.2026	36.7865	36.9252	36.3704	36.3704	35.6769	35.8156	36.0930	35.9543	36.2317	36.2317	36.7865	(39)
Average = Sum(39)m / 12 =												36.3704	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5916	0.5850	0.5872	0.5784	0.5784	0.5674	0.5696	0.5740	0.5718	0.5762	0.5762	0.5850	(40)
HLP (average)												0.5784	
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	2.0618	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
88.1834	86.8581	84.9270	81.2322	78.5055	75.4647	73.7363	75.6528	77.7537	81.0185	84.7927	87.8455	(42a)

Hot water usage for baths

25.4044	25.0271	24.4958	23.5162	22.7826	21.9692	21.5299	22.0575	22.6319	23.5023	24.5021	25.3185	(42b)

Hot water usage for other uses

35.7447	34.4449	33.1451	31.8453	30.5455	29.2457	29.2457	30.5455	31.8453	33.1451	34.4449	35.7447	(42c)

Average daily hot water use (litres/day)	137.3512	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.3325	146.3301	142.5679	136.5936	131.8336	126.6796	124.5119	128.2558	132.2309	137.6659	143.7397	148.9087	(44)
Energy conte	236.5061	208.3722	219.1216	186.9899	177.4734	155.7674	150.5864	158.8075	163.0539	186.8114	204.7836	233.1551	(45)
Energy content (annual)										Total = Sum(45)m =		2281.4282	
Distribution loss (46)m = 0.15 x (45)m													
	35.4759	31.2558	32.8682	28.0485	26.6210	23.3651	22.5880	23.8211	24.4581	28.0217	30.7175	34.9733	(46)
Water storage loss:													
Total storage loss													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
	287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140 (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												
	287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140 (64)
										Total per year (kWh/year) = Sum(64)m =		2881.4282 (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												
	91.3780	80.7906	85.5976	74.5029	71.7496	64.1214	62.8097	65.5432	66.5442	74.8545	80.4193	90.2638 (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	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	123.7070	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.5465	27.1311	22.0645	16.7043	12.4866	10.5417	11.3907	14.8061	19.8727	25.2329	29.4506	31.3955	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	268.8769	271.6670	264.6361	249.6680	230.7735	213.0153	201.1517	198.3616	205.3926	220.3607	239.2552	257.0134	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	49.4325	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)
Water heating gains (Table 5)													
	122.8199	120.2241	115.0506	103.4762	96.4377	89.0575	84.4216	88.0957	92.4225	100.6109	111.6935	121.3223	(72)
Total internal gains													
	515.9115	512.6904	495.4193	463.5166	433.3659	403.2827	387.6322	391.9315	408.3559	439.8726	474.0674	503.3993	(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	4.3800	11.5821	0.7200	0.7000	0.7700	17.7184	(74)
South	2.6000	49.2853	0.7200	0.7000	0.7700	44.7564	(78)

Solar gains	62.4747	96.2842	136.5699	187.1551	215.1242	235.5653	224.9793	200.3515	167.3282	117.2525	77.3653	54.7507	(83)
Total gains	578.3862	608.9746	631.9893	650.6717	648.4901	638.8480	612.6115	592.2830	575.6841	557.1251	551.4327	558.1500	(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	85.5772	86.5452	86.2201	87.5354	87.5354	89.2370	88.8914	88.2082	88.5484	87.8705	87.8705	86.5452	
alpha	6.7051	6.7697	6.7480	6.8357	6.8357	6.9491	6.9261	6.8805	6.9032	6.8580	6.8580	6.7697	
util living area													
	0.8717	0.8312	0.7359	0.5908	0.4255	0.2569	0.1462	0.1645	0.3371	0.5730	0.7818	0.8831	(86)
MIT	20.8102	20.8678	20.9444	20.9881	20.9988	21.0000	21.0000	21.0000	20.9998	20.9919	20.9274	20.7978	(87)
Th 2	20.4375	20.4435	20.4415	20.4495	20.4495	20.4594	20.4574	20.4535	20.4555	20.4515	20.4515	20.4435	(88)
util rest of house													
	0.8553	0.8121	0.7110	0.5622	0.3949	0.2267	0.1144	0.1312	0.3032	0.5393	0.7570	0.8675	(89)
MIT 2	20.2762	20.3334	20.3979	20.4411	20.4488	20.4594	20.4574	20.4535	20.4554	20.4462	20.3943	20.2708	(90)
Living area fraction										fLA = Living area / (4) =		0.3639	(91)
MIT	20.4705	20.5278	20.5968	20.6401	20.6489	20.6561	20.6549	20.6523	20.6535	20.6447	20.5883	20.4626	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4705	20.5278	20.5968	20.6401	20.6489	20.6561	20.6549	20.6523	20.6535	20.6447	20.5883	20.4626	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8563	0.8151	0.7180	0.5721	0.4060	0.2377	0.1260	0.1433	0.3155	0.5513	0.7633	0.8681	(94)
Useful gains	495.2609	496.3928	453.7986	372.2812	263.3133	151.8398	77.1778	84.9024	181.6510	307.1195	420.9308	484.5297	(95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000	(96)
Heat loss rate W													
	560.6608	541.7859	472.5234	376.0750	263.6466	151.8452	77.1778	84.9025	181.6943	309.5904	445.2251	554.0995	(97)
Space heating kWh													
	48.6575	30.5042	13.9312	2.7315	0.2480	0.0000	0.0000	0.0000	0.0000	1.8383	17.4919	51.7599	(98a)
Space heating requirement - total per year (kWh/year)												167.1627	
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													
	48.6575	30.5042	13.9312	2.7315	0.2480	0.0000	0.0000	0.0000	0.0000	1.8383	17.4919	51.7599	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												167.1627	
Space heating per m2											(98c) / (4) =	2.6584	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)

Efficiency of main space heating system 1 (in %)												84.5000	(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													
	48.6575	30.5042	13.9312	2.7315	0.2480	0.0000	0.0000	0.0000	0.0000	1.8383	17.4919	51.7599	(98)
Space heating efficiency (main heating system 1)													
	84.5000	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000	(210)
Space heating fuel (main heating system)													
	57.5829	36.0996	16.4867	3.2326	0.2935	0.0000	0.0000	0.0000	0.0000	2.1756	20.7005	61.2544	(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													
	287.4650	254.3996	270.0805	236.3049	228.4323	205.0825	201.5453	209.7664	212.3690	237.7703	254.0987	284.1140	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	321.1900	284.2453	301.7659	264.0279	255.2316	229.1424	225.1902	234.3758	237.2838	265.6651	283.9091	317.4458	(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	21.3155	19.2527	21.3155	20.6279	21.3155	20.6279	21.3155	21.3155	20.6279	21.3155	20.6279	21.3155	(231)
Lighting	26.7372	21.4495	19.3129	14.1495	10.9295	8.9295	9.9702	12.9597	16.8333	22.0863	24.9464	27.4803	(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												197.8257	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												3219.4729	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.7000, SFP = 0.9350)													
mechanical ventilation fans (SFP = 0.9350)												164.9726	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												250.9726	(231)
Electricity for lighting (calculated in Appendix L)												215.7842	(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												3884.0554	(238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	197.8257	6.1900	12.2454	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3219.4729	6.1900	199.2854	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	250.9726	25.1600	63.1447	(249)
Energy for lighting	215.7842	25.1600	54.2913	(250)
Additional standing charges			102.0000	(251)
Total energy cost			430.9668	(255)

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	197.8257	0.2100	41.5434	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3219.4729	0.2100	676.0893	(264)
Space and water heating			717.6327	(265)
Pumps, fans and electric keep-hot	250.9726	0.1387	34.8130	(267)
Energy for lighting	215.7842	0.1443	31.1443	(268)
Total CO2, kg/year			783.5900	(272)

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	197.8257	1.1300	223.5430	(275)
Total CO2 associated with community systems			0.0000	(473)

Water heating (other fuel)	3219.4729	1.1300	3638.0044 (278)
Space and water heating			3861.5474 (279)
Pumps, fans and electric keep-hot	250.9726	1.5128	379.6713 (281)
Energy for lighting	215.7842	1.5338	330.9770 (282)
Total Primary energy kWh/year			4572.1957 (286)

Full SAP Calculation Printout

Property Reference	Flat 7 Block A	**Issued on Date**	13/03/2024
Assessment Reference	Be Lean	**Prop Type Ref**	
Property	Flat 7 Block A, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	82 B	**DER**	16.00	**TER**	15.02
Environmental	86 B	**% DER < TER**			-6.52
CO_2 Emissions (t/year)	1.23	**DFEE**	46.81	**TFEE**	47.38
Compliance Check	See BREL	**% DFEE < TFEE**			1.21
% DPER < TPER	-14.78	**DPER**	91.17	**TPER**	79.43

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client	KGH, Kurt Gander - Howe		

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	86.7500	(1b)	x 3.1000	(2b) =	268.9250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		268.9250	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(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) =												81.0000	(23c)
Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			1.8900	1.4000	2.6460			(26)
window (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
RL			1.4500	1.2357	1.7918			(27a)
External Wall 1	40.6700	4.5500	36.1200	0.1300	4.6956	70.0000	2528.4000	(29a)
dormer wall	20.6000	2.4300	18.1700	0.1800	3.2706	70.0000	1271.9000	(29a)
sheltered 3rd floor only	16.4300	1.8900	14.5400	0.1800	2.6172	9.0000	130.8600	(29a)
main sloping roof	56.3000	1.4500	54.8500	0.1100	6.0335	9.0000	493.6500	(30)
flat roof rear	45.0000		45.0000	0.1100	4.9500	9.0000	405.0000	(30)
Total net area of external elements Aum(A, m2)			179.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.9971			(33)
Party Wall 1			20.8300	0.0000	0.0000	180.0000	3749.4000	(32)
Party Floor 1			86.7500			30.0000	2602.5000	(32d)
Party Ceiling 1			86.7500			20.0000	1735.0000	(32b)
Internal Wall 1			173.6000			9.0000	1562.4000	(32c)

Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =	14479.1100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K				166.9062 (35)
List of Thermal Bridges				
K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	5.6100	0.0600	0.3366	
E3 Sill	4.7100	0.0400	0.1884	
E4 Jamb	19.0800	0.0200	0.3816	
R11 Upstands or kerbs of rooflights	6.8000	0.2400	1.6320	
E24 Eaves (insulation at ceiling level - inverted)	24.9000	0.1500	3.7350	
E7 Party floor between dwellings (in blocks of flats)	6.8000	0.0000	0.0000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.0000	0.0000	0.0000	
E16 Corner (normal)	15.5000	0.0500	0.7750	
R4 Ridge (vaulted ceiling)	11.0000	0.1200	1.3200	
E15 Flat roof with parapet	14.2000	0.3000	4.2600	
E11 Eaves (insulation at rafter level)	14.4000	0.1500	2.1600	
P4 Party wall - Roof (insulation at ceiling level)	8.0000	0.4800	3.8400	
P5 Party wall - Roof (insulation at rafter level)	12.8000	0.4800	6.1440	
R4 Ridge (vaulted ceiling)	7.0000	0.1200	0.8400	
R7 Flat ceiling (inverted)	12.0000	0.1200	1.4400	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				27.0526 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	61.0497 (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	21.5845	21.3266	21.0687	19.7791	19.5212	18.2316	18.2316	17.9737	18.7474	19.5212	20.0370	20.5528	(38)
Heat transfer coeff	82.6342	82.3763	82.1184	80.8288	80.5709	79.2813	79.2813	79.0234	79.7971	80.5709	81.0867	81.6025	(39)
Average = Sum(39)m / 12 =												80.7643	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9526	0.9496	0.9466	0.9317	0.9288	0.9139	0.9139	0.9109	0.9199	0.9288	0.9347	0.9407	(40)
HLP (average)												0.9310	
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											2.5786	(42)
Hot water usage for mixer showers												
101.1809	99.6603	97.4446	93.2052	90.0766	86.5876	84.6045	86.8034	89.2139	92.9600	97.2905	100.7932	(42a)
Hot water usage for baths												
29.1306	28.6980	28.0887	26.9654	26.1243	25.1916	24.6878	25.2928	25.9515	26.9495	28.0960	29.0321	(42b)
Hot water usage for other uses												
41.0372	39.5449	38.0526	36.5604	35.0681	33.5759	33.5759	35.0681	36.5604	38.0526	39.5449	41.0372	(42c)
Average daily hot water use (litres/day)												157.6005	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	171.3486	167.9032	163.5860	156.7310	151.2690	145.3551	142.8682	147.1644	151.7258	157.9622	164.9314	170.8625	(44)
Energy conte	271.3744	239.0919	251.4255	214.5568	203.6371	178.7310	172.7867	182.2202	187.0931	214.3532	234.9750	267.5294	(45)
Energy content (annual)										Total = Sum(45)m =		2617.7742	
Distribution loss (46)m = 0.15 x (45)m													
	40.7062	35.8638	37.7138	32.1835	30.5456	26.8097	25.9180	27.3330	28.0640	32.1530	35.2462	40.1294	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	322.3333	285.1193	302.3844	263.8719	254.5960	228.0461	223.7456	233.1791	236.4082	265.3121	284.2900	318.4883	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	322.3333	285.1193	302.3844	263.8719	254.5960	228.0461	223.7456	233.1791	236.4082	265.3121	284.2900	318.4883	(64)
										Total per year (kWh/year) = Sum(64)m =		3217.7742	(64)
12Total per year (kWh/year)												3218	(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													
	102.9717	91.0049	96.3387	83.6689	80.4491	71.7568	70.1913	73.3279	74.5372	84.0122	90.4579	101.6932	(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	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	135.5171	150.0368	135.5171	140.0344	135.5171	140.0344	135.5171	135.5171	140.0344	135.5171	140.0344	135.5171	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	232.9699	235.3874	229.2954	216.3262	199.9550	184.5683	174.2890	171.8715	177.9635	190.9327	207.3040	222.6907	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	(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)													
	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	(71)
Water heating gains (Table 5)													
	138.4028	135.4240	129.4875	116.2068	108.1305	99.6623	94.3431	98.5591	103.5239	112.9196	125.6360	136.6845	(72)
Total internal gains													
	571.5685	585.5268	558.9786	537.2460	508.2811	485.9435	465.8279	467.6263	483.2004	504.0480	537.6530	559.5708	(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				4.5500		10.6334		0.7200		0.7000		0.7700	16.8985 (74)
South				2.4300		46.7521		0.7200		0.7000		0.7700	39.6799 (78)
North				1.4500		26.0000		0.7200		0.7000		1.0000	17.1007 (82)
Solar gains	73.6791	132.7962	200.7962	280.3608	342.5142	352.4811	334.6572	286.4428	228.0889	151.9440	89.5854	62.1866 (83)	
Total gains	645.2476	718.3230	759.7748	817.6068	850.7953	838.4246	800.4851	754.0691	711.2893	655.9920	627.2384	621.7575 (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	48.6720	48.8244	48.9778	49.7592	49.9185	50.7304	50.7304	50.8960	50.4025	49.9185	49.6009	49.2874	
alpha	4.2448	4.2550	4.2652	4.3173	4.3279	4.3820	4.3820	4.3931	4.3602	4.3279	4.3067	4.2858	
util living area	0.9785	0.9649	0.9412	0.8768	0.7574	0.5768	0.4293	0.4717	0.6974	0.8967	0.9628	0.9813	(86)
MIT	19.6809	19.8834	20.1607	20.5373	20.8140	20.9577	20.9907	20.9861	20.9030	20.5573	20.0738	19.6553	(87)
Th 2	20.1231	20.1256	20.1281	20.1406	20.1431	20.1557	20.1557	20.1582	20.1507	20.1431	20.1381	20.1331	(88)
util rest of house	0.9741	0.9579	0.9292	0.8521	0.7122	0.5100	0.3498	0.3898	0.6328	0.8706	0.9542	0.9774	(89)
MIT 2	18.9266	19.1272	19.3990	19.7652	20.0113	20.1328	20.1523	20.1528	20.0925	19.7925	19.3261	18.9092	(90)
Living area fraction										fLA = Living area / (4) =		0.4460	(91)
MIT	19.2630	19.4645	19.7387	20.1096	20.3693	20.5007	20.5262	20.5245	20.4540	20.1336	19.6595	19.2419	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2630	19.4645	19.7387	20.1096	20.3693	20.5007	20.5262	20.5245	20.4540	20.1336	19.6595	19.2419	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9687	0.9515	0.9230	0.8511	0.7248	0.5380	0.3850	0.4260	0.6569	0.8703	0.9484	0.9725	(94)
Useful gains	625.0681	683.4722	701.2728	695.8869	616.6201	451.0513	308.2259	321.2347	467.2736	570.9234	594.8896	604.6576	(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	1236.4565	1199.7663	1087.1414	906.0571	698.4913	467.8153	311.2770	325.9304	507.0297	768.1280	1018.4124	1227.4582	(97)
Space heating kWh	454.8730	346.9497	287.0862	151.3225	60.9122	0.0000	0.0000	0.0000	0.0000	146.7202	304.9364	463.3637	(98a)
Space heating requirement - total per year (kWh/year)												2216.1639	
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	454.8730	346.9497	287.0862	151.3225	60.9122	0.0000	0.0000	0.0000	0.0000	146.7202	304.9364	463.3637	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2216.1639	
Space heating per m2											(98c) / (4) =	25.5466	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												84.5000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement	454.8730	346.9497	287.0862	151.3225	60.9122	0.0000	0.0000	0.0000	0.0000	146.7202	304.9364	463.3637	(98)
Space heating efficiency (main heating system 1)	84.5000	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000	(210)
Space heating fuel (main heating system)	538.3112	410.5913	339.7470	179.0799	72.0855	0.0000	0.0000	0.0000	0.0000	173.6334	360.8715	548.3594	(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	322.3333	285.1193	302.3844	263.8719	254.5960	228.0461	223.7456	233.1791	236.4082	265.3121	284.2900	318.4883	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	360.1489	318.5691	337.8597	294.8290	284.4648	254.8001	249.9950	260.5353	264.1432	296.4381	317.6425	355.8528	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	24.1625	21.8242	24.1625	23.3830	24.1625	23.3830	24.1625	24.1625	23.3830	24.1625	23.3830	24.1625	(231)
Lighting	36.5581	29.3283	26.4069	19.3468	14.9440	12.2094	13.6324	17.7200	23.0165	30.1989	34.1096	37.5742	(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												2622.6792	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												3595.2785	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)		
mechanical ventilation fans (SFP = 0.6050)	198.4935	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	284.4935	(231)
Electricity for lighting (calculated in Appendix L)	295.0451	(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	6797.4963	(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	2622.6792	0.2100	550.7626	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3595.2785	0.2100	755.0085	(264)
Space and water heating			1305.7711	(265)
Pumps, fans and electric keep-hot	284.4935	0.1387	39.4628	(267)
Energy for lighting	295.0451	0.1443	42.5841	(268)
Total CO2, kg/year			1387.8180	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			16.0000	(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	2622.6792	1.1300	2963.6275	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3595.2785	1.1300	4062.6647	(278)
Space and water heating			7026.2922	(279)
Pumps, fans and electric keep-hot	284.4935	1.5128	430.3818	(281)
Energy for lighting	295.0451	1.5338	452.5500	(282)
Total Primary energy kWh/year			7909.2239	(286)
Dwelling Primary energy Rate (DPER)			91.1700	(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	86.7500	(1b)	x 3.1000	(2b) =	268.9250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	268.9250	(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) =	0.1116	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3616	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2802	(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	0.3573	0.3503	0.3433	0.3082	0.3012	0.2662	0.2662	0.2592	0.2802	0.3012	0.3152	0.3292	(22b)
Effective ac	0.5638	0.5613	0.5589	0.5475	0.5454	0.5354	0.5354	0.5336	0.5393	0.5454	0.5497	0.5542	(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			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
RL			1.4500	2.0221	2.9320			(27a)
External Wall 1	40.6700	4.5500	36.1200	0.1800	6.5016			(29a)
dormer wall	20.6000	2.4300	18.1700	0.1800	3.2706			(29a)
sheltered 3rd floor only	16.4300	1.8900	14.5400	0.1800	2.6172			(29a)
main sloping roof	56.3000	1.4500	54.8500	0.1100	6.0335			(30)
flat roof rear	45.0000		45.0000	0.1100	4.9500			(30)
Total net area of external elements Aum(A, m2)			179.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1873			(33)
Party Wall 1			20.8300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 176.9062 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	5.6100	0.0500	0.2805
E3	Sill	4.7100	0.0500	0.2355
E4	Jamb	19.0800	0.0500	0.9540
R11	Upstands or kerbs of rooflights	6.8000	0.0800	0.5440
E24	Eaves (insulation at ceiling level - inverted)	24.9000	0.2400	5.9760
E7	Party floor between dwellings (in blocks of flats)	6.8000	0.0700	0.4760
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	11.0000	0.0000	0.0000
E16	Corner (normal)	15.5000	0.0900	1.3950
R4	Ridge (vaulted ceiling)	11.0000	0.0800	0.8800
E15	Flat roof with parapet	14.2000	0.5600	7.9520
E11	Eaves (insulation at rafter level)	14.4000	0.0400	0.5760
P4	Party wall - Roof (insulation at ceiling level)	8.0000	0.1200	0.9600
P5	Party wall - Roof (insulation at rafter level)	12.8000	0.0800	1.0240
R4	Ridge (vaulted ceiling)	7.0000	0.0800	0.5600
R7	Flat ceiling (inverted)	12.0000	0.0400	0.4800

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 22.2930 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 58.4803 (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	50.0362	49.8162	49.6007	48.5882	48.3987	47.5169	47.5169	47.3536	47.8565	48.3987	48.7820	49.1826	(38)
Heat transfer coeff	108.5164	108.2965	108.0809	107.0684	106.8790	105.9971	105.9971	105.8338	106.3368	106.8790	107.2622	107.6629	(39)
Average = Sum(39)m / 12 =												107.0675	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2509	1.2484	1.2459	1.2342	1.2320	1.2219	1.2219	1.2200	1.2258	1.2320	1.2365	1.2411	(40)
HLP (average)												1.2342	
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 2.5786 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4539	66.4402	64.9630	62.1368	60.0510	57.7251	56.4030	57.8690	59.4759	61.9733	64.8603	67.1955	(42a)

Hot water usage for baths

29.1306	28.6980	28.0887	26.9654	26.1243	25.1916	24.6878	25.2928	25.9515	26.9495	28.0960	29.0321	(42b)

Hot water usage for other uses

41.0372	39.5449	38.0526	36.5604	35.0681	33.5759	33.5759	35.0681	36.5604	38.0526	39.5449	41.0372	(42c)

Average daily hot water use (litres/day) 126.5054 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.6217	134.6831	131.1044	125.6626	121.2435	116.4925	114.6667	118.2299	121.9878	126.9755	132.5012	137.2648	(44)
Energy conte	217.9591	191.7869	201.5026	172.0258	163.2170	143.2412	138.6794	146.3933	150.4232	172.3045	188.7722	214.9234	(45)
Energy content (annual)										Total = Sum(45)m =		2101.2287	
Distribution loss (46)m = 0.15 x (45)m	32.6939	28.7680	30.2254	25.8039	24.4825	21.4862	20.8019	21.9590	22.5635	25.8457	28.3158	32.2385	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	268.9180	237.8143	252.4615	221.3408	214.1759	192.5562	189.6383	197.3522	199.7383	223.2634	238.0873	265.8823	(62)
WWHRS	-30.8371	-27.2726	-28.5583	-23.6474	-22.0385	-18.8585	-17.6769	-18.7976	-19.5117	-23.0022	-26.0587	-30.2661	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	238.0809	210.5417	223.9032	197.6935	192.1374	173.6977	171.9614	178.5546	180.2265	200.2612	212.0286	235.6163	(64)
										Total per year (kWh/year) = Sum(64)m =		2414.7031	(64)
12Total per year (kWh/year)												2415	(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	85.2111	75.2760	79.7394	69.5273	67.0094	59.9565	58.8506	61.4155	62.3445	70.0310	75.0955	84.2018	(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	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	135.5171	150.0368	135.5171	140.0344	135.5171	140.0344	135.5171	135.5171	140.0344	135.5171	140.0344	135.5171	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.9699	235.3874	229.2954	216.3262	199.9550	184.5683	174.2890	171.8715	177.9635	190.9327	207.3040	222.6907	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													

	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	(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)													
	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	(71)
Water heating gains (Table 5)													
	114.5311	112.0179	107.1765	96.5657	90.0664	83.2729	79.1003	82.5477	86.5896	94.1277	104.2994	113.1744	(72)
Total internal gains													
	547.6967	562.1207	536.6677	517.6049	490.2170	469.5541	450.5850	451.6149	466.2660	485.2561	516.3163	536.0608	(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	4.5500	10.6334	0.6300	0.7000	0.7700	14.7861	(74)
South	2.4300	46.7521	0.6300	0.7000	0.7700	34.7199	(78)
North	1.4500	26.0000	0.6300	0.7000	1.0000	14.9631	(82)

Solar gains	64.4692	116.1967	175.6967	245.3157	299.6999	308.4210	292.8251	250.6375	199.5778	132.9510	78.3872	54.4133	(83)
Total gains	612.1659	678.3173	712.3643	762.9206	789.9169	777.9750	743.4101	702.2524	665.8438	618.2071	594.7035	590.4741	(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	39.2839	39.3637	39.4422	39.8152	39.8857	40.2176	40.2176	40.2796	40.0891	39.8857	39.7432	39.5953	
alpha	3.6189	3.6242	3.6295	3.6543	3.6590	3.6812	3.6812	3.6853	3.6726	3.6590	3.6495	3.6397	
util living area													
	0.9869	0.9798	0.9680	0.9351	0.8652	0.7296	0.5800	0.6261	0.8224	0.9445	0.9787	0.9885	(86)
MIT	19.1037	19.3054	19.6208	20.0827	20.5105	20.8249	20.9444	20.9254	20.7061	20.1682	19.5685	19.0727	(87)
Th 2	19.8795	19.8815	19.8835	19.8927	19.8945	19.9025	19.9025	19.9040	19.8994	19.8945	19.8909	19.8873	(88)
util rest of house													
	0.9837	0.9749	0.9597	0.9168	0.8239	0.6449	0.4548	0.5031	0.7549	0.9252	0.9726	0.9857	(89)
MIT 2	17.6872	17.9444	18.3452	18.9272	19.4393	19.7803	19.8784	19.8685	19.6683	19.0419	18.2872	17.6527	(90)
Living area fraction										fLA = Living area / (4) =		0.4460	(91)
MIT	18.3190	18.5514	18.9141	19.4425	19.9171	20.2462	20.3538	20.3399	20.1312	19.5442	18.8587	18.2860	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3190	18.5514	18.9141	19.4425	19.9171	20.2462	20.3538	20.3399	20.1312	19.5442	18.8587	18.2860	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9775	0.9670	0.9502	0.9076	0.8249	0.6737	0.5089	0.5551	0.7710	0.9175	0.9649	0.9800	(94)
Useful gains	598.3907	655.9055	676.9012	692.4561	651.5995	524.1219	378.3191	389.8018	513.3720	567.1898	573.8532	578.6852	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1521.2870	1478.4004	1341.7278	1128.7737	878.2302	598.4775	397.8908	416.9719	641.3368	955.9504	1261.2634	1516.5410	(97)
Space heating kWh													
	686.6348	552.7166	494.6310	314.1487	168.6133	0.0000	0.0000	0.0000	0.0000	289.2379	494.9353	697.7647	(98a)
Space heating requirement - total per year (kWh/year)												3698.6823	
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													
	686.6348	552.7166	494.6310	314.1487	168.6133	0.0000	0.0000	0.0000	0.0000	289.2379	494.9353	697.7647	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3698.6823	
Space heating per m2											(98c) / (4) =	42.6361	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	686.6348	552.7166	494.6310	314.1487	168.6133	0.0000	0.0000	0.0000	0.0000	289.2379	494.9353	697.7647	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	743.1112	598.1781	535.3149	339.9878	182.4819	0.0000	0.0000	0.0000	0.0000	313.0280	535.6443	755.1566	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	238.0809	210.5417	223.9032	197.6935	192.1374	173.6977	171.9614	178.5546	180.2265	200.2612	212.0286	235.6163	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.5145	86.3490	86.0290	85.3687	84.1027	80.3000	80.3000	80.3000	80.3000	85.1683	86.1334	86.5598	(217)
Fuel for water heating, kWh/month													
	275.1920	243.8264	260.2650	231.5761	228.4557	216.3110	214.1487	222.3594	224.4415	235.1359	246.1631	272.2005	(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	28.1578	22.5892	20.3391	14.9013	11.5102	9.4039	10.5000	13.6483	17.7277	23.2598	26.2718	28.9404	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-29.2407	-42.3985	-62.6402	-72.4322	-79.8037	-75.0848	-74.1683	-69.2035	-60.6935	-49.3985	-32.5650	-25.1452	(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	-13.0990	-27.8992	-56.1029	-85.2224	-113.6298	-114.5314	-113.1796	-95.3838	-69.3327	-40.2049	-17.5868	-10.3321	(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	4002.9029	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2870.0754	(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)	227.2494	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1429.2787	(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	5756.9490	(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	4002.9029	0.2100	840.6096	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2870.0754	0.2100	602.7158	(264)
Space and water heating			1443.3254	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	227.2494	0.1443	32.7991	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-672.7742	0.1340	-90.1583	
PV Unit electricity exported	-756.5045	0.1256	-94.9895	
Total			-185.1478	(269)
Total CO2, kg/year			1302.9060	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.0200	(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	4002.9029	1.1300	4523.2803	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2870.0754	1.1300	3243.1852	(278)
Space and water heating			7766.4655	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	227.2494	1.5338	348.5628	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-672.7742	1.4952	-1005.9622	
PV Unit electricity exported	-756.5045	0.4609	-348.6648	
Total			-1354.6270	(283)
Total Primary energy kWh/year			6890.5020	(286)
Target Primary Energy Rate (TPER)			79.4300	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	86.7500	(1b)	x 3.1000	(2b) =	268.9250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		268.9250	(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	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) =	0.1116 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.2616 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2027 (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	0.2584	0.2534	0.2483	0.2230	0.2179	0.1926	0.1926	0.1875	0.2027	0.2179	0.2280	0.2382	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5334	0.5321	0.5308	0.5249	0.5237	0.5185	0.5185	0.5176	0.5205	0.5237	0.5260	0.5284	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			1.8900	1.4000	2.6460			(26)
window (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
RL			1.4500	1.2357	1.7918			(27a)
External Wall 1	40.6700	4.5500	36.1200	0.1300	4.6956	70.0000	2528.4000	(29a)
dormer wall	20.6000	2.4300	18.1700	0.1800	3.2706	70.0000	1271.9000	(29a)
sheltered 3rd floor only	16.4300	1.8900	14.5400	0.1800	2.6172	9.0000	130.8600	(29a)
main sloping roof	56.3000	1.4500	54.8500	0.1100	6.0335	9.0000	493.6500	(30)
flat roof rear	45.0000		45.0000	0.1100	4.9500	9.0000	405.0000	(30)
Total net area of external elements Aum(A, m2)			179.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9971			(33)
Party Wall 1			20.8300	0.0000	0.0000	180.0000	3749.4000	(32)
Party Floor 1			86.7500			30.0000	2602.5000	(32d)
Party Ceiling 1			86.7500			30.0000	2602.5000	(32b)
Internal Wall 1			173.6000			9.0000	1562.4000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15346.6100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		176.9062 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6100	0.0600	0.3366
E3 Sill	4.7100	0.0400	0.1884
E4 Jamb	19.0800	0.0200	0.3816
R11 Upstands or kerbs of rooflights	6.8000	0.2400	1.6320
E24 Eaves (insulation at ceiling level - inverted)	24.9000	0.1500	3.7350
E7 Party floor between dwellings (in blocks of flats)	6.8000	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.0000	0.0000	0.0000
E16 Corner (normal)	15.5000	0.0500	0.7750
R4 Ridge (vaulted ceiling)	11.0000	0.1200	1.3200
E15 Flat roof with parapet	14.2000	0.3000	4.2600
E11 Eaves (insulation at rafter level)	14.4000	0.1500	2.1600
P4 Party wall - Roof (insulation at ceiling level)	8.0000	0.4800	3.8400
P5 Party wall - Roof (insulation at rafter level)	12.8000	0.4800	6.1440
R4 Ridge (vaulted ceiling)	7.0000	0.1200	0.8400
R7 Flat ceiling (inverted)	12.0000	0.1200	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		27.0526 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	61.0497 (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	47.3365	47.2214	47.1086	46.5788	46.4796	46.0181	46.0181	45.9326	46.1959	46.4796	46.6802	46.8898	(38)
Heat transfer coeff	108.3862	108.2711	108.1583	107.6284	107.5293	107.0678	107.0678	106.9823	107.2456	107.5293	107.7299	107.9395	(39)
Average = Sum(39)m / 12 =												107.6280	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2494	1.2481	1.2468	1.2407	1.2395	1.2342	1.2342	1.2332	1.2363	1.2395	1.2418	1.2443	(40)
HLP (average)												1.2407	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5786 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.1306	28.6980	28.0887	26.9654	26.1243	25.1916	24.6878	25.2928	25.9515	26.9495	28.0960	29.0321	(42b)
Hot water usage for other uses	41.0372	39.5449	38.0526	36.5604	35.0681	33.5759	33.5759	35.0681	36.5604	38.0526	39.5449	41.0372	(42c)
Average daily hot water use (litres/day)												64.3152	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1678	68.2429	66.1414	63.5258	61.1924	58.7675	58.2637	60.3609	62.5119	65.0021	67.6409	70.0693	(44)
Energy conte	111.1286	97.1769	101.6568	86.9636	82.3768	72.2615	70.4649	74.7394	77.0834	88.2073	96.3668	109.7116	(45)
Energy content (annual)										Total = Sum(45)m =		1068.1377	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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													
	94.4593	82.6004	86.4083	73.9191	70.0202	61.4222	59.8952	63.5285	65.5209	74.9762	81.9118	93.2548	(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													
	94.4593	82.6004	86.4083	73.9191	70.0202	61.4222	59.8952	63.5285	65.5209	74.9762	81.9118	93.2548	(64)
									Total per year (kWh/year) = Sum(64)m =			907.9170	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)													
	54.0193	48.1317	52.5579	50.1554	51.0966	48.7412	50.3659	51.0966	50.1554	52.5579	51.5697	54.0193	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							614.4669	(64a)
Heat gains from water heating, kWh/month													
	37.1197	32.6830	34.7416	31.0186	30.2792	27.5409	27.5653	28.6563	28.9191	31.8835	33.3704	36.8185	(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	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	135.5171	150.0368	135.5171	140.0344	135.5171	140.0344	135.5171	135.5171	140.0344	135.5171	140.0344	135.5171	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	232.9699	235.3874	229.2954	216.3262	199.9550	184.5683	174.2890	171.8715	177.9635	190.9327	207.3040	222.6907	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	(71)
Water heating gains (Table 5)													
	49.8920	48.6354	46.6957	43.0814	40.6978	38.2512	37.0501	38.5165	40.1654	42.8542	46.3477	49.4873	(72)
Total internal gains													
	480.0577	495.7383	473.1868	461.1206	437.8485	424.5324	408.5348	407.5837	419.8419	430.9826	455.3647	469.3737	(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	4.5500	10.6334	0.7200	0.7000	0.7700	16.8985	(74)
South	2.4300	46.7521	0.7200	0.7000	0.7700	39.6799	(78)
North	1.4500	26.0000	0.7200	0.7000	1.0000	17.1007	(82)

Solar gains	73.6791	132.7962	200.7962	280.3608	342.5142	352.4811	334.6572	286.4428	228.0889	151.9440	89.5854	62.1866	(83)
Total gains	553.7368	628.5345	673.9830	741.4814	780.3627	777.0135	743.1920	694.0265	647.9308	582.9267	544.9501	531.5603	(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	39.3311	39.3729	39.4140	39.6080	39.6445	39.8154	39.8154	39.8472	39.7494	39.6445	39.5707	39.4938	
alpha	3.6221	3.6249	3.6276	3.6405	3.6430	3.6544	3.6544	3.6565	3.6500	3.6430	3.6380	3.6329	
util living area													
	0.9904	0.9840	0.9728	0.9402	0.8699	0.7333	0.5841	0.6356	0.8338	0.9531	0.9838	0.9918	(86)
MIT	19.0190	19.2335	19.5661	20.0479	20.4945	20.8181	20.9416	20.9196	20.6854	20.1144	19.4879	18.9780	(87)
Th 2	19.8807	19.8817	19.8828	19.8876	19.8885	19.8927	19.8927	19.8935	19.8911	19.8885	19.8867	19.8848	(88)
util rest of house													
	0.9881	0.9800	0.9656	0.9230	0.8293	0.6484	0.4575	0.5111	0.7680	0.9362	0.9790	0.9898	(89)
MIT 2	18.0882	18.3015	18.6311	19.1037	19.5212	19.7937	19.8730	19.8636	19.6967	19.1755	18.5591	18.0503	(90)
Living area fraction										fLA = Living area / (4) =		0.4460	(91)
MIT	18.5033	18.7171	19.0481	19.5248	19.9553	20.2506	20.3496	20.3345	20.1376	19.5943	18.9733	18.4641	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5033	18.7171	19.0481	19.5248	19.9553	20.2506	20.3496	20.3345	20.1376	19.5943	18.9733	18.4641	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9841	0.9745	0.9586	0.9161	0.8321	0.6782	0.5124	0.5640	0.7847	0.9306	0.9737	0.9862	(94)
Useful gains	544.9236	612.5218	646.1106	679.3055	649.3217	526.9791	380.8413	391.4412	508.4241	542.4515	530.6435	524.2008	(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													
	1539.4447	1495.9981	1357.1822	1143.5326	887.6864	604.9931	401.4611	420.9261	647.5093	967.1464	1279.1115	1539.6568	(97)
Space heating kWh													
	739.9238	593.6961	529.0372	334.2435	177.3434	0.0000	0.0000	0.0000	0.0000	315.9730	538.8970	755.4992	(98a)
Space heating requirement - total per year (kWh/year)												3984.6133	
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													
	739.9238	593.6961	529.0372	334.2435	177.3434	0.0000	0.0000	0.0000	0.0000	315.9730	538.8970	755.4992	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3984.6133	
Space heating per m2											(98c) / (4) =	45.9321	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

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

Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1006.4373	792.3017	813.0657	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6986	0.7814	0.7432	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	703.0931	619.0973	604.2834	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	819.9871	784.7871	733.6857	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	84.1636	123.2732	96.2754	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction											fC = cooled area / (4) =	1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	21.0409	30.8183	24.0688	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												75.9280	(107)
Energy for space heating												45.9321	(99)
Energy for space cooling												0.8753	(108)
Total												46.8074	(109)
Fabric Energy Efficiency (DFEE)												46.8	(109)

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		86.7500	(1b)	x 3.1000	(2b) =	268.9250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7500						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		268.9250	(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	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) =	0.1116	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3616	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2802	(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													
	0.3573	0.3503	0.3433	0.3082	0.3012	0.2662	0.2662	0.2592	0.2802	0.3012	0.3152	0.3292	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5638	0.5613	0.5589	0.5475	0.5454	0.5354	0.5354	0.5336	0.5393	0.5454	0.5497	0.5542	(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			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
RL			1.4500	2.0221	2.9320			(27a)
External Wall 1	40.6700	4.5500	36.1200	0.1800	6.5016			(29a)
dormer wall	20.6000	2.4300	18.1700	0.1800	3.2706			(29a)
sheltered 3rd floor only	16.4300	1.8900	14.5400	0.1800	2.6172			(29a)
main sloping roof	56.3000	1.4500	54.8500	0.1100	6.0335			(30)
flat roof rear	45.0000		45.0000	0.1100	4.9500			(30)
Total net area of external elements Aum(A, m2)			179.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1873			(33)
Party Wall 1			20.8300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 176.9062 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6100	0.0500	0.2805
E3 Sill	4.7100	0.0500	0.2355
E4 Jamb	19.0800	0.0500	0.9540
R11 Upstands or kerbs of rooflights	6.8000	0.0800	0.5440
E24 Eaves (insulation at ceiling level - inverted)	24.9000	0.2400	5.9760
E7 Party floor between dwellings (in blocks of flats)	6.8000	0.0700	0.4760
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.0000	0.0000	0.0000
E16 Corner (normal)	15.5000	0.0900	1.3950
R4 Ridge (vaulted ceiling)	11.0000	0.0800	0.8800

E15 Flat roof with parapet	14.2000	0.5600	7.9520	
E11 Eaves (insulation at rafter level)	14.4000	0.0400	0.5760	
P4 Party wall - Roof (insulation at ceiling level)	8.0000	0.1200	0.9600	
P5 Party wall - Roof (insulation at rafter level)	12.8000	0.0800	1.0240	
R4 Ridge (vaulted ceiling)	7.0000	0.0800	0.5600	
R7 Flat ceiling (inverted)	12.0000	0.0400	0.4800	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 22.2930 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 58.4803 (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	50.0362	49.8162	49.6007	48.5882	48.3987	47.5169	47.5169	47.3536	47.8565	48.3987	48.7820	49.1826	(38)
Heat transfer coeff	108.5164	108.2965	108.0809	107.0684	106.8790	105.9971	105.9971	105.8338	106.3368	106.8790	107.2622	107.6629	(39)
Average = Sum(39)m / 12 =												107.0675	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2509	1.2484	1.2459	1.2342	1.2320	1.2219	1.2219	1.2200	1.2258	1.2320	1.2365	1.2411	(40)
HLP (average)												1.2342	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5786 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1306	28.6980	28.0887	26.9654	26.1243	25.1916	24.6878	25.2928	25.9515	26.9495	28.0960	29.0321	(42b)

Hot water usage for other uses

41.0372	39.5449	38.0526	36.5604	35.0681	33.5759	33.5759	35.0681	36.5604	38.0526	39.5449	41.0372	(42c)

Average daily hot water use (litres/day) 64.3152 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1678	68.2429	66.1414	63.5258	61.1924	58.7675	58.2637	60.3609	62.5119	65.0021	67.6409	70.0693	(44)
Energy conte	111.1286	97.1769	101.6568	86.9636	82.3768	72.2615	70.4649	74.7394	77.0834	88.2073	96.3668	109.7116	(45)
Energy content (annual)										Total = Sum(45)m =		1068.1377	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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	94.4593	82.6004	86.4083	73.9191	70.0202	61.4222	59.8952	63.5285	65.5209	74.9762	81.9118	93.2548	(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	94.4593	82.6004	86.4083	73.9191	70.0202	61.4222	59.8952	63.5285	65.5209	74.9762	81.9118	93.2548	(64)
									Total per year (kWh/year) = Sum(64)m =			907.9170	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0193	48.1317	52.5579	50.1554	51.0966	48.7412	50.3659	51.0966	50.1554	52.5579	51.5697	54.0193	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.4669	(64a)
Heat gains from water heating, kWh/month	37.1197	32.6830	34.7416	31.0186	30.2792	27.5409	27.5653	28.6563	28.9191	31.8835	33.3704	36.8185	(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	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	135.5171	150.0368	135.5171	140.0344	135.5171	140.0344	135.5171	135.5171	140.0344	135.5171	140.0344	135.5171	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.9699	235.3874	229.2954	216.3262	199.9550	184.5683	174.2890	171.8715	177.9635	190.9327	207.3040	222.6907	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	(71)
Water heating gains (Table 5)	49.8920	48.6354	46.6957	43.0814	40.6978	38.2512	37.0501	38.5165	40.1654	42.8542	46.3477	49.4873	(72)
Total internal gains	480.0577	495.7383	473.1868	461.1206	437.8485	424.5324	408.5348	407.5837	419.8419	430.9826	455.3647	469.3737	(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	4.5500	10.6334	0.6300	0.7000	0.7700	14.7861	(74)
South	2.4300	46.7521	0.6300	0.7000	0.7700	34.7199	(78)
North	1.4500	26.0000	0.6300	0.7000	1.0000	14.9631	(82)

Solar gains	64.4692	116.1967	175.6967	245.3157	299.6999	308.4210	292.8251	250.6375	199.5778	132.9510	78.3872	54.4133	(83)
Total gains	544.5269	611.9349	648.8834	706.4363	737.5484	732.9534	701.3599	658.2212	619.4197	563.9337	533.7519	523.7870	(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	39.2839	39.3637	39.4422	39.8152	39.8857	40.2176	40.2176	40.2796	40.0891	39.8857	39.7432	39.5953	
alpha	3.6189	3.6242	3.6295	3.6543	3.6590	3.6812	3.6812	3.6853	3.6726	3.6590	3.6495	3.6397	
util living area	0.9909	0.9853	0.9757	0.9473	0.8847	0.7550	0.6067	0.6559	0.8470	0.9570	0.9848	0.9922	(86)
MIT	19.0024	19.2085	19.5322	20.0131	20.4617	20.8024	20.9355	20.9128	20.6699	20.0985	19.4797	18.9720	(87)
Th 2	19.8795	19.8815	19.8835	19.8927	19.8945	19.9025	19.9025	19.9040	19.8994	19.8945	19.8909	19.8873	(88)
util rest of house	0.9887	0.9816	0.9692	0.9318	0.8472	0.6723	0.4790	0.5316	0.7842	0.9413	0.9803	0.9902	(89)
MIT 2	18.0709	18.2767	18.5986	19.0753	19.4988	19.7930	19.8802	19.8709	19.6927	19.1653	18.5542	18.0462	(90)
Living area fraction										fLA = Living area / (4) =		0.4460	(91)
MIT	18.4863	18.6923	19.0150	19.4936	19.9282	20.2432	20.3508	20.3356	20.1286	19.5815	18.9670	18.4591	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4863	18.6923	19.0150	19.4936	19.9282	20.2432	20.3508	20.3356	20.1286	19.5815	18.9670	18.4591	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9848	0.9764	0.9626	0.9249	0.8485	0.7004	0.5342	0.5841	0.7993	0.9357	0.9752	0.9868	(94)
Useful gains	536.2733	597.4709	624.6013	653.3519	625.8179	513.3396	374.6622	384.4371	495.0833	527.6720	520.5249	516.8505	(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	1539.4494	1493.6603	1352.6303	1134.2347	879.4244	598.1621	397.5791	416.5194	641.0576	959.9313	1272.8774	1535.1753	(97)
Space heating kWh	746.3630	602.2393	541.6536	346.2356	188.6832	0.0000	0.0000	0.0000	0.0000	321.6009	541.6938	757.6337	(98a)
Space heating requirement - total per year (kWh/year)												4046.1031	
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	746.3630	602.2393	541.6536	346.2356	188.6832	0.0000	0.0000	0.0000	0.0000	321.6009	541.6938	757.6337	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4046.1031	
Space heating per m2											(98c) / (4) =	46.6410	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	996.3729	784.3786	804.3369	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6765	0.7621	0.7251	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	674.0733	597.7582	583.2617	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	771.2643	738.5158	694.0146	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	69.9775	104.7236	82.4002	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	17.4944	26.1809	20.6000	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												64.2753	(107)
Energy for space heating												46.6410	(99)
Energy for space cooling												0.7409	(108)
Total												47.3819	(109)
Fabric Energy Efficiency (TFEE)												47.4	(109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	86.7500	(1b)	x 3.1000	(2b) =	268.9250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		268.9250	(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	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	3	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.1162	(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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(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) =	81.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			1.8900	1.4000	2.6460			(26)
window (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
RL			1.4500	1.2357	1.7918			(27a)
External Wall 1	40.6700	4.5500	36.1200	0.1300	4.6956	70.0000	2528.4000	(29a)
dormer wall	20.6000	2.4300	18.1700	0.1800	3.2706	70.0000	1271.9000	(29a)
sheltered 3rd floor only	16.4300	1.8900	14.5400	0.1800	2.6172	9.0000	130.8600	(29a)
main sloping roof	56.3000	1.4500	54.8500	0.1100	6.0335	9.0000	493.6500	(30)
flat roof rear	45.0000		45.0000	0.1100	4.9500	9.0000	405.0000	(30)
Total net area of external elements Aum(A, m2)			179.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.9971			(33)
Party Wall 1			20.8300	0.0000	0.0000	180.0000	3749.4000	(32)
Party Floor 1			86.7500			30.0000	2602.5000	(32d)
Party Ceiling 1			86.7500			30.0000	2602.5000	(32b)
Internal Wall 1			173.6000			9.0000	1562.4000	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	15346.6100	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	176.9062	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6100	0.0600	0.3366
E3 Sill	4.7100	0.0400	0.1884
E4 Jamb	19.0800	0.0200	0.3816
R11 Upstands or kerbs of rooflights	6.8000	0.2400	1.6320
E24 Eaves (insulation at ceiling level - inverted)	24.9000	0.1500	3.7350
E7 Party floor between dwellings (in blocks of flats)	6.8000	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.0000	0.0000	0.0000
E16 Corner (normal)	15.5000	0.0500	0.7750
R4 Ridge (vaulted ceiling)	11.0000	0.1200	1.3200
E15 Flat roof with parapet	14.2000	0.3000	4.2600
E11 Eaves (insulation at rafter level)	14.4000	0.1500	2.1600
P4 Party wall - Roof (insulation at ceiling level)	8.0000	0.4800	3.8400
P5 Party wall - Roof (insulation at rafter level)	12.8000	0.4800	6.1440
R4 Ridge (vaulted ceiling)	7.0000	0.1200	0.8400
R7 Flat ceiling (inverted)	12.0000	0.1200	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	27.0526	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	61.0497	(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	21.5845	21.3266	21.0687	19.7791	19.5212	18.2316	18.2316	17.9737	18.7474	19.5212	20.0370	20.5528	(38)
Heat transfer coeff	82.6342	82.3763	82.1184	80.8288	80.5709	79.2813	79.2813	79.0234	79.7971	80.5709	81.0867	81.6025	(39)
Average = Sum(39)m / 12 =												80.7643	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9526	0.9496	0.9466	0.9317	0.9288	0.9139	0.9139	0.9109	0.9199	0.9288	0.9347	0.9407	(40)
HLP (average)												0.9310	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5786	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
101.1809	99.6603	97.4446	93.2052	90.0766	86.5876	84.6045	86.8034	89.2139	92.9600	97.2905	100.7932	(42a)

Hot water usage for baths

29.1306	28.6980	28.0887	26.9654	26.1243	25.1916	24.6878	25.2928	25.9515	26.9495	28.0960	29.0321	(42b)

Hot water usage for other uses

41.0372	39.5449	38.0526	36.5604	35.0681	33.5759	33.5759	35.0681	36.5604	38.0526	39.5449	41.0372	(42c)

Average daily hot water use (litres/day)	157.6005	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	171.3486	167.9032	163.5860	156.7310	151.2690	145.3551	142.8682	147.1644	151.7258	157.9622	164.9314	170.8625	(44)
Energy conte	271.3744	239.0919	251.4255	214.5568	203.6371	178.7310	172.7867	182.2202	187.0931	214.3532	234.9750	267.5294	(45)
Energy content (annual)										Total = Sum(45)m =		2617.7742	
Distribution loss (46)m = 0.15 x (45)m													
	40.7062	35.8638	37.7138	32.1835	30.5456	26.8097	25.9180	27.3330	28.0640	32.1530	35.2462	40.1294	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	322.3333	285.1193	302.3844	263.8719	254.5960	228.0461	223.7456	233.1791	236.4082	265.3121	284.2900	318.4883	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)

FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	322.3333	285.1193	302.3844	263.8719	254.5960	228.0461	223.7456	233.1791	236.4082	265.3121	284.2900	318.4883	(64)
										Total per year (kWh/year) = Sum(64)m =		3217.7742	(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	102.9717	91.0049	96.3387	83.6689	80.4491	71.7568	70.1913	73.3279	74.5372	84.0122	90.4579	101.6932	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.7667	37.0968	30.1691	22.8400	17.0732	14.4139	15.5747	20.2446	27.1722	34.5014	40.2682	42.9275	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.7163	351.3245	342.2320	322.8750	298.4402	275.4750	260.1329	256.5247	265.6172	284.9742	309.4090	332.3742	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	(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)	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	(71)
Water heating gains (Table 5)	138.4028	135.4240	129.4875	116.2068	108.1305	99.6623	94.3431	98.5591	103.5239	112.9196	125.6360	136.6845	(72)
Total internal gains	635.5073	631.4667	609.5101	569.5432	531.2653	494.1726	474.6721	479.9498	500.9348	540.0166	582.9346	619.6076	(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	4.5500	10.6334	0.7200	0.7000	0.7700	16.8985	(74)
South	2.4300	46.7521	0.7200	0.7000	0.7700	39.6799	(78)
North	1.4500	26.0000	0.7200	0.7000	1.0000	17.1007	(82)

Solar gains	73.6791	132.7962	200.7962	280.3608	342.5142	352.4811	334.6572	286.4428	228.0889	151.9440	89.5854	62.1866	(83)
Total gains	709.1864	764.2629	810.3062	849.9040	873.7795	846.6537	809.3294	766.3926	729.0237	691.9607	672.5201	681.7942	(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	51.5882	51.7497	51.9122	52.7405	52.9093	53.7699	53.7699	53.9454	53.4223	52.9093	52.5727	52.2404	
alpha	4.4392	4.4500	4.4608	4.5160	4.5273	4.5847	4.5847	4.5964	4.5615	4.5273	4.5048	4.4827	
util living area	0.9740	0.9616	0.9346	0.8711	0.7511	0.5749	0.4258	0.4661	0.6902	0.8878	0.9582	0.9776	(86)
MIT	19.8379	20.0023	20.2682	20.5972	20.8423	20.9649	20.9928	20.9893	20.9194	20.6208	20.1825	19.8088	(87)
Th 2	20.1231	20.1256	20.1281	20.1406	20.1431	20.1557	20.1557	20.1582	20.1507	20.1431	20.1381	20.1331	(88)
util rest of house	0.9686	0.9538	0.9211	0.8449	0.7045	0.5074	0.3465	0.3845	0.6243	0.8594	0.9483	0.9729	(89)
MIT 2	19.0767	19.2393	19.4987	19.8178	20.0333	20.1372	20.1532	20.1542	20.1036	19.8476	19.4277	19.0561	(90)
Living area fraction									fLA = Living area / (4) =			0.4460	(91)
MIT	19.4162	19.5796	19.8419	20.1654	20.3941	20.5064	20.5277	20.5267	20.4674	20.1924	19.7643	19.3918	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4162	19.5796	19.8419	20.1654	20.3941	20.5064	20.5277	20.5267	20.4674	20.1924	19.7643	19.3918	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9633	0.9480	0.9160	0.8457	0.7188	0.5361	0.3818	0.4206	0.6500	0.8612	0.9432	0.9679	(94)
Useful gains	683.1485	724.4994	742.2615	718.8039	628.0842	453.8868	308.9766	322.3816	473.8368	595.9461	634.3263	659.9362	(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	1249.1142	1209.2486	1095.6151	910.5693	700.4917	468.2641	311.3901	326.1021	508.1039	772.8720	1026.9095	1239.6889	(97)
Space heating kWh	421.0785	325.7514	262.8951	138.0711	53.8712	0.0000	0.0000	0.0000	0.0000	131.6329	282.6599	431.3360	(98a)
Space heating requirement - total per year (kWh/year)												2047.2961	
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	421.0785	325.7514	262.8951	138.0711	53.8712	0.0000	0.0000	0.0000	0.0000	131.6329	282.6599	431.3360	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2047.2961	
Space heating per m2											(98c) / (4) =	23.6000	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	84.5000	(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	421.0785	325.7514	262.8951	138.0711	53.8712	0.0000	0.0000	0.0000	0.0000	131.6329	282.6599	431.3360	(98)
Space heating efficiency (main heating system 1)	84.5000	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000	(210)

```
Space heating fuel (main heating system)
             498.3177   385.5047   311.1184   163.3977    63.7529     0.0000     0.0000     0.0000     0.0000   155.7786   334.5088   510.4568 (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
             322.3333   285.1193   302.3844   263.8719   254.5960   228.0461   223.7456   233.1791   236.4082   265.3121   284.2900   318.4883 (64)
Efficiency of water heater                                                                                                                 89.5000 (216)
(217)m        89.5000    89.5000    89.5000    89.5000    89.5000    89.5000    89.5000    89.5000    89.5000    89.5000    89.5000    89.5000 (217)
Fuel for water heating, kWh/month
             360.1489   318.5691   337.8597   294.8290   284.4648   254.8001   249.9950   260.5353   264.1432   296.4381   317.6425   355.8528 (219)
Space cooling fuel requirement
(221)m         0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (221)
Pumps and Fa  24.1625    21.8242    24.1625    23.3830    24.1625    23.3830    24.1625    24.1625    23.3830    24.1625    23.3830    24.1625 (231)
Lighting      36.5581    29.3283    26.4069    19.3468    14.9440    12.2094    13.6324    17.7200    23.0165    30.1989    34.1096    37.5742 (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                                                                                                      2422.8356 (211)
Space heating fuel - main system 2                                                                                                         0.0000 (213)
Space heating fuel - secondary                                                                                                             0.0000 (215)
Efficiency of water heater                                                                                                                89.5000
Water heating fuel used                                                                                                                 3595.2785 (219)
Space cooling fuel                                                                                                                         0.0000 (221)

Electricity for pumps and fans:
    (BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)
   mechanical ventilation fans (SFP =       0.6050)                                                                                       198.4935 (230a)
   central heating pump                                                                                                                   41.0000 (230c)
   main heating flue fan                                                                                                                  45.0000 (230e)
Total electricity for the above, kWh/year                                                                                                284.4935 (231)
Electricity for lighting (calculated in Appendix L)                                                                                      295.0451 (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                                                                                                     6597.6527 (238)


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10a. Fuel costs - using Table 12 prices
-------------------------------------------------------------------------------------------------------------
                                                                  Fuel          Fuel price           Fuel cost
                                                               kWh/year             p/kWh             £/year
Space heating - main system 1                                2422.8356             3.6400           88.1912 (240)
Total CO2 associated with community systems                                                           0.0000 (473)
Water heating (other fuel)                                   3595.2785             3.6400          130.8681 (247)
Energy for instantaneous electric shower(s)                     0.0000            16.4900            0.0000 (247a)
Pumps, fans and electric keep-hot                             284.4935            16.4900           46.9130 (249)
Energy for lighting                                           295.0451            16.4900           48.6529 (250)
Additional standing charges                                                                         92.0000 (251)
Total energy cost                                                                                  406.6253 (255)


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11a. SAP rating - Individual heating systems
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Energy cost deflator (Table 12):                                                                    0.3600 (256)
Energy cost factor (ECF)                                                [(255) x (256)] / [(4) + 45.0] =        1.1111 (257)
SAP value                                                                                          81.9894
SAP rating (Section 12)                                                                                82 (258)
SAP band                                                                                                B


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12a. Carbon dioxide emissions - Individual heating systems including micro-CHP
-------------------------------------------------------------------------------------------------------------
                                                                  Energy  Emission factor          Emissions
                                                               kWh/year        kg CO2/kWh        kg CO2/year
Space heating - main system 1                                2422.8356            0.2100           508.7955 (261)
Total CO2 associated with community systems                                                           0.0000 (373)
Water heating (other fuel)                                   3595.2785            0.2100           755.0085 (264)
Space and water heating                                                                            1263.8040 (265)
Pumps, fans and electric keep-hot                             284.4935            0.1387            39.4628 (267)
Energy for lighting                                           295.0451            0.1443            42.5841 (268)
Total CO2, kg/year                                                                                 1345.8508 (272)
CO2 emissions per m2                                                                                 15.5100 (273)
EI value                                                                                             86.3116
EI rating                                                                                               86 (274)
EI band                                                                                                  B


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SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	86.7500	(1b)	x 3.1000	(2b) =	268.9250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		268.9250	(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		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000	(22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750	(22a)
Adj infilt rate	0.1337	0.1250	0.1279	0.1162	0.1162	0.1017	0.1046	0.1104	0.1075	0.1133	0.1133	0.1250	(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) =	81.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2287	0.2200	0.2229	0.2112	0.2112	0.1967	0.1996	0.2054	0.2025	0.2083	0.2083	0.2200	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			1.8900	1.4000	2.6460			(26)
window (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
RL			1.4500	1.2357	1.7918			(27a)
External Wall 1	40.6700	4.5500	36.1200	0.1300	4.6956	70.0000	2528.4000	(29a)
dormer wall	20.6000	2.4300	18.1700	0.1800	3.2706	70.0000	1271.9000	(29a)
sheltered 3rd floor only	16.4300	1.8900	14.5400	0.1800	2.6172	9.0000	130.8600	(29a)
main sloping roof	56.3000	1.4500	54.8500	0.1100	6.0335	9.0000	493.6500	(30)
flat roof rear	45.0000		45.0000	0.1100	4.9500	9.0000	405.0000	(30)
Total net area of external elements Aum(A, m2)			179.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9971			(33)
Party Wall 1			20.8300	0.0000	0.0000	180.0000	3749.4000	(32)
Party Floor 1			86.7500			30.0000	2602.5000	(32d)
Party Ceiling 1			86.7500			30.0000	2602.5000	(32b)
Internal Wall 1			173.6000			9.0000	1562.4000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15346.6100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	176.9062 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6100	0.0600	0.3366
E3 Sill	4.7100	0.0400	0.1884
E4 Jamb	19.0800	0.0200	0.3816
R11 Upstands or kerbs of rooflights	6.8000	0.2400	1.6320
E24 Eaves (insulation at ceiling level - inverted)	24.9000	0.1500	3.7350
E7 Party floor between dwellings (in blocks of flats)	6.8000	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.0000	0.0000	0.0000
E16 Corner (normal)	15.5000	0.0500	0.7750
R4 Ridge (vaulted ceiling)	11.0000	0.1200	1.3200
E15 Flat roof with parapet	14.2000	0.3000	4.2600
E11 Eaves (insulation at rafter level)	14.4000	0.1500	2.1600
P4 Party wall - Roof (insulation at ceiling level)	8.0000	0.4800	3.8400
P5 Party wall - Roof (insulation at rafter level)	12.8000	0.4800	6.1440
R4 Ridge (vaulted ceiling)	7.0000	0.1200	0.8400
R7 Flat ceiling (inverted)	12.0000	0.1200	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	27.0526 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 61.0497 (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	20.2949	19.5212	19.7791	18.7474	18.7474	17.4579	17.7158	18.2316	17.9737	18.4895	18.4895	19.5212	(38)

Heat transfer coeff

	81.3446	80.5709	80.8288	79.7971	79.7971	78.5075	78.7655	79.2813	79.0234	79.5392	79.5392	80.5709 (39)
Average = Sum(39)m / 12 =												79.7971
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9377	0.9288	0.9317	0.9199	0.9199	0.9050	0.9080	0.9139	0.9109	0.9169	0.9169	0.9288 (40)
HLP (average)												0.9199
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5786 (42)
Hot water usage for mixer showers												
	101.1809	99.6603	97.4446	93.2052	90.0766	86.5876	84.6045	86.8034	89.2139	92.9600	97.2905	100.7932 (42a)
Hot water usage for baths												
	29.1306	28.6980	28.0887	26.9654	26.1243	25.1916	24.6878	25.2928	25.9515	26.9495	28.0960	29.0321 (42b)
Hot water usage for other uses												
	41.0372	39.5449	38.0526	36.5604	35.0681	33.5759	33.5759	35.0681	36.5604	38.0526	39.5449	41.0372 (42c)
Average daily hot water use (litres/day)												157.6005 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	171.3486	167.9032	163.5860	156.7310	151.2690	145.3551	142.8682	147.1644	151.7258	157.9622	164.9314	170.8625 (44)
Energy conte	271.3744	239.0919	251.4255	214.5568	203.6371	178.7310	172.7867	182.2202	187.0931	214.3532	234.9750	267.5294 (45)
Energy content (annual)										Total = Sum(45)m =		2617.7742
Distribution loss (46)m = 0.15 x (45)m												
	40.7062	35.8638	37.7138	32.1835	30.5456	26.8097	25.9180	27.3330	28.0640	32.1530	35.2462	40.1294 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
	322.3333	285.1193	302.3844	263.8719	254.5960	228.0461	223.7456	233.1791	236.4082	265.3121	284.2900	318.4883 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h												
	322.3333	285.1193	302.3844	263.8719	254.5960	228.0461	223.7456	233.1791	236.4082	265.3121	284.2900	318.4883 (64)
										Total per year (kWh/year) = Sum(64)m =		3217.7742 (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												
	102.9717	91.0049	96.3387	83.6689	80.4491	71.7568	70.1913	73.3279	74.5372	84.0122	90.4579	101.6932 (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	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	41.7667	37.0968	30.1691	22.8400	17.0732	14.4139	15.5747	20.2446	27.1722	34.5014	40.2682	42.9275	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.7163	351.3245	342.2320	322.8750	298.4402	275.4750	260.1329	256.5247	265.6172	284.9742	309.4090	332.3742	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	(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)													
	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	(71)
Water heating gains (Table 5)													
	138.4028	135.4240	129.4875	116.2068	108.1305	99.6623	94.3431	98.5591	103.5239	112.9196	125.6360	136.6845	(72)
Total internal gains													
	635.5073	631.4667	609.5101	569.5432	531.2653	494.1726	474.6721	479.9498	500.9348	540.0166	582.9346	619.6076	(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	4.5500	11.5821	0.7200	0.7000	0.7700	18.4061	(74)
South	2.4300	49.2853	0.7200	0.7000	0.7700	41.8300	(78)
North	1.4500	29.0000	0.7200	0.7000	1.0000	19.0739	(82)

Solar gains	79.3099	128.7007	196.2859	286.0873	338.6742	373.9999	356.0059	310.8407	247.2605	161.1134	99.6581	68.5290 (83)
Total gains	714.8172	760.1675	805.7959	855.6305	869.9395	868.1725	830.6781	790.7905	748.1953	701.1301	682.5927	688.1366 (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	52.4060	52.9093	52.7405	53.4223	53.4223	54.2998	54.1220	53.7699	53.9454	53.5955	53.5955	52.9093
alpha	4.4937	4.5273	4.5160	4.5615	4.5615	4.6200	4.6081	4.5847	4.5964	4.5730	4.5730	4.5273
util living area												
	0.9654	0.9528	0.9125	0.8193	0.6501	0.4117	0.2368	0.2702	0.5510	0.8245	0.9391	0.9693 (86)
MIT	20.0204	20.1514	20.4379	20.7403	20.9304	20.9937	20.9997	20.9993	20.9753	20.7791	20.3721	19.9995 (87)
Th 2	20.1356	20.1431	20.1406	20.1507	20.1507	20.1633	20.1607	20.1557	20.1582	20.1532	20.1532	20.1431 (88)
util rest of house												
	0.9580	0.9430	0.8940	0.7838	0.5908	0.3388	0.1574	0.1860	0.4726	0.7816	0.9245	0.9626 (89)
MIT 2	19.2660	19.3989	19.6710	19.9544	20.1086	20.1610	20.1607	20.1556	20.1470	19.9958	19.6229	19.2519 (90)
Living area fraction									fLA = Living area / (4) =			0.4460 (91)
MIT	19.6024	19.7345	20.0131	20.3049	20.4751	20.5324	20.5349	20.5319	20.5164	20.3452	19.9570	19.5854 (92)

Temperature adjustment											0.0000	
adjusted MIT	19.6024	19.7345	20.0131	20.3049	20.4751	20.5324	20.5349	20.5319	20.5164	20.3452	19.9570	19.5854 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9525	0.9375	0.8910	0.7907	0.6141	0.3712	0.1929	0.2236	0.5067	0.7921	0.9206	0.9574	(94)
Useful gains	680.8753	712.6625	717.9330	676.5216	534.2587	322.2610	160.2119	176.8047	379.0835	555.3720	628.3740	658.8254	(95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000	(96)
Heat loss rate W	1155.2904	1122.7134	987.1674	798.3633	564.5734	324.4218	160.2778	176.9482	388.5103	655.8130	927.1912	1142.9265	(97)
Space heating kWh	352.9648	275.5542	200.3104	87.7260	22.5541	0.0000	0.0000	0.0000	0.0000	74.7281	215.1483	360.1712	(98a)
Space heating requirement - total per year (kWh/year)												1589.1572	
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	352.9648	275.5542	200.3104	87.7260	22.5541	0.0000	0.0000	0.0000	0.0000	74.7281	215.1483	360.1712	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1589.1572	
Space heating per m2											(98c) / (4) =	18.3188	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												84.5000	(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	352.9648	275.5542	200.3104	87.7260	22.5541	0.0000	0.0000	0.0000	0.0000	74.7281	215.1483	360.1712	(98)
Space heating efficiency (main heating system 1)	84.5000	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000	(210)
Space heating fuel (main heating system)	417.7098	326.0996	237.0537	103.8178	26.6913	0.0000	0.0000	0.0000	0.0000	88.4357	254.6134	426.2381	(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	322.3333	285.1193	302.3844	263.8719	254.5960	228.0461	223.7456	233.1791	236.4082	265.3121	284.2900	318.4883	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	360.1489	318.5691	337.8597	294.8290	284.4648	254.8001	249.9950	260.5353	264.1432	296.4381	317.6425	355.8528	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	24.1625	21.8242	24.1625	23.3830	24.1625	23.3830	24.1625	24.1625	23.3830	24.1625	23.3830	24.1625	(231)
Lighting	36.5581	29.3283	26.4069	19.3468	14.9440	12.2094	13.6324	17.7200	23.0165	30.1989	34.1096	37.5742	(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	1880.6594	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	3595.2785	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)		
mechanical ventilation fans (SFP = 0.6050)	198.4935	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	284.4935	(231)
Electricity for lighting (calculated in Appendix L)	295.0451	(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	6055.4765	(238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1880.6594	6.1900	116.4128	(240)

Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3595.2785	6.1900	222.5477	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	284.4935	25.1600	71.5786	(249)
Energy for lighting	295.0451	25.1600	74.2333	(250)
Additional standing charges			102.0000	(251)
Total energy cost			586.7725	(255)

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	1880.6594	0.2100	394.9385	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3595.2785	0.2100	755.0085	(264)
Space and water heating			1149.9470	(265)
Pumps, fans and electric keep-hot	284.4935	0.1387	39.4628	(267)
Energy for lighting	295.0451	0.1443	42.5841	(268)
Total CO2, kg/year			1231.9938	(272)

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	1880.6594	1.1300	2125.1452	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3595.2785	1.1300	4062.6647	(278)
Space and water heating			6187.8098	(279)
Pumps, fans and electric keep-hot	284.4935	1.5128	430.3818	(281)
Energy for lighting	295.0451	1.5338	452.5500	(282)
Total Primary energy kWh/year			7070.7416	(286)

SAP 10 EPC IMPROVEMENTS

Be Lean

Current energy efficiency rating: B 82
Current environmental impact rating: B 86

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: B 82
Potential environmental impact rating: B 86

Fuel prices for cost data on this page from database revision number 538 TEST (29 Feb 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£146	£146	£0
Mains gas	£441	£441	£0
Space heating	£290	£290	£0
Water heating	£223	£223	£0
Lighting	£74	£74	£0
Total cost of fuels	£587	£587	£0
Total cost of uses	£587	£587	£0
Delivered energy	70 kWh/m²	70 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.2 tonnes	1.2 tonnes	0.0 tonnes
CO2 emissions per m²	14 kg/m²	14 kg/m²	0 kg/m²
Primary energy	82 kWh/m²	82 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		86.7500 (1b)	x	3.1000 (2b)	=	268.9250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7500						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	268.9250	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(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) =		81.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			1.8900	1.4000	2.6460			(26)
window (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
RL			1.4500	1.2357	1.7918			(27a)
External Wall 1	40.6700	4.5500	36.1200	0.1300	4.6956	70.0000	2528.4000	(29a)
dormer wall	20.6000	2.4300	18.1700	0.1800	3.2706	70.0000	1271.9000	(29a)
sheltered 3rd floor only	16.4300	1.8900	14.5400	0.1800	2.6172	9.0000	130.8600	(29a)
main sloping roof	56.3000	1.4500	54.8500	0.1100	6.0335	9.0000	493.6500	(30)
flat roof rear	45.0000		45.0000	0.1100	4.9500	9.0000	405.0000	(30)
Total net area of external elements Aum(A, m2)			179.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.9971			(33)
Party Wall 1			20.8300	0.0000	0.0000	180.0000	3749.4000	(32)
Party Floor 1			86.7500			30.0000	2602.5000	(32d)
Party Ceiling 1			86.7500			30.0000	2602.5000	(32b)
Internal Wall 1			173.6000			9.0000	1562.4000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15346.6100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		176.9062 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6100	0.0600	0.3366
E3 Sill	4.7100	0.0400	0.1884
E4 Jamb	19.0800	0.0200	0.3816
R11 Upstands or kerbs of rooflights	6.8000	0.2400	1.6320
E24 Eaves (insulation at ceiling level - inverted)	24.9000	0.1500	3.7350
E7 Party floor between dwellings (in blocks of flats)	6.8000	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.0000	0.0000	0.0000
E16 Corner (normal)	15.5000	0.0500	0.7750
R4 Ridge (vaulted ceiling)	11.0000	0.1200	1.3200
E15 Flat roof with parapet	14.2000	0.3000	4.2600
E11 Eaves (insulation at rafter level)	14.4000	0.1500	2.1600
P4 Party wall - Roof (insulation at ceiling level)	8.0000	0.4800	3.8400
P5 Party wall - Roof (insulation at rafter level)	12.8000	0.4800	6.1440
R4 Ridge (vaulted ceiling)	7.0000	0.1200	0.8400
R7 Flat ceiling (inverted)	12.0000	0.1200	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		27.0526 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	61.0497 (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	21.5845	21.3266	21.0687	19.7791	19.5212	18.2316	18.2316	17.9737	18.7474	19.5212	20.0370	20.5528	(38)
Heat transfer coeff	82.6342	82.3763	82.1184	80.8288	80.5709	79.2813	79.2813	79.0234	79.7971	80.5709	81.0867	81.6025	(39)
Average = Sum(39)m / 12 =												80.7643	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9526	0.9496	0.9466	0.9317	0.9288	0.9139	0.9139	0.9109	0.9199	0.9288	0.9347	0.9407	(40)
HLP (average)												0.9310	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5786 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
101.1809	99.6603	97.4446	93.2052	90.0766	86.5876	84.6045	86.8034	89.2139	92.9600	97.2905	100.7932	(42a)

Hot water usage for baths

29.1306	28.6980	28.0887	26.9654	26.1243	25.1916	24.6878	25.2928	25.9515	26.9495	28.0960	29.0321	(42b)

Hot water usage for other uses

41.0372	39.5449	38.0526	36.5604	35.0681	33.5759	33.5759	35.0681	36.5604	38.0526	39.5449	41.0372	(42c)

Average daily hot water use (litres/day) 157.6005 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	171.3486	167.9032	163.5860	156.7310	151.2690	145.3551	142.8682	147.1644	151.7258	157.9622	164.9314	170.8625	(44)
Energy conte	271.3744	239.0919	251.4255	214.5568	203.6371	178.7310	172.7867	182.2202	187.0931	214.3532	234.9750	267.5294	(45)
Energy content (annual)										Total = Sum(45)m =		2617.7742	
Distribution loss (46)m = 0.15 x (45)m													
	40.7062	35.8638	37.7138	32.1835	30.5456	26.8097	25.9180	27.3330	28.0640	32.1530	35.2462	40.1294	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	322.3333	285.1193	302.3844	263.8719	254.5960	228.0461	223.7456	233.1791	236.4082	265.3121	284.2900	318.4883	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	322.3333	285.1193	302.3844	263.8719	254.5960	228.0461	223.7456	233.1791	236.4082	265.3121	284.2900	318.4883	(64)
										Total per year (kWh/year) = Sum(64)m =		3217.7742	(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													
	102.9717	91.0049	96.3387	83.6689	80.4491	71.7568	70.1913	73.3279	74.5372	84.0122	90.4579	101.6932	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	41.7667	37.0968	30.1691	22.8400	17.0732	14.4139	15.5747	20.2446	27.1722	34.5014	40.2682	42.9275	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.7163	351.3245	342.2320	322.8750	298.4402	275.4750	260.1329	256.5247	265.6172	284.9742	309.4090	332.3742	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	(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)													
	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	(71)
Water heating gains (Table 5)													
	138.4028	135.4240	129.4875	116.2068	108.1305	99.6623	94.3431	98.5591	103.5239	112.9196	125.6360	136.6845	(72)
Total internal gains													
	635.5073	631.4667	609.5101	569.5432	531.2653	494.1726	474.6721	479.9498	500.9348	540.0166	582.9346	619.6076	(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	4.5500	10.6334	0.7200	0.7000	0.7700	16.8985	(74)
South	2.4300	46.7521	0.7200	0.7000	0.7700	39.6799	(78)
North	1.4500	26.0000	0.7200	0.7000	1.0000	17.1007	(82)

Solar gains	73.6791	132.7962	200.7962	280.3608	342.5142	352.4811	334.6572	286.4428	228.0889	151.9440	89.5854	62.1866	(83)
Total gains	709.1864	764.2629	810.3062	849.9040	873.7795	846.6537	809.3294	766.3926	729.0237	691.9607	672.5201	681.7942	(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	51.5882	51.7497	51.9122	52.7405	52.9093	53.7699	53.7699	53.9454	53.4223	52.9093	52.5727	52.2404	
alpha	4.4392	4.4500	4.4608	4.5160	4.5273	4.5847	4.5847	4.5964	4.5615	4.5273	4.5048	4.4827	
util living area													
	0.9740	0.9616	0.9346	0.8711	0.7511	0.5749	0.4258	0.4661	0.6902	0.8878	0.9582	0.9776	(86)
MIT	19.8379	20.0023	20.2682	20.5972	20.8423	20.9649	20.9928	20.9893	20.9194	20.6208	20.1825	19.8088	(87)
Th 2	20.1231	20.1256	20.1281	20.1406	20.1431	20.1557	20.1557	20.1582	20.1507	20.1431	20.1381	20.1331	(88)
util rest of house													
	0.9686	0.9538	0.9211	0.8449	0.7045	0.5074	0.3465	0.3845	0.6243	0.8594	0.9483	0.9729	(89)
MIT 2	19.0767	19.2393	19.4987	19.8178	20.0333	20.1372	20.1532	20.1542	20.1036	19.8476	19.4277	19.0561	(90)
Living area fraction									fLA = Living area / (4) =			0.4460	(91)
MIT	19.4162	19.5796	19.8419	20.1654	20.3941	20.5064	20.5277	20.5267	20.4674	20.1924	19.7643	19.3918	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4162	19.5796	19.8419	20.1654	20.3941	20.5064	20.5277	20.5267	20.4674	20.1924	19.7643	19.3918	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9633	0.9480	0.9160	0.8457	0.7188	0.5361	0.3818	0.4206	0.6500	0.8612	0.9432	0.9679	(94)
Useful gains	683.1485	724.4994	742.2615	718.8039	628.0842	453.8868	308.9766	322.3816	473.8368	595.9461	634.3263	659.9362	(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													
	1249.1142	1209.2486	1095.6151	910.5693	700.4917	468.2641	311.3901	326.1021	508.1039	772.8720	1026.9095	1239.6889	(97)
Space heating kWh													
	421.0785	325.7514	262.8951	138.0711	53.8712	0.0000	0.0000	0.0000	0.0000	131.6329	282.6599	431.3360	(98a)
Space heating requirement - total per year (kWh/year)												2047.2961	
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	(98b)
Solar heating contribution - total per year (kWh/year)											0.0000	
Space heating kWh												
	421.0785	325.7514	262.8951	138.0711	53.8712	0.0000	0.0000	0.0000	0.0000	131.6329	282.6599	431.3360 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)											2047.2961	
Space heating per m2										(98c) / (4) =	23.6000	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)											0.0000	(201)
Fraction of space heat from main system(s)											1.0000	(202)
Efficiency of main space heating system 1 (in %)											84.5000	(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													
	421.0785	325.7514	262.8951	138.0711	53.8712	0.0000	0.0000	0.0000	0.0000	131.6329	282.6599	431.3360	(98)
Space heating efficiency (main heating system 1)													
	84.5000	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000	(210)
Space heating fuel (main heating system)													
	498.3177	385.5047	311.1184	163.3977	63.7529	0.0000	0.0000	0.0000	0.0000	155.7786	334.5088	510.4568	(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													
	322.3333	285.1193	302.3844	263.8719	254.5960	228.0461	223.7456	233.1791	236.4082	265.3121	284.2900	318.4883	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	360.1489	318.5691	337.8597	294.8290	284.4648	254.8001	249.9950	260.5353	264.1432	296.4381	317.6425	355.8528	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	24.1625	21.8242	24.1625	23.3830	24.1625	23.3830	24.1625	24.1625	23.3830	24.1625	23.3830	24.1625	(231)
Lighting	36.5581	29.3283	26.4069	19.3468	14.9440	12.2094	13.6324	17.7200	23.0165	30.1989	34.1096	37.5742	(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											2422.8356		(211)
Space heating fuel - main system 2											0.0000		(213)
Space heating fuel - secondary											0.0000		(215)
Efficiency of water heater											89.5000		
Water heating fuel used											3595.2785		(219)
Space cooling fuel											0.0000		(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)													
mechanical ventilation fans (SFP = 0.6050)											198.4935		(230a)
central heating pump											41.0000		(230c)
main heating flue fan											45.0000		(230e)
Total electricity for the above, kWh/year											284.4935		(231)
Electricity for lighting (calculated in Appendix L)											295.0451		(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											6597.6527		(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2422.8356	3.6400	88.1912	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3595.2785	3.6400	130.8681	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	284.4935	16.4900	46.9130	(249)
Energy for lighting	295.0451	16.4900	48.6529	(250)
Additional standing charges			92.0000	(251)
Total energy cost			406.6253	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1111	(257)
SAP value		81.9894	
SAP rating (Section 12)		82	(258)
SAP band		B	

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	2422.8356	0.2100	508.7955	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3595.2785	0.2100	755.0085	(264)
Space and water heating			1263.8040	(265)
Pumps, fans and electric keep-hot	284.4935	0.1387	39.4628	(267)
Energy for lighting	295.0451	0.1443	42.5841	(268)
Total CO2, kg/year			1345.8508	(272)
CO2 emissions per m2			15.5100	(273)
EI value			86.3116	
EI rating			86	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	86.7500	(1b)	x 3.1000	(2b) =	268.9250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	268.9250	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000	(22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750	(22a)
Adj infilt rate	0.1337	0.1250	0.1279	0.1162	0.1162	0.1017	0.1046	0.1104	0.1075	0.1133	0.1133	0.1250	(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) =	81.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2287	0.2200	0.2229	0.2112	0.2112	0.1967	0.1996	0.2054	0.2025	0.2083	0.2083	0.2200	(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	
front door			1.8900	1.4000	2.6460			(26)
window (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
RL			1.4500	1.2357	1.7918			(27a)
External Wall 1	40.6700	4.5500	36.1200	0.1300	4.6956	70.0000	2528.4000	(29a)
dormer wall	20.6000	2.4300	18.1700	0.1800	3.2706	70.0000	1271.9000	(29a)
sheltered 3rd floor only	16.4300	1.8900	14.5400	0.1800	2.6172	9.0000	130.8600	(29a)
main sloping roof	56.3000	1.4500	54.8500	0.1100	6.0335	9.0000	493.6500	(30)
flat roof rear	45.0000		45.0000	0.1100	4.9500	9.0000	405.0000	(30)
Total net area of external elements Aum(A, m2)			179.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.9971			(33)
Party Wall 1			20.8300	0.0000	0.0000	180.0000	3749.4000	(32)
Party Floor 1			86.7500			30.0000	2602.5000	(32d)
Party Ceiling 1			86.7500			30.0000	2602.5000	(32b)
Internal Wall 1			173.6000			9.0000	1562.4000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15346.6100	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	176.9062	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E2 Other lintels (including other steel lintels)	5.6100	0.0600	0.3366	
E3 Sill	4.7100	0.0400	0.1884	
E4 Jamb	19.0800	0.0200	0.3816	
R11 Upstands or kerbs of rooflights	6.8000	0.2400	1.6320	
E24 Eaves (insulation at ceiling level - inverted)	24.9000	0.1500	3.7350	
E7 Party floor between dwellings (in blocks of flats)	6.8000	0.0000	0.0000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.0000	0.0000	0.0000	
E16 Corner (normal)	15.5000	0.0500	0.7750	
R4 Ridge (vaulted ceiling)	11.0000	0.1200	1.3200	
E15 Flat roof with parapet	14.2000	0.3000	4.2600	
E11 Eaves (insulation at rafter level)	14.4000	0.1500	2.1600	
P4 Party wall - Roof (insulation at ceiling level)	8.0000	0.4800	3.8400	
P5 Party wall - Roof (insulation at rafter level)	12.8000	0.4800	6.1440	
R4 Ridge (vaulted ceiling)	7.0000	0.1200	0.8400	
R7 Flat ceiling (inverted)	12.0000	0.1200	1.4400	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) = 27.0526 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 61.0497 (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	20.2949	19.5212	19.7791	18.7474	18.7474	17.4579	17.7158	18.2316	17.9737	18.4895	18.4895	19.5212	(38)
Heat transfer coeff	81.3446	80.5709	80.8288	79.7971	79.7971	78.5075	78.7655	79.2813	79.0234	79.5392	79.5392	80.5709	(39)
Average = Sum(39)m / 12 =												79.7971	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9377	0.9288	0.9317	0.9199	0.9199	0.9050	0.9080	0.9139	0.9109	0.9169	0.9169	0.9288	(40)
HLP (average)												0.9199	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5786 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
101.1809	99.6603	97.4446	93.2052	90.0766	86.5876	84.6045	86.8034	89.2139	92.9600	97.2905	100.7932	(42a)

Hot water usage for baths

29.1306	28.6980	28.0887	26.9654	26.1243	25.1916	24.6878	25.2928	25.9515	26.9495	28.0960	29.0321	(42b)

Hot water usage for other uses

41.0372	39.5449	38.0526	36.5604	35.0681	33.5759	33.5759	35.0681	36.5604	38.0526	39.5449	41.0372	(42c)

Average daily hot water use (litres/day) 157.6005 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	171.3486	167.9032	163.5860	156.7310	151.2690	145.3551	142.8682	147.1644	151.7258	157.9622	164.9314	170.8625	(44)
Energy conte	271.3744	239.0919	251.4255	214.5568	203.6371	178.7310	172.7867	182.2202	187.0931	214.3532	234.9750	267.5294	(45)
Energy content (annual)											Total = Sum(45)m =	2617.7742	
Distribution loss (46)m = 0.15 x (45)m	40.7062	35.8638	37.7138	32.1835	30.5456	26.8097	25.9180	27.3330	28.0640	32.1530	35.2462	40.1294	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	322.3333	285.1193	302.3844	263.8719	254.5960	228.0461	223.7456	233.1791	236.4082	265.3121	284.2900	318.4883	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	322.3333	285.1193	302.3844	263.8719	254.5960	228.0461	223.7456	233.1791	236.4082	265.3121	284.2900	318.4883	(64)
										Total per year (kWh/year) = Sum(64)m =		3217.7742	(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	102.9717	91.0049	96.3387	83.6689	80.4491	71.7568	70.1913	73.3279	74.5372	84.0122	90.4579	101.6932	(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	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	154.7143	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.7667	37.0968	30.1691	22.8400	17.0732	14.4139	15.5747	20.2446	27.1722	34.5014	40.2682	42.9275	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.7163	351.3245	342.2320	322.8750	298.4402	275.4750	260.1329	256.5247	265.6172	284.9742	309.4090	332.3742	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	53.0500	(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)	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	(71)
Water heating gains (Table 5)	138.4028	135.4240	129.4875	116.2068	108.1305	99.6623	94.3431	98.5591	103.5239	112.9196	125.6360	136.6845	(72)
Total internal gains	635.5073	631.4667	609.5101	569.5432	531.2653	494.1726	474.6721	479.9498	500.9348	540.0166	582.9346	619.6076	(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	4.5500	11.5821	0.7200	0.7000	0.7700	18.4061	(74)
South	2.4300	49.2853	0.7200	0.7000	0.7700	41.8300	(78)
North	1.4500	29.0000	0.7200	0.7000	1.0000	19.0739	(82)

Solar gains	79.3099	128.7007	196.2859	286.0873	338.6742	373.9999	356.0059	310.8407	247.2605	161.1134	99.6581	68.5290	(83)
Total gains	714.8172	760.1675	805.7959	855.6305	869.9395	868.1725	830.6781	790.7905	748.1953	701.1301	682.5927	688.1366	(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	52.4060	52.9093	52.7405	53.4223	53.4223	54.2998	54.1220	53.7699	53.9454	53.5955	53.5955	52.9093	
alpha	4.4937	4.5273	4.5160	4.5615	4.5615	4.6200	4.6081	4.5847	4.5964	4.5730	4.5730	4.5273	
util living area	0.9654	0.9528	0.9125	0.8193	0.6501	0.4117	0.2368	0.2702	0.5510	0.8245	0.9391	0.9693	(86)
MIT	20.0204	20.1514	20.4379	20.7403	20.9304	20.9937	20.9997	20.9993	20.9753	20.7791	20.3721	19.9995	(87)
Th 2	20.1356	20.1431	20.1406	20.1507	20.1507	20.1633	20.1607	20.1557	20.1582	20.1532	20.1532	20.1431	(88)
util rest of house	0.9580	0.9430	0.8940	0.7838	0.5908	0.3388	0.1574	0.1860	0.4726	0.7816	0.9245	0.9626	(89)
MIT 2	19.2660	19.3989	19.6710	19.9544	20.1086	20.1610	20.1607	20.1556	20.1470	19.9958	19.6229	19.2519	(90)
Living area fraction										fLA = Living area / (4) =		0.4460	(91)
MIT	19.6024	19.7345	20.0131	20.3049	20.4751	20.5324	20.5349	20.5319	20.5164	20.3452	19.9570	19.5854	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6024	19.7345	20.0131	20.3049	20.4751	20.5324	20.5349	20.5319	20.5164	20.3452	19.9570	19.5854	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9525	0.9375	0.8910	0.7907	0.6141	0.3712	0.1929	0.2236	0.5067	0.7921	0.9206	0.9574	(94)
Useful gains	680.8753	712.6625	717.9330	676.5216	534.2587	322.2610	160.2119	176.8047	379.0835	555.3720	628.3740	658.8254	(95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000	(96)
Heat loss rate W	1155.2904	1122.7134	987.1674	798.3633	564.5734	324.4218	160.2778	176.9482	388.5103	655.8130	927.1912	1142.9265	(97)
Space heating kWh	352.9648	275.5542	200.3104	87.7260	22.5541	0.0000	0.0000	0.0000	0.0000	74.7281	215.1483	360.1712	(98a)
Space heating requirement - total per year (kWh/year)												1589.1572	
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	352.9648	275.5542	200.3104	87.7260	22.5541	0.0000	0.0000	0.0000	0.0000	74.7281	215.1483	360.1712	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1589.1572	
Space heating per m2										(98c) / (4) =		18.3188	(99)

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

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

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

Efficiency of main space heating system 1 (in %) 84.5000 (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	352.9648	275.5542	200.3104	87.7260	22.5541	0.0000	0.0000	0.0000	0.0000	74.7281	215.1483	360.1712	(98)
Space heating efficiency (main heating system 1)	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000	84.5000	(210)
Space heating fuel (main heating system)	417.7098	326.0996	237.0537	103.8178	26.6913	0.0000	0.0000	0.0000	0.0000	88.4357	254.6134	426.2381	(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	322.3333	285.1193	302.3844	263.8719	254.5960	228.0461	223.7456	233.1791	236.4082	265.3121	284.2900	318.4883	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	360.1489	318.5691	337.8597	294.8290	284.4648	254.8001	249.9950	260.5353	264.1432	296.4381	317.6425	355.8528	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	24.1625	21.8242	24.1625	23.3830	24.1625	23.3830	24.1625	24.1625	23.3830	24.1625	23.3830	24.1625	(231)
Lighting	36.5581	29.3283	26.4069	19.3468	14.9440	12.2094	13.6324	17.7200	23.0165	30.1989	34.1096	37.5742	(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 1880.6594 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 89.5000

Water heating fuel used 3595.2785 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)

mechanical ventilation fans (SFP = 0.6050) 198.4935 (230a)

central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	284.4935	(231)
Electricity for lighting (calculated in Appendix L)	295.0451	(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	6055.4765	(238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1880.6594	6.1900	116.4128	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3595.2785	6.1900	222.5477	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	284.4935	25.1600	71.5786	(249)
Energy for lighting	295.0451	25.1600	74.2333	(250)
Additional standing charges			102.0000	(251)
Total energy cost			586.7725	(255)

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	1880.6594	0.2100	394.9385	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3595.2785	0.2100	755.0085	(264)
Space and water heating			1149.9470	(265)
Pumps, fans and electric keep-hot	284.4935	0.1387	39.4628	(267)
Energy for lighting	295.0451	0.1443	42.5841	(268)
Total CO2, kg/year			1231.9938	(272)

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	1880.6594	1.1300	2125.1452	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3595.2785	1.1300	4062.6647	(278)
Space and water heating			6187.8098	(279)
Pumps, fans and electric keep-hot	284.4935	1.5128	430.3818	(281)
Energy for lighting	295.0451	1.5338	452.5500	(282)
Total Primary energy kWh/year			7070.7416	(286)

Full SAP Calculation Printout

Property Reference	House 1 Block C	**Issued on Date**	13/03/2024
Assessment Reference	Be Lean	**Prop Type Ref**	
Property	House 1 Block C, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	82 B	**DER**	18.50	**TER**	15.17
Environmental	85 B	**% DER < TER**			-21.95
CO_2 Emissions (t/year)	1.29	**DFEE**	43.18	**TFEE**	51.57
Compliance Check	See BREL	**% DFEE < TFEE**			16.29
% DPER < TPER	-28.70	**DPER**	102.64	**TPER**	79.75

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client	KGH, Kurt Gander - Howe		

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	38.2900 (1b)	x	2.5000 (2b)	=	95.7250	(1b) - (3b)
First floor	40.6300 (1c)	x	2.8000 (2c)	=	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	209.4890	(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		4 * 10 =	40.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		40.0000 / (5) =	0.1909	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.3409	(18)
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2898	(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	0.3695	0.3622	0.3550	0.3188	0.3115	0.2753	0.2753	0.2681	0.2898	0.3115	0.3260	0.3405	(22b)
Effective ac	0.5683	0.5656	0.5630	0.5508	0.5485	0.5379	0.5379	0.5359	0.5420	0.5485	0.5531	0.5580	(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	
front door			2.4000	1.2000	2.8800			(26)
window (Uw = 1.20)			16.8300	1.1450	19.2710			(27)
rl			0.9600	1.2357	1.1863			(27a)
ground floor			38.2900	0.1000	3.8290	75.0000	2871.7500	(28a)
exposed upper			8.0000	0.1300	1.0400	20.0000	160.0000	(28b)
External Wall 1	106.0000	19.2300	86.7700	0.1300	11.2801	70.0000	6073.9000	(29a)
main flat roof	40.6300		40.6300	0.1100	4.4693	9.0000	365.6700	(30)
lower terrace	3.2000	0.9600	2.2400	0.1100	0.2464	9.0000	20.1600	(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.2021			(33)
Party Wall 1			34.9800	0.0000	0.0000	180.0000	6296.4000	(32)
Internal Wall 1			50.9600			9.0000	458.6400	(32c)
Internal Floor 1			32.6300			18.0000	587.3400	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	16833.8600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.3028 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	15.6000	0.0600	0.9360

E3 Sill	14.6000	0.0400	0.5840	
E4 Jamb	23.9600	0.0200	0.4792	
E5 Ground floor (normal)	20.0000	0.1300	2.6000	
E6 Intermediate floor within a dwelling	7.9400	0.0000	0.0000	
E24 Eaves (insulation at ceiling level - inverted)	5.0000	0.1500	0.7500	
E15 Flat roof with parapet	20.0000	0.3000	6.0000	
E21 Exposed floor (inverted)	6.8000	0.3200	2.1760	
E20 Exposed floor (normal)	7.5000	0.3200	2.4000	
E16 Corner (normal)	17.5000	0.0500	0.8750	
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0600	-0.4500	
E18 Party wall between dwellings	0.0000	0.2400	0.0000	
P1 Party wall - Ground floor	6.8000	0.3200	2.1760	
P2 Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	6.8000	0.4800	3.2640	
R11 Upstands or kerbs of rooflights	4.0000	0.2400	0.9600	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 22.7502 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 66.9523 (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	39.2848	39.1016	38.9219	38.0783	37.9204	37.1856	37.1856	37.0495	37.4686	37.9204	38.2397	38.5736	(38)
Heat transfer coeff	106.2371	106.0539	105.8742	105.0306	104.8727	104.1379	104.1379	104.0018	104.4209	104.8727	105.1920	105.5259	(39)
Average = Sum(39)m / 12 =												105.0298	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3461	1.3438	1.3415	1.3308	1.3288	1.3195	1.3195	1.3178	1.3231	1.3288	1.3329	1.3371	(40)
HLP (average)												1.3308	
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 2.4420 (42)

Hot water usage for mixer showers

97.7473	96.2783	94.1378	90.0422	87.0198	83.6492	81.7334	83.8577	86.1864	89.8054	93.9889	97.3728	(42a)

Hot water usage for baths

28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511	(42b)

Hot water usage for other uses

39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390	(42c)

Average daily hot water use (litres/day) 152.2512 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	165.5325	162.2042	158.0335	151.4112	146.1347	140.4215	138.0189	142.1692	146.5758	152.6004	159.3331	165.0629	(44)
Energy conte	262.1631	230.9766	242.8917	207.2744	196.7253	172.6646	166.9219	176.0352	180.7426	207.0773	226.9992	258.4486	(45)
Energy content (annual)											Total = Sum(45)m =	2528.9204	
Distribution loss (46)m = 0.15 x (45)m	39.3245	34.6465	36.4337	31.0912	29.5088	25.8997	25.0383	26.4053	27.1114	31.0616	34.0499	38.7673	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(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	313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(64)
										Total per year (kWh/year) = Sum(64)m =		3128.9204	(64)
12Total per year (kWh/year)												3129	(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	99.9089	88.3066	93.5012	81.2475	78.1509	69.7398	68.2413	71.2714	72.4257	81.5929	87.8060	98.6739	(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	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.5142	121.2478	109.5142	113.1646	109.5142	113.1646	109.5142	109.5142	113.1646	109.5142	113.1646	109.5142	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.1685	219.4221	213.7433	201.6537	186.3928	172.0498	162.4677	160.2142	165.8930	177.9825	193.2434	207.5865	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	(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)	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	(71)
Water heating gains (Table 5)	134.2862	131.4086	125.6737	112.8437	105.0415	96.8608	91.7221	95.7949	100.5912	109.6679	121.9528	132.6262	(72)
Total internal gains	523.5997	534.7092	511.5618	490.2928	463.5793	441.7059	423.3348	425.1540	439.2796	459.7954	490.9916	512.3576	(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	4.5400	10.6334	0.7200	0.7000	0.7700	16.8613	(74)
South	8.3500	46.7521	0.7200	0.7000	0.7700	136.3487	(78)
West	3.9400	19.6403	0.7200	0.7000	0.7700	27.0276	(80)
South	0.9600	26.0000	0.7200	0.7000	1.0000	11.3219	(82)

Solar gains	191.5595	331.9132	468.0802	601.7477	692.7268	695.6430	667.3985	598.5163	514.3199	370.6883	230.4906	163.2450	(83)
Total gains	715.1592	866.6224	979.6420	1092.0405	1156.3061	1137.3489	1090.7333	1023.6703	953.5995	830.4837	721.4822	675.6026	(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	44.0154	44.0915	44.1663	44.5211	44.5881	44.9027	44.9027	44.9614	44.7810	44.5881	44.4527	44.3121	
alpha	3.9344	3.9394	3.9444	3.9681	3.9725	3.9935	3.9935	3.9974	3.9854	3.9725	3.9635	3.9541	
util living area													
	0.9831	0.9647	0.9310	0.8543	0.7259	0.5552	0.4124	0.4552	0.6753	0.8911	0.9682	0.9862	(86)
MIT	19.4181	19.7124	20.0788	20.4994	20.7985	20.9479	20.9875	20.9815	20.8864	20.4804	19.8692	19.3628	(87)
Th 2	19.8049	19.8067	19.8084	19.8167	19.8183	19.8256	19.8256	19.8269	19.8228	19.8183	19.8152	19.8119	(88)
util rest of house													
	0.9784	0.9554	0.9129	0.8177	0.6627	0.4650	0.3060	0.3448	0.5864	0.8546	0.9582	0.9824	(89)
MIT 2	18.4055	18.6941	19.0476	19.4410	19.6922	19.8028	19.8224	19.8218	19.7658	19.4374	18.8582	18.3564	(90)
Living area fraction										fLA = Living area / (4) =		0.3833	(91)
MIT	18.7936	19.0844	19.4429	19.8467	20.1162	20.2417	20.2690	20.2663	20.1953	19.8372	19.2457	18.7421	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.6436	18.9344	19.2929	19.6967	19.9662	20.0917	20.1190	20.1163	20.0453	19.6872	19.0957	18.5921	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9723	0.9467	0.9034	0.8135	0.6712	0.4862	0.3331	0.3727	0.6045	0.8498	0.9502	0.9770	(94)
Useful gains	695.3353	820.4345	885.0386	888.3518	776.1425	553.0291	363.3240	381.5637	576.4323	705.7587	685.5406	660.0790	(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													
	1523.8260	1488.4045	1354.4333	1133.9845	866.9019	571.8962	366.4601	386.5029	620.8187	952.9994	1261.8562	1518.7430	(97)
Space heating kWh													
	616.3971	448.8758	349.2297	176.8556	67.5250	0.0000	0.0000	0.0000	0.0000	183.9471	414.9472	638.8460	(98a)
Space heating requirement - total per year (kWh/year)												2896.6235	
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													
	616.3971	448.8758	349.2297	176.8556	67.5250	0.0000	0.0000	0.0000	0.0000	183.9471	414.9472	638.8460	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2896.6235	
Space heating per m2											(98c) / (4) =	36.7033	(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 %)												89.5000	(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													
	616.3971	448.8758	349.2297	176.8556	67.5250	0.0000	0.0000	0.0000	0.0000	183.9471	414.9472	638.8460	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	688.7118	501.5372	390.2007	197.6040	75.4470	0.0000	0.0000	0.0000	0.0000	205.5275	463.6282	713.7944	(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													
	313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	349.8570	309.5016	328.3247	286.6921	276.7422	248.0220	243.4423	253.6247	257.0476	288.3086	308.7310	345.7067	(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	29.2809	23.4903	21.1504	15.4957	11.9693	9.7790	10.9188	14.1927	18.4349	24.1875	27.3198	30.0947	(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												3236.4509	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												3496.0004	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:

central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	236.3139	(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	7054.7652	(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	3236.4509	0.2100	679.6547	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3496.0004	0.2100	734.1601	(264)
Space and water heating			1413.8148	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	236.3139	0.1443	34.1074	(268)
Total CO2, kg/year			1459.8514	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			18.5000	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3236.4509	1.1300	3657.1895	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3496.0004	1.1300	3950.4805	(278)
Space and water heating			7607.6700	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	236.3139	1.5338	362.4662	(282)
Total Primary energy kWh/year			8100.2369	(286)
Dwelling Primary energy Rate (DPER)			102.6400	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		38.2900 (1b)	x	2.5000 (2b)	=	95.7250	(1b) - (3b)
First floor		40.6300 (1c)	x	2.8000 (2c)	=	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9200						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	209.4890	(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) =	0.1432	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3932	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3342	(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	0.4261	0.4178	0.4094	0.3676	0.3593	0.3175	0.3175	0.3092	0.3342	0.3593	0.3760	0.3927	(22b)
Effective ac	0.5908	0.5873	0.5838	0.5676	0.5645	0.5504	0.5504	0.5478	0.5559	0.5645	0.5707	0.5771	(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			2.4000	1.0000	2.4000			(26)
TER Opening Type (Uw = 1.20)			16.4000	1.1450	18.7786			(27)
rl			0.9400	2.0221	1.9007			(27a)
ground floor			38.2900	0.1300	4.9777			(28a)
exposed upper			8.0000	0.1300	1.0400			(28b)
External Wall 1	106.0000	18.8000	87.2000	0.1800	15.6960			(29a)
main flat roof	40.6300		40.6300	0.1100	4.4693			(30)
lower terrace	3.2000	0.9400	2.2600	0.1100	0.2486			(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	49.5110			(33)
Party Wall 1			34.9800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.3028 (35)

List of Thermal Bridges

		Length	Psi-value	Total
K1	Element			
E2	Other lintels (including other steel lintels)	15.6000	0.0500	0.7800
E3	Sill	14.6000	0.0500	0.7300
E4	Jamb	23.9600	0.0500	1.1980
E5	Ground floor (normal)	20.0000	0.1600	3.2000
E6	Intermediate floor within a dwelling	7.9400	0.0000	0.0000
E24	Eaves (insulation at ceiling level - inverted)	5.0000	0.2400	1.2000
E15	Flat roof with parapet	20.0000	0.5600	11.2000
E21	Exposed floor (inverted)	6.8000	0.3200	2.1760
E20	Exposed floor (normal)	7.5000	0.3200	2.4000
E16	Corner (normal)	17.5000	0.0900	1.5750
E17	Corner (inverted - internal area greater than external area)	7.5000	-0.0900	-0.6750
E18	Party wall between dwellings	0.0000	0.0600	0.0000
P1	Party wall - Ground floor	6.8000	0.0800	0.5440
P2	Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000
P4	Party wall - Roof (insulation at ceiling level)	6.8000	0.1200	0.8160
R11	Upstands or kerbs of rooflights	4.0000	0.0800	0.3200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 25.4640 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 74.9750 (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	40.8426	40.5988	40.3599	39.2377	39.0278	38.0504	38.0504	37.8694	38.4269	39.0278	39.4525	39.8966	(38)
Heat transfer coeff	115.8175	115.5738	115.3349	114.2127	114.0027	113.0254	113.0254	112.8444	113.4018	114.0027	114.4275	114.8715	(39)

Average = Sum(39)m / 12 = 114.2117

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4675	1.4644	1.4614	1.4472	1.4445	1.4322	1.4322	1.4299	1.4369	1.4445	1.4499	1.4555	(40)
HLP (average)												1.4472	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4420 (42)

Hot water usage for mixer showers

65.1648	64.1855	62.7585	60.0281	58.0132	55.7661	54.4889	55.9052	57.4576	59.8703	62.6593	64.9152	(42a)

Hot water usage for baths

28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511	(42b)

Hot water usage for other uses

39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390	(42c)

Average daily hot water use (litres/day) 122.2113 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.9501	130.1114	126.6543	121.3971	117.1281	112.5384	110.7745	114.2166	117.8470	122.6653	128.0034	132.6053	(44)
Energy conte	210.5605	185.2769	194.6629	166.1866	157.6769	138.3791	133.9721	141.4240	145.3171	166.4556	182.3644	207.6278	(45)

Energy content (annual) Total = Sum(45)m = 2029.9040

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

31.5841	27.7915	29.1994	24.9280	23.6515	20.7569	20.0958	21.2136	21.7976	24.9683	27.3547	31.1442	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)

Primary loss
Combi loss

Total heat required for water heating calculated for each month

261.5194	231.3043	245.6218	215.5017	208.6358	187.6942	184.9310	192.3830	194.6321	217.4145	231.6794	258.5867	(62)
-29.7906	-26.3471	-27.5892	-22.8449	-21.2906	-18.2185	-17.0770	-18.1597	-18.8496	-22.2216	-25.1744	-29.2390	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS

Output from w/h

231.7287	204.9572	218.0327	192.6568	187.3452	169.4757	167.8540	174.2233	175.7825	195.1929	206.5050	229.3478	(64)

Total per year (kWh/year) = Sum(64)m = 2353.1018 (64)

12Total per year (kWh/year) 2353 (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

82.7511	73.1114	77.4651	67.5858	65.1673	58.3398	57.2854	59.7632	60.6467	68.0862	72.9649	81.7760	(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	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.5450	121.2820	109.5450	113.1965	109.5450	113.1965	109.5450	109.5450	113.1965	109.5450	113.1965	109.5450	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.1685	219.4221	213.7433	201.6537	186.3928	172.0498	162.4677	160.2142	165.8930	177.9825	193.2434	207.5865	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	(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)													

	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	(71)
Water heating gains (Table 5)												
	111.2246	108.7967	104.1198	93.8692	87.5904	81.0275	76.9966	80.3269	84.2315	91.5137	101.3402	109.9140 (72)
Total internal gains												
	500.5689	512.1315	490.0388	471.3501	446.1590	425.9045	408.6400	409.7168	422.9518	441.6720	470.4108	489.6762 (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	4.4200	10.6334	0.6300	0.7000	0.7700	14.3637	(74)
South	8.1400	46.7521	0.6300	0.7000	0.7700	116.3046	(78)
West	3.8400	19.6403	0.6300	0.7000	0.7700	23.0489	(80)
South	0.9400	26.0000	0.6300	0.7000	1.0000	9.7002	(82)

Solar gains	163.4175	283.1620	399.3484	513.4095	591.0432	593.5338	569.4343	510.6573	438.8066	316.2477	196.6312	139.2613 (83)
Total gains	663.9863	795.2935	889.3873	984.7597	1037.2022	1019.4383	978.0743	920.3741	861.7584	757.9198	667.0421	628.9375 (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	40.3745	40.4596	40.5434	40.9418	41.0172	41.3719	41.3719	41.4382	41.2345	41.0172	40.8649	40.7070	
alpha	3.6916	3.6973	3.7029	3.7295	3.7345	3.7581	3.7581	3.7625	3.7490	3.7345	3.7243	3.7138	
util living area													
	0.9872	0.9748	0.9524	0.8983	0.7974	0.6390	0.4880	0.5335	0.7498	0.9229	0.9768	0.9895	(86)
MIT	19.1559	19.4335	19.8083	20.2798	20.6622	20.8956	20.9709	20.9592	20.8022	20.2957	19.6411	19.1098	(87)
Th 2	19.7119	19.7143	19.7166	19.7273	19.7294	19.7388	19.7388	19.7405	19.7351	19.7294	19.7253	19.7210	(88)
util rest of house													
	0.9835	0.9677	0.9385	0.8679	0.7370	0.5380	0.3576	0.4010	0.6592	0.8930	0.9689	0.9864	(89)
MIT 2	17.6171	17.9689	18.4387	19.0177	19.4487	19.6784	19.7294	19.7259	19.6030	19.0528	18.2427	17.5645	(90)
Living area fraction										fLA = Living area / (4) =		0.3833	(91)
MIT	18.2069	18.5303	18.9636	19.5015	19.9138	20.1449	20.2052	20.1986	20.0626	19.5292	18.7787	18.1568	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2069	18.5303	18.9636	19.5015	19.9138	20.1449	20.2052	20.1986	20.0626	19.5292	18.7787	18.1568	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9773	0.9588	0.9280	0.8615	0.7467	0.5725	0.4074	0.4513	0.6851	0.8872	0.9609	0.9810	(94)
Useful gains	648.9378	762.5107	825.3835	848.3700	774.5012	583.6743	398.4940	415.3850	590.4012	672.4162	640.9460	616.9604	(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													
	1610.6654	1575.3029	1437.4933	1210.8228	936.3951	626.7184	407.4845	428.6524	676.1725	1017.9557	1336.3664	1603.2434	(97)
Space heating kWh													
	715.5253	546.1964	455.4097	260.9661	120.4491	0.0000	0.0000	0.0000	0.0000	257.0814	500.7027	733.7946	(98a)
Space heating requirement - total per year (kWh/year)												3590.1252	
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													
	715.5253	546.1964	455.4097	260.9661	120.4491	0.0000	0.0000	0.0000	0.0000	257.0814	500.7027	733.7946	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3590.1252	
Space heating per m2											(98c) / (4) =	45.4907	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	715.5253	546.1964	455.4097	260.9661	120.4491	0.0000	0.0000	0.0000	0.0000	257.0814	500.7027	733.7946	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	774.3781	591.1216	492.8676	282.4308	130.3562	0.0000	0.0000	0.0000	0.0000	278.2266	541.8861	794.1500	(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													
	231.7287	204.9572	218.0327	192.6568	187.3452	169.4757	167.8540	174.2233	175.7825	195.1929	206.5050	229.3478	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.6303	86.3759	85.9208	85.0323	83.4595	80.3000	80.3000	80.3000	80.3000	84.9724	86.2042	86.6892	(217)
Fuel for water heating, kWh/month													
	267.4915	237.2852	253.7601	226.5690	224.4744	211.0531	209.0336	216.9655	218.9073	229.7132	239.5535	264.5633	(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	22.7613	18.2599	16.4411	12.0454	9.3042	7.6016	8.4876	11.0325	14.3302	18.8020	21.2368	23.3939	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-35.9441	-50.7401	-73.0350	-82.2424	-88.7930	-82.9175	-81.8821	-77.2349	-69.0675	-58.0584	-39.5348	-31.0672	(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	-20.1200	-42.3446	-84.1987	-126.5159	-167.3420	-168.1628	-166.1945	-140.7034	-103.1067	-60.5900	-26.8737	-15.9100	(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	3885.4169	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2799.3697	(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)	183.6966	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1892.5792	(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	5061.9040	(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	3885.4169	0.2100	815.9375	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2799.3697	0.2100	587.8676	(264)
Space and water heating			1403.8052	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	183.6966	0.1443	26.5131	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-770.5169	0.1346	-103.6782	
PV Unit electricity exported	-1122.0623	0.1259	-141.2475	
Total			-244.9257	(269)
Total CO2, kg/year			1197.3219	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.1700	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3885.4169	1.1300	4390.5211	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2799.3697	1.1300	3163.2878	(278)
Space and water heating			7553.8089	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	183.6966	1.5338	281.7600	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-770.5169	1.4973	-1153.6926	
PV Unit electricity exported	-1122.0623	0.4621	-518.4746	
Total			-1672.1672	(283)
Total Primary energy kWh/year			6293.5025	(286)
Target Primary Energy Rate (TPER)			79.7500	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	38.2900 (1b)	x	2.5000 (2b)	=	95.7250	(1b) - (3b)
First floor	40.6300 (1c)	x	2.8000 (2c)	=	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 78.9200						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	209.4890	(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	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) =	0.1432 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.2932 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2492 (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													
	0.3178	0.3115	0.3053	0.2741	0.2679	0.2368	0.2368	0.2305	0.2492	0.2679	0.2804	0.2928	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5505	0.5485	0.5466	0.5376	0.5359	0.5280	0.5280	0.5266	0.5311	0.5359	0.5393	0.5429	(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	
front door			2.4000	1.2000	2.8800			(26)
window (Uw = 1.20)			16.8300	1.1450	19.2710			(27)
rl			0.9600	1.2357	1.1863			(27a)
ground floor			38.2900	0.1000	3.8290	75.0000	2871.7500	(28a)
exposed upper			8.0000	0.1300	1.0400	20.0000	160.0000	(28b)
External Wall 1	106.0000	19.2300	86.7700	0.1300	11.2801	70.0000	6073.9000	(29a)
main flat roof	40.6300		40.6300	0.1100	4.4693	9.0000	365.6700	(30)
lower terrace	3.2000	0.9600	2.2400	0.1100	0.2464	9.0000	20.1600	(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.2021			(33)
Party Wall 1			34.9800	0.0000	0.0000	180.0000	6296.4000	(32)
Internal Wall 1			50.9600			9.0000	458.6400	(32c)
Internal Floor 1			32.6300			18.0000	587.3400	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	16833.8600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.3028 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	15.6000	0.0600	0.9360
E3 Sill	14.6000	0.0400	0.5840
E4 Jamb	23.9600	0.0200	0.4792
E5 Ground floor (normal)	20.0000	0.1300	2.6000
E6 Intermediate floor within a dwelling	7.9400	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	5.0000	0.1500	0.7500
E15 Flat roof with parapet	20.0000	0.3000	6.0000
E21 Exposed floor (inverted)	6.8000	0.3200	2.1760
E20 Exposed floor (normal)	7.5000	0.3200	2.4000
E16 Corner (normal)	17.5000	0.0500	0.8750
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0600	-0.4500
E18 Party wall between dwellings	0.0000	0.2400	0.0000
P1 Party wall - Ground floor	6.8000	0.3200	2.1760
P2 Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.8000	0.4800	3.2640
R11 Upstands or kerbs of rooflights	4.0000	0.2400	0.9600

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		22.7502 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	66.9523 (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	38.0559	37.9203	37.7875	37.1635	37.0468	36.5033	36.5033	36.4027	36.7127	37.0468	37.2830	37.5299	(38)
Heat transfer coeff													
	105.0082	104.8726	104.7398	104.1158	103.9991	103.4556	103.4556	103.3550	103.6650	103.9991	104.2353	104.4822	(39)
Average = Sum(39)m / 12 =												104.1153	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3306	1.3288	1.3272	1.3193	1.3178	1.3109	1.3109	1.3096	1.3135	1.3178	1.3208	1.3239	(40)
HLP (average)												1.3193	
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		2.4420 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511	(42b)

Hot water usage for other uses

39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390	(42c)

Average daily hot water use (litres/day)	62.1315 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	67.7853	65.9258	63.8958	61.3690	59.1149	56.7723	56.2855	58.3115	60.3893	62.7950	65.3442	67.6901	(44)
Energy conte	107.3553	93.8775	98.2054	84.0111	79.5800	69.8082	68.0725	72.2018	74.4661	85.2123	93.0947	105.9864	(45)
Energy content (annual)										Total = Sum(45)m =		1031.8712	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)

Combi loss	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													
	91.2520	79.7959	83.4746	71.4094	67.6430	59.3369	57.8616	61.3715	63.2962	72.4304	79.1305	90.0884	(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													
	91.2520	79.7959	83.4746	71.4094	67.6430	59.3369	57.8616	61.3715	63.2962	72.4304	79.1305	90.0884	(64)
										Total per year (kWh/year) = Sum(64)m =		877.0905	(64)
12Total per year (kWh/year)												877	(64)
Electric shower(s)													
	52.1862	46.4983	50.7744	48.4534	49.3626	47.0871	48.6567	49.3626	48.4534	50.7744	49.8196	52.1862	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		593.6147	(64a)
Heat gains from water heating, kWh/month													
	35.8595	31.5736	33.5622	29.9657	29.2514	26.6060	26.6296	27.6835	27.9374	30.8012	32.2375	35.5686	(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	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	109.5142	121.2478	109.5142	113.1646	109.5142	113.1646	109.5142	109.5142	113.1646	109.5142	113.1646	109.5142	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	217.1685	219.4221	213.7433	201.6537	186.3928	172.0498	162.4677	160.2142	165.8930	177.9825	193.2434	207.5865	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	(71)
Water heating gains (Table 5)													
	48.1983	46.9845	45.1105	41.6190	39.3164	36.9528	35.7924	37.2090	38.8019	41.3995	44.7744	47.8073	(72)
Total internal gains													
	434.5118	447.2851	427.9987	416.0681	394.8541	381.7979	367.4051	366.5681	377.4903	388.5269	410.8132	424.5387	(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	4.5400	10.6334	0.7200	0.7000	0.7700	16.8613	(74)
South	8.3500	46.7521	0.7200	0.7000	0.7700	136.3487	(78)
West	3.9400	19.6403	0.7200	0.7000	0.7700	27.0276	(80)
South	0.9600	26.0000	0.7200	0.7000	1.0000	11.3219	(82)

Solar gains	191.5595	331.9132	468.0802	601.7477	692.7268	695.6430	667.3985	598.5163	514.3199	370.6883	230.4906	163.2450	(83)
Total gains	626.0712	779.1983	896.0789	1017.8158	1087.5809	1077.4409	1034.8036	965.0844	891.8103	759.2152	641.3038	587.7837	(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	44.5306	44.5881	44.6447	44.9122	44.9626	45.1988	45.1988	45.2428	45.1075	44.9626	44.8608	44.7547	
alpha	3.9687	3.9725	3.9763	3.9941	3.9975	4.0133	4.0133	4.0162	4.0072	3.9975	3.9907	3.9836	
util living area													
	0.9891	0.9745	0.9458	0.8750	0.7505	0.5778	0.4306	0.4777	0.7040	0.9127	0.9781	0.9914	(86)
MIT	19.3195	19.6231	20.0049	20.4517	20.7757	20.9411	20.9857	20.9785	20.8699	20.4227	19.7804	19.2606	(87)
Th 2	19.8170	19.8183	19.8196	19.8258	19.8269	19.8323	19.8323	19.8333	19.8302	19.8269	19.8246	19.8222	(88)
util rest of house													
	0.9861	0.9675	0.9308	0.8416	0.6889	0.4861	0.3208	0.3635	0.6159	0.8813	0.9708	0.9890	(89)
MIT 2	18.3176	18.6169	18.9880	19.4086	19.6844	19.8062	19.8287	19.8273	19.7637	19.3955	18.7799	18.2632	(90)
Living area fraction										fLA = Living area / (4) =		0.3833	(91)
MIT	18.7016	19.0026	19.3777	19.8084	20.1027	20.2412	20.2722	20.2685	20.1877	19.7892	19.1634	18.6455	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7016	19.0026	19.3777	19.8084	20.1027	20.2412	20.2722	20.2685	20.1877	19.7892	19.1634	18.6455	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9821	0.9613	0.9241	0.8410	0.7045	0.5194	0.3629	0.4072	0.6448	0.8801	0.9654	0.9856	(94)
Useful gains	614.8527	749.0432	828.0270	856.0328	766.1691	559.6652	375.5683	392.9473	575.0046	668.1964	619.1407	579.3235	(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													
	1512.2863	1478.9745	1348.8117	1135.7420	873.8736	583.6133	379.9072	399.8317	631.0808	955.6709	1257.4323	1509.2940	(97)
Space heating kWh													
	667.6907	490.5138	387.4638	201.3906	80.1321	0.0000	0.0000	0.0000	0.0000	213.8810	459.5700	691.8981	(98a)
Space heating requirement - total per year (kWh/year)												3192.5402	
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													
	667.6907	490.5138	387.4638	201.3906	80.1321	0.0000	0.0000	0.0000	0.0000	213.8810	459.5700	691.8981	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3192.5402	
Space heating per m2											(98c) / (4) =	40.4529	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

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

Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	972.4830	765.5717	785.4980	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8755	0.9260	0.9045	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	851.3888	708.8951	710.5035	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1202.6464	1155.7518	1078.7503	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	252.9054	332.4614	273.9756	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	63.2264	83.1153	68.4939	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												214.8356	(107)
Energy for space heating												40.4529	(99)
Energy for space cooling												2.7222	(108)
Total												43.1751	(109)
Fabric Energy Efficiency (DFEE)												43.2	(109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	38.2900	(1b)	x 2.5000	(2b) =	95.7250	(1b) - (3b)
First floor	40.6300	(1c)	x 2.8000	(2c) =	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		209.4890	(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	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) =	0.1432	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3932	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3342	(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													
	0.4261	0.4178	0.4094	0.3676	0.3593	0.3175	0.3175	0.3092	0.3342	0.3593	0.3760	0.3927	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5908	0.5873	0.5838	0.5676	0.5645	0.5504	0.5504	0.5478	0.5559	0.5645	0.5707	0.5771	(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			2.4000	1.0000	2.4000			(26)
TER Opening Type (Uw = 1.20)			16.4000	1.1450	18.7786			(27)
rl			0.9400	2.0221	1.9007			(27a)
ground floor			38.2900	0.1300	4.9777			(28a)
exposed upper			8.0000	0.1300	1.0400			(28b)
External Wall 1	106.0000	18.8000	87.2000	0.1800	15.6960			(29a)
main flat roof	40.6300		40.6300	0.1100	4.4693			(30)
lower terrace	3.2000	0.9400	2.2600	0.1100	0.2486			(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.5110			(33)
Party Wall 1			34.9800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	213.3028	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	15.6000	0.0500	0.7800
E3 Sill	14.6000	0.0500	0.7300
E4 Jamb	23.9600	0.0500	1.1980
E5 Ground floor (normal)	20.0000	0.1600	3.2000
E6 Intermediate floor within a dwelling	7.9400	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	5.0000	0.2400	1.2000
E15 Flat roof with parapet	20.0000	0.5600	11.2000
E21 Exposed floor (inverted)	6.8000	0.3200	2.1760

E20 Exposed floor (normal)	7.5000	0.3200	2.4000	
E16 Corner (normal)	17.5000	0.0900	1.5750	
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0900	-0.6750	
E18 Party wall between dwellings	0.0000	0.0600	0.0000	
P1 Party wall - Ground floor	6.8000	0.0800	0.5440	
P2 Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	6.8000	0.1200	0.8160	
R11 Upstands or kerbs of rooflights	4.0000	0.0800	0.3200	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 25.4640 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 74.9750 (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	40.8426	40.5988	40.3599	39.2377	39.0278	38.0504	38.0504	37.8694	38.4269	39.0278	39.4525	39.8966	(38)
Heat transfer coeff	115.8175	115.5738	115.3349	114.2127	114.0027	113.0254	113.0254	112.8444	113.4018	114.0027	114.4275	114.8715	(39)
Average = Sum(39)m / 12 =												114.2117	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4675	1.4644	1.4614	1.4472	1.4445	1.4322	1.4322	1.4299	1.4369	1.4445	1.4499	1.4555	(40)
HLP (average)												1.4472	
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 2.4420 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511	(42b)

Hot water usage for other uses

39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390	(42c)

Average daily hot water use (litres/day) 62.1315 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	67.7853	65.9258	63.8958	61.3690	59.1149	56.7723	56.2855	58.3115	60.3893	62.7950	65.3442	67.6901	(44)
Energy conte	107.3553	93.8775	98.2054	84.0111	79.5800	69.8082	68.0725	72.2018	74.4661	85.2123	93.0947	105.9864	(45)
Energy content (annual)										Total = Sum(45)m =		1031.8712	

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

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 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

91.2520	79.7959	83.4746	71.4094	67.6430	59.3369	57.8616	61.3715	63.2962	72.4304	79.1305	90.0884	(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

91.2520	79.7959	83.4746	71.4094	67.6430	59.3369	57.8616	61.3715	63.2962	72.4304	79.1305	90.0884	(64)
									Total per year (kWh/year) = Sum(64)m =		877.0905	(64)
12Total per year (kWh/year)											877	(64)

Electric shower(s)

52.1862	46.4983	50.7744	48.4534	49.3626	47.0871	48.6567	49.3626	48.4534	50.7744	49.8196	52.1862	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				593.6147	(64a)

Heat gains from water heating, kWh/month

35.8595	31.5736	33.5622	29.9657	29.2514	26.6060	26.6296	27.6835	27.9374	30.8012	32.2375	35.5686	(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	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.5450	121.2820	109.5450	113.1965	109.5450	113.1965	109.5450	109.5450	113.1965	109.5450	113.1965	109.5450	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.1685	219.4221	213.7433	201.6537	186.3928	172.0498	162.4677	160.2142	165.8930	177.9825	193.2434	207.5865	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	(71)
Water heating gains (Table 5)	48.1983	46.9845	45.1105	41.6190	39.3164	36.9528	35.7924	37.2090	38.8019	41.3995	44.7744	47.8073	(72)
Total internal gains	434.5426	447.3192	428.0295	416.1000	394.8850	381.8298	367.4359	366.5990	377.5222	388.5578	410.8450	424.5696	(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	4.4200	10.6334	0.6300	0.7000	0.7700	14.3637	(74)
South	8.1400	46.7521	0.6300	0.7000	0.7700	116.3046	(78)
West	3.8400	19.6403	0.6300	0.7000	0.7700	23.0489	(80)
South	0.9400	26.0000	0.6300	0.7000	1.0000	9.7002	(82)

Solar gains	163.4175	283.1620	399.3484	513.4095	591.0432	593.5338	569.4343	510.6573	438.8066	316.2477	196.6312	139.2613	(83)
Total gains	597.9601	730.4812	827.3780	929.5095	985.9282	975.3636	936.8702	877.2562	816.3288	704.8055	607.4763	563.8309	(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	40.3745	40.4596	40.5434	40.9418	41.0172	41.3719	41.3719	41.4382	41.2345	41.0172	40.8649	40.7070	
alpha	3.6916	3.6973	3.7029	3.7295	3.7345	3.7581	3.7581	3.7625	3.7490	3.7345	3.7243	3.7138	
util living area	0.9909	0.9806	0.9613	0.9119	0.8164	0.6595	0.5066	0.5552	0.7724	0.9364	0.9827	0.9926	(86)
MIT	19.0650	19.3485	19.7336	20.2263	20.6302	20.8837	20.9670	20.9534	20.7796	20.2385	19.5621	19.0193	(87)
Th 2	19.7119	19.7143	19.7166	19.7273	19.7294	19.7388	19.7388	19.7405	19.7351	19.7294	19.7253	19.7210	(88)
util rest of house	0.9882	0.9750	0.9496	0.8844	0.7586	0.5580	0.3725	0.4193	0.6840	0.9106	0.9766	0.9905	(89)
MIT 2	17.9898	18.2712	18.6499	19.1271	19.4867	19.6856	19.7304	19.7273	19.6182	19.1513	18.4931	17.9509	(90)
Living area fraction										fLA = Living area / (4) =		0.3833	(91)
MIT	18.4019	18.6841	19.0653	19.5484	19.9250	20.1448	20.2044	20.1972	20.0633	19.5681	18.9029	18.3604	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4019	18.6841	19.0653	19.5484	19.9250	20.1448	20.2044	20.1972	20.0633	19.5681	18.9029	18.3604	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9843	0.9689	0.9420	0.8798	0.7686	0.5929	0.4239	0.4710	0.7096	0.9065	0.9713	0.9871	(94)
Useful gains	588.5923	707.7588	779.3894	817.7748	757.7411	578.3125	397.1222	413.2026	579.3056	638.9009	590.0245	556.5798	(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	1633.2504	1593.0848	1449.2190	1216.1828	937.6742	626.7080	407.3859	428.4983	676.2519	1022.3843	1350.5713	1626.6289	(97)
Space heating kWh	777.2256	594.9391	498.3532	286.8537	133.8702	0.0000	0.0000	0.0000	0.0000	285.3116	547.5937	796.1165	(98a)
Space heating requirement - total per year (kWh/year)												3920.2637	
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	777.2256	594.9391	498.3532	286.8537	133.8702	0.0000	0.0000	0.0000	0.0000	285.3116	547.5937	796.1165	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3920.2637	
Space heating per m2											(98c) / (4) =	49.6739	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1062.4386	836.3878	857.6173	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7982	0.8672	0.8384	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	848.0336	725.2962	719.0510	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1085.4066	1043.2413	977.7150	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	170.9086	236.5511	192.4460	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	42.7272	59.1378	48.1115	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												149.9764	(107)
Energy for space heating												49.6739	(99)
Energy for space cooling												1.9004	(108)
Total												51.5743	(109)
Fabric Energy Efficiency (TFEE)												51.6	(109)

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

CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	38.2900	(1b)	x 2.5000	(2b) =	95.7250	(1b) - (3b)
First floor	40.6300	(1c)	x 2.8000	(2c) =	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		209.4890	(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	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

												Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =												40.0000 / (5) =	0.1909 (8)
Pressure test													Yes
Pressure Test Method													Blower Door
Measured/design AP50													3.0000 (17)
Infiltration rate													0.3409 (18)
Number of sides sheltered													2 (19)
Shelter factor												(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) =	0.2898 (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													
	0.3695	0.3622	0.3550	0.3188	0.3115	0.2753	0.2753	0.2681	0.2898	0.3115	0.3260	0.3405	(22b)
Effective ac	0.5683	0.5656	0.5630	0.5508	0.5485	0.5379	0.5379	0.5359	0.5420	0.5485	0.5531	0.5580	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.4000	1.2000	2.8800			(26)
window (Uw = 1.20)			16.8300	1.1450	19.2710			(27)
rl			0.9600	1.2357	1.1863			(27a)
ground floor			38.2900	0.1000	3.8290	75.0000	2871.7500	(28a)
exposed upper			8.0000	0.1300	1.0400	20.0000	160.0000	(28b)
External Wall 1	106.0000	19.2300	86.7700	0.1300	11.2801	70.0000	6073.9000	(29a)
main flat roof	40.6300		40.6300	0.1100	4.4693	9.0000	365.6700	(30)
lower terrace	3.2000	0.9600	2.2400	0.1100	0.2464	9.0000	20.1600	(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.2021			(33)
Party Wall 1			34.9800	0.0000	0.0000	180.0000	6296.4000	(32)
Internal Wall 1			50.9600			9.0000	458.6400	(32c)
Internal Floor 1			32.6300			18.0000	587.3400	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	16833.8600	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.3028	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	15.6000	0.0600	0.9360
E3 Sill	14.6000	0.0400	0.5840
E4 Jamb	23.9600	0.0200	0.4792
E5 Ground floor (normal)	20.0000	0.1300	2.6000
E6 Intermediate floor within a dwelling	7.9400	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	5.0000	0.1500	0.7500
E15 Flat roof with parapet	20.0000	0.3000	6.0000
E21 Exposed floor (inverted)	6.8000	0.3200	2.1760
E20 Exposed floor (normal)	7.5000	0.3200	2.4000
E16 Corner (normal)	17.5000	0.0500	0.8750
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0600	-0.4500
E18 Party wall between dwellings	0.0000	0.2400	0.0000
P1 Party wall - Ground floor	6.8000	0.3200	2.1760
P2 Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.8000	0.4800	3.2640
R11 Upstands or kerbs of rooflights	4.0000	0.2400	0.9600

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		22.7502	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	66.9523	(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	39.2848	39.1016	38.9219	38.0783	37.9204	37.1856	37.1856	37.0495	37.4686	37.9204	38.2397	38.5736	(38)
Heat transfer coeff													
	106.2371	106.0539	105.8742	105.0306	104.8727	104.1379	104.1379	104.0018	104.4209	104.8727	105.1920	105.5259	(39)
Average = Sum(39)m / 12 =												105.0298	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3461	1.3438	1.3415	1.3308	1.3288	1.3195	1.3195	1.3178	1.3231	1.3288	1.3329	1.3371	(40)
HLP (average)												1.3308	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4420	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
97.7473	96.2783	94.1378	90.0422	87.0198	83.6492	81.7334	83.8577	86.1864	89.8054	93.9889	97.3728	(42a)

Hot water usage for baths

28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511	(42b)

Hot water usage for other uses

39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390	(42c)

Average daily hot water use (litres/day)		152.2512	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	165.5325	162.2042	158.0335	151.4112	146.1347	140.4215	138.0189	142.1692	146.5758	152.6004	159.3331	165.0629	(44)
Energy conte	262.1631	230.9766	242.8917	207.2744	196.7253	172.6646	166.9219	176.0352	180.7426	207.0773	226.9992	258.4486	(45)
Energy content (annual)										Total = Sum(45)m =		2528.9204	
Distribution loss (46)m = 0.15 x (45)m													
	39.3245	34.6465	36.4337	31.0912	29.5088	25.8997	25.0383	26.4053	27.1114	31.0616	34.0499	38.7673	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(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

	313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075 (64)
										Total per year (kWh/year) = Sum(64)m =		3128.9204 (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

	99.9089	88.3066	93.5012	81.2475	78.1509	69.7398	68.2413	71.2714	72.4257	81.5929	87.8060	98.6739 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	(66)

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

	33.4527	29.7124	24.1637	18.2935	13.6746	11.5447	12.4744	16.2147	21.7634	27.6336	32.2525	34.3824 (67)

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

	324.1322	327.4956	319.0198	300.9757	278.1983	256.7907	242.4891	239.1256	247.6015	265.6456	288.4230	309.8306 (68)

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

	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943 (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)

	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820 (71)

Water heating gains (Table 5)

	134.2862	131.4086	125.6737	112.8437	105.0415	96.8608	91.7221	95.7949	100.5912	109.6679	121.9528	132.6262 (72)

Total internal gains

	595.8064	592.5519	572.7925	536.0483	500.8497	466.1315	447.6210	452.0706	470.8914	506.8825	546.5636	580.7745 (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	4.5400	10.6334	0.7200	0.7000	0.7700	16.8613	(74)
South	8.3500	46.7521	0.7200	0.7000	0.7700	136.3487	(78)
West	3.9400	19.6403	0.7200	0.7000	0.7700	27.0276	(80)
South	0.9600	26.0000	0.7200	0.7000	1.0000	11.3219	(82)

Solar gains	191.5595	331.9132	468.0802	601.7477	692.7268	695.6430	667.3985	598.5163	514.3199	370.6883	230.4906	163.2450	(83)
Total gains	787.3659	924.4651	1040.8727	1137.7959	1193.5765	1161.7745	1115.0195	1050.5869	985.2114	877.5707	777.0542	744.0195	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	44.0154	44.0915	44.1663	44.5211	44.5881	44.9027	44.9027	44.9614	44.7810	44.5881	44.4527	44.3121	
alpha	3.9344	3.9394	3.9444	3.9681	3.9725	3.9935	3.9935	3.9974	3.9854	3.9725	3.9635	3.9541	
util living area	0.9768	0.9570	0.9185	0.8403	0.7114	0.5453	0.4039	0.4445	0.6598	0.8753	0.9600	0.9810	(86)
MIT	19.5156	19.7843	20.1439	20.5337	20.8130	20.9511	20.9884	20.9830	20.8955	20.5220	19.9395	19.4569	(87)
Th 2	19.8049	19.8067	19.8084	19.8167	19.8183	19.8256	19.8256	19.8269	19.8228	19.8183	19.8152	19.8119	(88)
util rest of house	0.9706	0.9460	0.8981	0.8018	0.6476	0.4561	0.2995	0.3363	0.5711	0.8356	0.9478	0.9759	(89)
MIT 2	18.5008	18.7630	19.1074	19.4696	19.7021	19.8043	19.8227	19.8222	19.7709	19.4723	18.9251	18.4486	(90)
Living area fraction									fLA = Living area / (4) =			0.3833	(91)
MIT	18.8898	19.1545	19.5047	19.8775	20.1279	20.2439	20.2695	20.2672	20.2020	19.8747	19.3139	18.8351	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.7398	19.0045	19.3547	19.7275	19.9779	20.0939	20.1195	20.1172	20.0520	19.7247	19.1639	18.6851	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9633	0.9368	0.8888	0.7985	0.6569	0.4772	0.3261	0.3637	0.5896	0.8319	0.9392	0.9694	(94)
Useful gains	758.5048	865.9965	925.1136	908.5424	784.0347	554.4495	363.6066	382.0690	580.8381	730.0638	729.7995	721.2207	(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	1534.0417	1495.8332	1360.9807	1137.2156	868.1285	572.1197	366.5109	386.5910	621.5105	956.9291	1269.0280	1528.5517	(97)
Space heating kWh	576.9995	423.2503	324.2851	164.6448	62.5658	0.0000	0.0000	0.0000	0.0000	168.7878	388.2445	600.6543	(98a)
Space heating requirement - total per year (kWh/year)												2709.4319	
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	576.9995	423.2503	324.2851	164.6448	62.5658	0.0000	0.0000	0.0000	0.0000	168.7878	388.2445	600.6543	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2709.4319	
Space heating per m2											(98c) / (4) =	34.3314	(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 %)	89.5000 (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	576.9995	423.2503	324.2851	164.6448	62.5658	0.0000	0.0000	0.0000	0.0000	168.7878	388.2445	600.6543	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)

Space heating fuel (main heating system)

644.6921	472.9053	362.3297	183.9606	69.9059	0.0000	0.0000	0.0000	0.0000	188.5897	433.7928	671.1221	(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

313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(64)

Efficiency of water heater

											89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)

Fuel for water heating, kWh/month

349.8570	309.5016	328.3247	286.6921	276.7422	248.0220	243.4423	253.6247	257.0476	288.3086	308.7310	345.7067	(219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	29.2809	23.4903	21.1504	15.4957	11.9693	9.7790	10.9188	14.1927	18.4349	24.1875	27.3198	30.0947	(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	(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	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	(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	3027.2982	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	3496.0004	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	236.3139	(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	6845.6125	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3027.2982	3.6400	110.1937	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3496.0004	3.6400	127.2544	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	236.3139	16.4900	38.9682	(250)
Additional standing charges			92.0000	(251)
Total energy cost			382.5976	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1115	(257)
SAP value		81.9828	
SAP rating (Section 12)		82	(258)
SAP band		B	

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	3027.2982	0.2100	635.7326	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3496.0004	0.2100	734.1601	(264)
Space and water heating			1369.8927	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	236.3139	0.1443	34.1074	(268)
Total CO2, kg/year			1415.9294	(272)
CO2 emissions per m2			17.9400	(273)
EI value			84.6889	
EI rating			85	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	38.2900 (1b)	x	2.5000 (2b)	=	95.7250	(1b) - (3b)
First floor	40.6300 (1c)	x	2.8000 (2c)	=	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	209.4890	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1909	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3409	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2898	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000	(22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750	(22a)
Adj infilt rate	0.3333	0.3115	0.3188	0.2898	0.2898	0.2536	0.2608	0.2753	0.2681	0.2826	0.2826	0.3115	(22b)
Effective ac	0.5555	0.5485	0.5508	0.5420	0.5420	0.5322	0.5340	0.5379	0.5359	0.5399	0.5399	0.5485	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.4000	1.2000	2.8800			(26)
window (Uw = 1.20)			16.8300	1.1450	19.2710			(27)
rl			0.9600	1.2357	1.1863			(27a)
ground floor			38.2900	0.1000	3.8290	75.0000	2871.7500	(28a)
exposed upper			8.0000	0.1300	1.0400	20.0000	160.0000	(28b)
External Wall 1	106.0000	19.2300	86.7700	0.1300	11.2801	70.0000	6073.9000	(29a)
main flat roof	40.6300		40.6300	0.1100	4.4693	9.0000	365.6700	(30)
lower terrace	3.2000	0.9600	2.2400	0.1100	0.2464	9.0000	20.1600	(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.2021			(33)
Party Wall 1			34.9800	0.0000	0.0000	180.0000	6296.4000	(32)
Internal Wall 1			50.9600			9.0000	458.6400	(32c)
Internal Floor 1			32.6300			18.0000	587.3400	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	16833.8600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.3028 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	15.6000	0.0600	0.9360
E3 Sill	14.6000	0.0400	0.5840
E4 Jamb	23.9600	0.0200	0.4792
E5 Ground floor (normal)	20.0000	0.1300	2.6000
E6 Intermediate floor within a dwelling	7.9400	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	5.0000	0.1500	0.7500
E15 Flat roof with parapet	20.0000	0.3000	6.0000
E21 Exposed floor (inverted)	6.8000	0.3200	2.1760
E20 Exposed floor (normal)	7.5000	0.3200	2.4000
E16 Corner (normal)	17.5000	0.0500	0.8750
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0600	-0.4500
E18 Party wall between dwellings	0.0000	0.2400	0.0000
P1 Party wall - Ground floor	6.8000	0.3200	2.1760
P2 Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.8000	0.4800	3.2640
R11 Upstands or kerbs of rooflights	4.0000	0.2400	0.9600

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		22.7502 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	66.9523 (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	38.4048	37.9204	38.0783	37.4686	37.4686	36.7883	36.9171	37.1856	37.0495	37.3253	37.3253	37.9204	(38)
Heat transfer coeff	105.3572	104.8727	105.0306	104.4209	104.4209	103.7406	103.8694	104.1379	104.0018	104.2776	104.2776	104.8727	(39)
Average = Sum(39)m / 12 =												104.4400	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3350	1.3288	1.3308	1.3231	1.3231	1.3145	1.3161	1.3195	1.3178	1.3213	1.3213	1.3288	(40)
HLP (average)												1.3234	

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												2.4420	(42)
Hot water usage for mixer showers													
	97.7473	96.2783	94.1378	90.0422	87.0198	83.6492	81.7334	83.8577	86.1864	89.8054	93.9889	97.3728	(42a)
Hot water usage for baths													
	28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511	(42b)
Hot water usage for other uses													
	39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390	(42c)
Average daily hot water use (litres/day)												152.2512	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	165.5325	162.2042	158.0335	151.4112	146.1347	140.4215	138.0189	142.1692	146.5758	152.6004	159.3331	165.0629	(44)
Energy conte	262.1631	230.9766	242.8917	207.2744	196.7253	172.6646	166.9219	176.0352	180.7426	207.0773	226.9992	258.4486	(45)
Energy content (annual)											Total = Sum(45)m =	2528.9204	
Distribution loss (46)m = 0.15 x (45)m													
	39.3245	34.6465	36.4337	31.0912	29.5088	25.8997	25.0383	26.4053	27.1114	31.0616	34.0499	38.7673	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(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													
	313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(64)
										Total per year (kWh/year) = Sum(64)m =		3128.9204	(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													
	99.9089	88.3066	93.5012	81.2475	78.1509	69.7398	68.2413	71.2714	72.4257	81.5929	87.8060	98.6739	(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	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	33.4527	29.7124	24.1637	18.2935	13.6746	11.5447	12.4744	16.2147	21.7634	27.6336	32.2525	34.3824	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	324.1322	327.4956	319.0198	300.9757	278.1983	256.7907	242.4891	239.1256	247.6015	265.6456	288.4230	309.8306	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	(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)													
	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	(71)
Water heating gains (Table 5)													
	134.2862	131.4086	125.6737	112.8437	105.0415	96.8608	91.7221	95.7949	100.5912	109.6679	121.9528	132.6262	(72)
Total internal gains													
	595.8064	592.5519	572.7925	536.0483	500.8497	466.1315	447.6210	452.0706	470.8914	506.8825	546.5636	580.7745	(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	4.5400	11.5821	0.7200	0.7000	0.7700	18.3656	(74)
South	8.3500	49.2853	0.7200	0.7000	0.7700	143.7368	(78)
West	3.9400	21.5869	0.7200	0.7000	0.7700	29.7065	(80)
South	0.9600	29.0000	0.7200	0.7000	1.0000	12.6282	(82)

Solar gains	204.4371	318.1836	451.5220	605.9622	677.3365	730.9080	702.5994	641.4056	549.9905	388.3711	254.0393	178.4790	(83)
Total gains	800.2435	910.7355	1024.3145	1142.0105	1178.1863	1197.0395	1150.2204	1093.4762	1020.8819	895.2536	800.6029	759.2536	(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	44.3831	44.5881	44.5211	44.7810	44.7810	45.0747	45.0188	44.9027	44.9614	44.8425	44.8425	44.5881	
alpha	3.9589	3.9725	3.9681	3.9854	3.9854	4.0050	4.0013	3.9935	3.9974	3.9895	3.9895	3.9725	
util living area													
	0.9694	0.9506	0.8990	0.7906	0.6207	0.3926	0.2253	0.2563	0.5262	0.8137	0.9422	0.9740	(86)
MIT	19.7155	19.9206	20.3103	20.6818	20.9075	20.9892	20.9992	20.9986	20.9637	20.7038	20.1540	19.6714	(87)
Th 2	19.8135	19.8183	19.8167	19.8228	19.8228	19.8295	19.8282	19.8256	19.8269	19.8242	19.8242	19.8183	(88)
util rest of house													
	0.9609	0.9374	0.8725	0.7407	0.5416	0.2956	0.1199	0.1452	0.4220	0.7553	0.9239	0.9667	(89)
MIT 2	18.7040	18.9048	19.2710	19.6024	19.7745	19.8266	19.8282	19.8255	19.8139	19.6323	19.1385	18.6651	(90)
Living area fraction										fLA = Living area / (4) =		0.3833	(91)
MIT	19.0917	19.2942	19.6694	20.0161	20.2088	20.2722	20.2770	20.2751	20.2546	20.0430	19.5277	19.0508	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.9417	19.1442	19.5194	19.8661	20.0588	20.1222	20.1270	20.1251	20.1046	19.8930	19.3777	18.9008	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9528	0.9281	0.8647	0.7427	0.5583	0.3202	0.1469	0.1737	0.4476	0.7591	0.9153	0.9591	(94)
Useful gains	762.4797	845.2795	885.7712	848.1578	657.7722	383.3180	168.9326	189.9215	456.9908	679.6151	732.8032	728.2359	(95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000	(96)
Heat loss rate W	1426.7145	1399.4388	1230.8922	998.9049	695.3156	386.1445	168.9997	190.0664	468.4906	812.6322	1155.1582	1415.8681	(97)
Space heating kWh	494.1907	372.3951	256.7700	108.5379	27.9323	0.0000	0.0000	0.0000	0.0000	98.9647	304.0956	511.5983	(98a)
Space heating requirement - total per year (kWh/year)												2174.4845	
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	494.1907	372.3951	256.7700	108.5379	27.9323	0.0000	0.0000	0.0000	0.0000	98.9647	304.0956	511.5983	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2174.4845	
Space heating per m2											(98c) / (4) =	27.5530	(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 %)	89.5000	(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	494.1907	372.3951	256.7700	108.5379	27.9323	0.0000	0.0000	0.0000	0.0000	98.9647	304.0956	511.5983	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	552.1684	416.0839	286.8938	121.2714	31.2092	0.0000	0.0000	0.0000	0.0000	110.5751	339.7716	571.6182	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	349.8570	309.5016	328.3247	286.6921	276.7422	248.0220	243.4423	253.6247	257.0476	288.3086	308.7310	345.7067	(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	29.2809	23.4903	21.1504	15.4957	11.9693	9.7790	10.9188	14.1927	18.4349	24.1875	27.3198	30.0947	(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	2429.5917	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	3496.0004	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	236.3139	(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	6247.9060	(238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2429.5917	6.1900	150.3917	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3496.0004	6.1900	216.4024	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	25.1600	21.6376	(249)
Energy for lighting	236.3139	25.1600	59.4566	(250)
Additional standing charges			102.0000	(251)
Total energy cost			549.8883	(255)

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	2429.5917	0.2100	510.2143	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3496.0004	0.2100	734.1601	(264)
Space and water heating			1244.3743	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	236.3139	0.1443	34.1074	(268)
Total CO2, kg/year			1290.4110	(272)

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	2429.5917	1.1300	2745.4386	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3496.0004	1.1300	3950.4805	(278)
Space and water heating			6695.9191	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	236.3139	1.5338	362.4662	(282)
Total Primary energy kWh/year			7188.4860	(286)

SAP 10 EPC IMPROVEMENTS

Be Lean

Current energy efficiency rating: B 82
Current environmental impact rating: B 85

N	Solar water heating	SAP increase too small
U	Solar photovoltaic panels	Recommended
V2	Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
U Solar photovoltaic panels	+ 5.7	-£ 189	-101 kg (7.8%)

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.6	-£ 28	-153 kg (11.8%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar photovoltaic panels	£189	1.28 kg/m²	B 88	B 86
Total Savings	£189	1.28 kg/m²		

Potential energy efficiency rating: B 88
Potential environmental impact rating: B 86

Fuel prices for cost data on this page from database revision number 538 TEST (29 Feb 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£81	£81	£0
Mains gas	£469	£469	£0
Space heating	£274	£274	£0
Water heating	£216	£216	£0
Lighting	£59	£59	£0
Generated (PV)	-£0	-£189	£189
Total cost of fuels	£550	£361	£189
Total cost of uses	£549	£360	£189
Delivered energy	79 kWh/m²	70 kWh/m²	10 kWh/m²
Carbon dioxide emissions	1.3 tonnes	1.2 tonnes	0.1 tonnes
CO2 emissions per m²	16 kg/m²	15 kg/m²	1 kg/m²
Primary energy	91 kWh/m²	77 kWh/m²	14 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	38.2900 (1b)	x	2.5000 (2b)	=	95.7250	(1b) - (3b)
First floor	40.6300 (1c)	x	2.8000 (2c)	=	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	209.4890	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1909	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3409	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2898	(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	0.3695	0.3622	0.3550	0.3188	0.3115	0.2753	0.2753	0.2681	0.2898	0.3115	0.3260	0.3405	(22b)
Effective ac	0.5683	0.5656	0.5630	0.5508	0.5485	0.5379	0.5379	0.5359	0.5420	0.5485	0.5531	0.5580	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.4000	1.2000	2.8800			(26)
window (Uw = 1.20)			16.8300	1.1450	19.2710			(27)
rl			0.9600	1.2357	1.1863			(27a)
ground floor			38.2900	0.1000	3.8290	75.0000	2871.7500	(28a)
exposed upper			8.0000	0.1300	1.0400	20.0000	160.0000	(28b)
External Wall 1	106.0000	19.2300	86.7700	0.1300	11.2801	70.0000	6073.9000	(29a)
main flat roof	40.6300		40.6300	0.1100	4.4693	9.0000	365.6700	(30)
lower terrace	3.2000	0.9600	2.2400	0.1100	0.2464	9.0000	20.1600	(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.2021			(33)
Party Wall 1			34.9800	0.0000	0.0000	180.0000	6296.4000	(32)
Internal Wall 1			50.9600			9.0000	458.6400	(32c)
Internal Floor 1			32.6300			18.0000	587.3400	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	16833.8600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.3028 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	15.6000	0.0600	0.9360
E3 Sill	14.6000	0.0400	0.5840
E4 Jamb	23.9600	0.0200	0.4792
E5 Ground floor (normal)	20.0000	0.1300	2.6000
E6 Intermediate floor within a dwelling	7.9400	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	5.0000	0.1500	0.7500
E15 Flat roof with parapet	20.0000	0.3000	6.0000
E21 Exposed floor (inverted)	6.8000	0.3200	2.1760
E20 Exposed floor (normal)	7.5000	0.3200	2.4000
E16 Corner (normal)	17.5000	0.0500	0.8750
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0600	-0.4500
E18 Party wall between dwellings	0.0000	0.2400	0.0000
P1 Party wall - Ground floor	6.8000	0.3200	2.1760
P2 Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.8000	0.4800	3.2640
R11 Upstands or kerbs of rooflights	4.0000	0.2400	0.9600

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		22.7502 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	66.9523 (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	39.2848	39.1016	38.9219	38.0783	37.9204	37.1856	37.1856	37.0495	37.4686	37.9204	38.2397	38.5736	(38)
Heat transfer coeff	106.2371	106.0539	105.8742	105.0306	104.8727	104.1379	104.1379	104.0018	104.4209	104.8727	105.1920	105.5259	(39)
Average = Sum(39)m / 12 =												105.0298	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3461	1.3438	1.3415	1.3308	1.3288	1.3195	1.3195	1.3178	1.3231	1.3288	1.3329	1.3371	(40)
HLP (average)												1.3308	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4420 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
97.7473	96.2783	94.1378	90.0422	87.0198	83.6492	81.7334	83.8577	86.1864	89.8054	93.9889	97.3728	(42a)

Hot water usage for baths

28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511	(42b)

Hot water usage for other uses

39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390	(42c)

Average daily hot water use (litres/day)		152.2512 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												
165.5325	162.2042	158.0335	151.4112	146.1347	140.4215	138.0189	142.1692	146.5758	152.6004	159.3331	165.0629	(44)

Energy conte	262.1631	230.9766	242.8917	207.2744	196.7253	172.6646	166.9219	176.0352	180.7426	207.0773	226.9992	258.4486	(45)
Energy content (annual)										Total = Sum(45)m =		2528.9204	
Distribution loss (46)m = 0.15 x (45)m													
	39.3245	34.6465	36.4337	31.0912	29.5088	25.8997	25.0383	26.4053	27.1114	31.0616	34.0499	38.7673	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(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													
	313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(64)
										Total per year (kWh/year) = Sum(64)m =		3128.9204	(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													
	99.9089	88.3066	93.5012	81.2475	78.1509	69.7398	68.2413	71.2714	72.4257	81.5929	87.8060	98.6739	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	33.4527	29.7124	24.1637	18.2935	13.6746	11.5447	12.4744	16.2147	21.7634	27.6336	32.2525	34.3824	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	324.1322	327.4956	319.0198	300.9757	278.1983	256.7907	242.4891	239.1256	247.6015	265.6456	288.4230	309.8306	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	(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)													
	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	(71)
Water heating gains (Table 5)													
	134.2862	131.4086	125.6737	112.8437	105.0415	96.8608	91.7221	95.7949	100.5912	109.6679	121.9528	132.6262	(72)
Total internal gains													
	595.8064	592.5519	572.7925	536.0483	500.8497	466.1315	447.6210	452.0706	470.8914	506.8825	546.5636	580.7745	(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	4.5400	10.6334	0.7200	0.7000	0.7700	16.8613	(74)
South	8.3500	46.7521	0.7200	0.7000	0.7700	136.3487	(78)
West	3.9400	19.6403	0.7200	0.7000	0.7700	27.0276	(80)
South	0.9600	26.0000	0.7200	0.7000	1.0000	11.3219	(82)

Solar gains	191.5595	331.9132	468.0802	601.7477	692.7268	695.6430	667.3985	598.5163	514.3199	370.6883	230.4906	163.2450	(83)
Total gains	787.3659	924.4651	1040.8727	1137.7959	1193.5765	1161.7745	1115.0195	1050.5869	985.2114	877.5707	777.0542	744.0195	(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	44.0154	44.0915	44.1663	44.5211	44.5881	44.9027	44.9027	44.9614	44.7810	44.5881	44.4527	44.3121	
alpha	3.9344	3.9394	3.9444	3.9681	3.9725	3.9935	3.9935	3.9974	3.9854	3.9725	3.9635	3.9541	
util living area													
	0.9768	0.9570	0.9185	0.8403	0.7114	0.5453	0.4039	0.4445	0.6598	0.8753	0.9600	0.9810	(86)
MIT	19.5156	19.7843	20.1439	20.5337	20.8130	20.9511	20.9884	20.9830	20.8955	20.5220	19.9395	19.4569	(87)
Th 2	19.8049	19.8067	19.8084	19.8167	19.8183	19.8256	19.8256	19.8269	19.8228	19.8183	19.8152	19.8119	(88)
util rest of house													
	0.9706	0.9460	0.8981	0.8018	0.6476	0.4561	0.2995	0.3363	0.5711	0.8356	0.9478	0.9759	(89)
MIT 2	18.5008	18.7630	19.1074	19.4696	19.7021	19.8043	19.8227	19.8222	19.7709	19.4723	18.9251	18.4486	(90)
Living area fraction										fLA = Living area / (4) =		0.3833	(91)
MIT	18.8898	19.1545	19.5047	19.8775	20.1279	20.2439	20.2695	20.2672	20.2020	19.8747	19.3139	18.8351	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.7398	19.0045	19.3547	19.7275	19.9779	20.0939	20.1195	20.1172	20.0520	19.7247	19.1639	18.6851	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9633	0.9368	0.8888	0.7985	0.6569	0.4772	0.3261	0.3637	0.5896	0.8319	0.9392	0.9694	(94)
Useful gains	758.5048	865.9965	925.1136	908.5424	784.0347	554.4495	363.6066	382.0690	580.8381	730.0638	729.7995	721.2207	(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													
	1534.0417	1495.8332	1360.9807	1137.2156	868.1285	572.1197	366.5109	386.5910	621.5105	956.9291	1269.0280	1528.5517	(97)
Space heating kWh													
	576.9995	423.2503	324.2851	164.6448	62.5658	0.0000	0.0000	0.0000	0.0000	168.7878	388.2445	600.6543	(98a)
Space heating requirement - total per year (kWh/year)												2709.4319	
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													
	576.9995	423.2503	324.2851	164.6448	62.5658	0.0000	0.0000	0.0000	0.0000	168.7878	388.2445	600.6543	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2709.4319	
Space heating per m2											(98c) / (4) =	34.3314	(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 %)												89.5000	(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													
	576.9995	423.2503	324.2851	164.6448	62.5658	0.0000	0.0000	0.0000	0.0000	168.7878	388.2445	600.6543	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	644.6921	472.9053	362.3297	183.9606	69.9059	0.0000	0.0000	0.0000	0.0000	188.5897	433.7928	671.1221	(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													
	313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	349.8570	309.5016	328.3247	286.6921	276.7422	248.0220	243.4423	253.6247	257.0476	288.3086	308.7310	345.7067	(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	29.2809	23.4903	21.1504	15.4957	11.9693	9.7790	10.9188	14.1927	18.4349	24.1875	27.3198	30.0947	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.0780	-47.3375	-69.1090	-78.8564	-85.8741	-80.4410	-79.4482	-74.6163	-66.1080	-54.6818	-36.6136	-28.5091	(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												3027.2982	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												3496.0004	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												236.3139	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-734.6731	(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												6110.9394	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3027.2982	3.6400	110.1937	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3496.0004	3.6400	127.2544	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	236.3139	16.4900	38.9682	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-734.6731	16.4900	-121.1476	
PV Unit electricity exported	0.0000	5.5900	0.0000	
Total			-121.1476	(252)
Total energy cost			261.4500	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7595	(257)
SAP value		87.6879	
SAP rating (Section 12)		88	(258)
SAP band		B	

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	3027.2982	0.2100	635.7326	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3496.0004	0.2100	734.1601	(264)
Space and water heating			1369.8927	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	236.3139	0.1443	34.1074	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-734.6731	0.1343	-98.6575	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-98.6575	(269)
Total CO2, kg/year			1317.2719	(272)
CO2 emissions per m2			16.6900	(273)
EI value			85.7558	
EI rating			86	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	38.2900	(1b)	x 2.5000	(2b) =	95.7250	(1b) - (3b)
First floor	40.6300	(1c)	x 2.8000	(2c) =	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		209.4890	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1909 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.3409 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2898 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000	(22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750	(22a)
Adj infilt rate	0.3333	0.3115	0.3188	0.2898	0.2898	0.2536	0.2608	0.2753	0.2681	0.2826	0.2826	0.3115	(22b)
Effective ac	0.5555	0.5485	0.5508	0.5420	0.5420	0.5322	0.5340	0.5379	0.5359	0.5399	0.5399	0.5485	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.4000	1.2000	2.8800			(26)
window (Uw = 1.20)			16.8300	1.1450	19.2710			(27)
rl			0.9600	1.2357	1.1863			(27a)
ground floor			38.2900	0.1000	3.8290	75.0000	2871.7500	(28a)
exposed upper			8.0000	0.1300	1.0400	20.0000	160.0000	(28b)
External Wall 1	106.0000	19.2300	86.7700	0.1300	11.2801	70.0000	6073.9000	(29a)
main flat roof	40.6300		40.6300	0.1100	4.4693	9.0000	365.6700	(30)
lower terrace	3.2000	0.9600	2.2400	0.1100	0.2464	9.0000	20.1600	(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.2021			(33)
Party Wall 1			34.9800	0.0000	0.0000	180.0000	6296.4000	(32)
Internal Wall 1			50.9600			9.0000	458.6400	(32c)
Internal Floor 1			32.6300			18.0000	587.3400	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	16833.8600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.3028 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	15.6000	0.0600	0.9360
E3 Sill	14.6000	0.0400	0.5840
E4 Jamb	23.9600	0.0200	0.4792

E5 Ground floor (normal)	20.0000	0.1300	2.6000	
E6 Intermediate floor within a dwelling	7.9400	0.0000	0.0000	
E24 Eaves (insulation at ceiling level - inverted)	5.0000	0.1500	0.7500	
E15 Flat roof with parapet	20.0000	0.3000	6.0000	
E21 Exposed floor (inverted)	6.8000	0.3200	2.1760	
E20 Exposed floor (normal)	7.5000	0.3200	2.4000	
E16 Corner (normal)	17.5000	0.0500	0.8750	
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0600	-0.4500	
E18 Party wall between dwellings	0.0000	0.2400	0.0000	
P1 Party wall - Ground floor	6.8000	0.3200	2.1760	
P2 Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	6.8000	0.4800	3.2640	
R11 Upstands or kerbs of rooflights	4.0000	0.2400	0.9600	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 22.7502 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 66.9523 (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	38.4048	37.9204	38.0783	37.4686	37.4686	36.7883	36.9171	37.1856	37.0495	37.3253	37.3253	37.9204	(38)
Heat transfer coeff	105.3572	104.8727	105.0306	104.4209	104.4209	103.7406	103.8694	104.1379	104.0018	104.2776	104.2776	104.8727	(39)
Average = Sum(39)m / 12 =												104.4400	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3350	1.3288	1.3308	1.3231	1.3231	1.3145	1.3161	1.3195	1.3178	1.3213	1.3213	1.3288	(40)
HLP (average)												1.3234	
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 2.4420 (42)
Hot water usage for mixer showers

97.7473	96.2783	94.1378	90.0422	87.0198	83.6492	81.7334	83.8577	86.1864	89.8054	93.9889	97.3728	(42a)

Hot water usage for baths

28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511	(42b)

Hot water usage for other uses

39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390	(42c)

Average daily hot water use (litres/day) 152.2512 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	165.5325	162.2042	158.0335	151.4112	146.1347	140.4215	138.0189	142.1692	146.5758	152.6004	159.3331	165.0629	(44)
Energy conte	262.1631	230.9766	242.8917	207.2744	196.7253	172.6646	166.9219	176.0352	180.7426	207.0773	226.9992	258.4486	(45)
Energy content (annual)										Total = Sum(45)m =		2528.9204	
Distribution loss (46)m = 0.15 x (45)m	39.3245	34.6465	36.4337	31.0912	29.5088	25.8997	25.0383	26.4053	27.1114	31.0616	34.0499	38.7673	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(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	313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(64)
										Total per year (kWh/year) = Sum(64)m =		3128.9204	(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	99.9089	88.3066	93.5012	81.2475	78.1509	69.7398	68.2413	71.2714	72.4257	81.5929	87.8060	98.6739	(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	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.4527	29.7124	24.1637	18.2935	13.6746	11.5447	12.4744	16.2147	21.7634	27.6336	32.2525	34.3824	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	324.1322	327.4956	319.0198	300.9757	278.1983	256.7907	242.4891	239.1256	247.6015	265.6456	288.4230	309.8306	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	(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)	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	(71)
Water heating gains (Table 5)	134.2862	131.4086	125.6737	112.8437	105.0415	96.8608	91.7221	95.7949	100.5912	109.6679	121.9528	132.6262	(72)
Total internal gains	595.8064	592.5519	572.7925	536.0483	500.8497	466.1315	447.6210	452.0706	470.8914	506.8825	546.5636	580.7745	(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	4.5400	11.5821	0.7200	0.7000	0.7700	18.3656	(74)
South	8.3500	49.2853	0.7200	0.7000	0.7700	143.7368	(78)
West	3.9400	21.5869	0.7200	0.7000	0.7700	29.7065	(80)
South	0.9600	29.0000	0.7200	0.7000	1.0000	12.6282	(82)

Solar gains	204.4371	318.1836	451.5220	605.9622	677.3365	730.9080	702.5994	641.4056	549.9905	388.3711	254.0393	178.4790	(83)

Total gains	800.2435	910.7355	1024.3145	1142.0105	1178.1863	1197.0395	1150.2204	1093.4762	1020.8819	895.2536	800.6029	759.2536	(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	44.3831	44.5881	44.5211	44.7810	44.7810	45.0747	45.0188	44.9027	44.9614	44.8425	44.8425	44.5881	
alpha	3.9589	3.9725	3.9681	3.9854	3.9854	4.0050	4.0013	3.9935	3.9974	3.9895	3.9895	3.9725	
util living area													
	0.9694	0.9506	0.8990	0.7906	0.6207	0.3926	0.2253	0.2563	0.5262	0.8137	0.9422	0.9740	(86)
MIT	19.7155	19.9206	20.3103	20.6818	20.9075	20.9892	20.9992	20.9986	20.9637	20.7038	20.1540	19.6714	(87)
Th 2	19.8135	19.8183	19.8167	19.8228	19.8228	19.8295	19.8282	19.8256	19.8269	19.8242	19.8242	19.8183	(88)
util rest of house													
	0.9609	0.9374	0.8725	0.7407	0.5416	0.2956	0.1199	0.1452	0.4220	0.7553	0.9239	0.9667	(89)
MIT 2	18.7040	18.9048	19.2710	19.6024	19.7745	19.8266	19.8282	19.8255	19.8139	19.6323	19.1385	18.6651	(90)
Living area fraction										fLA = Living area / (4) =		0.3833	(91)
MIT	19.0917	19.2942	19.6694	20.0161	20.2088	20.2722	20.2770	20.2751	20.2546	20.0430	19.5277	19.0508	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.9417	19.1442	19.5194	19.8661	20.0588	20.1222	20.1270	20.1251	20.1046	19.8930	19.3777	18.9008	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9528	0.9281	0.8647	0.7427	0.5583	0.3202	0.1469	0.1737	0.4476	0.7591	0.9153	0.9591	(94)
Useful gains	762.4797	845.2795	885.7712	848.1578	657.7722	383.3180	168.9326	189.9215	456.9908	679.6151	732.8032	728.2359	(95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000	(96)
Heat loss rate W													
	1426.7145	1399.4388	1230.8922	998.9049	695.3156	386.1445	168.9997	190.0664	468.4906	812.6322	1155.1582	1415.8681	(97)
Space heating kWh													
	494.1907	372.3951	256.7700	108.5379	27.9323	0.0000	0.0000	0.0000	0.0000	98.9647	304.0956	511.5983	(98a)
Space heating requirement - total per year (kWh/year)												2174.4845	
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													
	494.1907	372.3951	256.7700	108.5379	27.9323	0.0000	0.0000	0.0000	0.0000	98.9647	304.0956	511.5983	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2174.4845	
Space heating per m2											(98c) / (4) =	27.5530	(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 %)												89.5000	(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													
	494.1907	372.3951	256.7700	108.5379	27.9323	0.0000	0.0000	0.0000	0.0000	98.9647	304.0956	511.5983	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	552.1684	416.0839	286.8938	121.2714	31.2092	0.0000	0.0000	0.0000	0.0000	110.5751	339.7716	571.6182	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	349.8570	309.5016	328.3247	286.6921	276.7422	248.0220	243.4423	253.6247	257.0476	288.3086	308.7310	345.7067	(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	29.2809	23.4903	21.1504	15.4957	11.9693	9.7790	10.9188	14.1927	18.4349	24.1875	27.3198	30.0947	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-35.2266	-46.4454	-68.1447	-79.5722	-85.1732	-82.4051	-81.4866	-77.4671	-69.0621	-56.9300	-39.8226	-30.9806	(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												2429.5917	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												3496.0004	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)

Electricity for lighting (calculated in Appendix L)	236.3139	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-752.7162	(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	5495.1898	(238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2429.5917	6.1900	150.3917	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3496.0004	6.1900	216.4024	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	25.1600	21.6376	(249)
Energy for lighting	236.3139	25.1600	59.4566	(250)
Additional standing charges			102.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-752.7162	25.1600	-189.3834	
PV Unit electricity exported	0.0000	5.8100	0.0000	
Total			-189.3834	(252)
Total energy cost			360.5049	(255)

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	2429.5917	0.2100	510.2143	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3496.0004	0.2100	734.1601	(264)
Space and water heating			1244.3743	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	236.3139	0.1443	34.1074	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-752.7162	0.1343	-101.0621	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-101.0621	(269)
Total CO2, kg/year			1189.3489	(272)

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	2429.5917	1.1300	2745.4386	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3496.0004	1.1300	3950.4805	(278)
Space and water heating			6695.9191	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	236.3139	1.5338	362.4662	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-752.7162	1.4962	-1126.2025	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1126.2025	(283)
Total Primary energy kWh/year			6062.2835	(286)

Full SAP Calculation Printout

Property Reference	House 2 Block C	**Issued on Date**	13/03/2024
Assessment Reference	Be Lean	**Prop Type Ref**	
Property	House 2 Block C, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	82 B	**DER**	18.70	**TER**	15.18
Environmental	85 B	**% DER < TER**			-23.19
CO_2 Emissions (t/year)	1.3	**DFEE**	43.58	**TFEE**	51.30
Compliance Check	See BREL	**% DFEE < TFEE**			15.05
% DPER < TPER	-30.01	**DPER**	103.73	**TPER**	79.79

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client	KGH, Kurt Gander - Howe		

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	38.2900 (1b)	x	2.5000 (2b)	=	95.7250	(1b) - (3b)
First floor	40.6300 (1c)	x	2.8000 (2c)	=	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	209.4890	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1909	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3409	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2898	(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	0.3695	0.3622	0.3550	0.3188	0.3115	0.2753	0.2753	0.2681	0.2898	0.3115	0.3260	0.3405	(22b)
Effective ac	0.5683	0.5656	0.5630	0.5508	0.5485	0.5379	0.5379	0.5359	0.5420	0.5485	0.5531	0.5580	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.4000	1.2000	2.8800			(26)
window (Uw = 1.20)			14.3500	1.1450	16.4313			(27)
rl			0.9600	1.2357	1.1863			(27a)
ground floor			38.2900	0.1000	3.8290	75.0000	2871.7500	(28a)
exposed upper			8.0000	0.1300	1.0400	20.0000	160.0000	(28b)
External Wall 1	106.0000	16.7500	89.2500	0.1300	11.6025	70.0000	6247.5000	(29a)
main flat roof	40.6300		40.6300	0.1000	4.0630	9.0000	365.6700	(30)
lower terrace	3.2000	0.9600	2.2400	0.1000	0.2240	9.0000	20.1600	(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.2561			(33)
Party Wall 1			34.9800	0.0000	0.0000	180.0000	6296.4000	(32)
Internal Wall 1			50.9600			9.0000	458.6400	(32c)
Internal Floor 1			32.6300			18.0000	587.3400	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17007.4600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		215.5025 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.6000	0.0600	0.6960

E3 Sill	10.6000	0.0400	0.4240	
E4 Jamb	23.9600	0.0200	0.4792	
R11 Upstands or kerbs of rooflights	4.0000	0.2400	0.9600	
E5 Ground floor (normal)	20.0000	0.1300	2.6000	
E6 Intermediate floor within a dwelling	7.9400	0.0000	0.0000	
E24 Eaves (insulation at ceiling level - inverted)	5.0000	0.1500	0.7500	
E15 Flat roof with parapet	20.0000	0.3000	6.0000	
E21 Exposed floor (inverted)	6.8000	0.3200	2.1760	
E20 Exposed floor (normal)	7.5000	0.3200	2.4000	
E16 Corner (normal)	17.5000	0.0500	0.8750	
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0600	-0.4500	
E18 Party wall between dwellings	10.0000	0.2400	2.4000	
P1 Party wall - Ground floor	6.8000	0.3200	2.1760	
P2 Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	6.8000	0.4800	3.2640	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 24.7502 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 66.0063 (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	39.2848	39.1016	38.9219	38.0783	37.9204	37.1856	37.1856	37.0495	37.4686	37.9204	38.2397	38.5736	(38)
Heat transfer coeff	105.2911	105.1079	104.9282	104.0846	103.9267	103.1919	103.1919	103.0558	103.4750	103.9267	104.2461	104.5799	(39)

Average = Sum(39)m / 12 = 104.0838

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3342	1.3318	1.3296	1.3189	1.3169	1.3076	1.3076	1.3058	1.3111	1.3169	1.3209	1.3251	(40)
HLP (average)												1.3189	
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 2.4420 (42)

Hot water usage for mixer showers

97.7473	96.2783	94.1378	90.0422	87.0198	83.6492	81.7334	83.8577	86.1864	89.8054	93.9889	97.3728	(42a)

Hot water usage for baths

28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511	(42b)

Hot water usage for other uses

39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390	(42c)

Average daily hot water use (litres/day) 152.2512 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	165.5325	162.2042	158.0335	151.4112	146.1347	140.4215	138.0189	142.1692	146.5758	152.6004	159.3331	165.0629	(44)
Energy conte	262.1631	230.9766	242.8917	207.2744	196.7253	172.6646	166.9219	176.0352	180.7426	207.0773	226.9992	258.4486	(45)

Energy content (annual) Total = Sum(45)m = 2528.9204

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

39.3245	34.6465	36.4337	31.0912	29.5088	25.8997	25.0383	26.4053	27.1114	31.0616	34.0499	38.7673	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)

Total heat required for water heating calculated for each month

313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(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

313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(64)

Total per year (kWh/year) = Sum(64)m = 3128.9204 (64)

12Total per year (kWh/year) 3129 (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

99.9089	88.3066	93.5012	81.2475	78.1509	69.7398	68.2413	71.2714	72.4257	81.5929	87.8060	98.6739	(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	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.5233	122.3651	110.5233	114.2074	110.5233	114.2074	110.5233	110.5233	114.2074	110.5233	114.2074	110.5233	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.1685	219.4221	213.7433	201.6537	186.3928	172.0498	162.4677	160.2142	165.8930	177.9825	193.2434	207.5865	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	(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)	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	(71)
Water heating gains (Table 5)	134.2862	131.4086	125.6737	112.8437	105.0415	96.8608	91.7221	95.7949	100.5912	109.6679	121.9528	132.6262	(72)
Total internal gains	524.6088	535.8264	512.5709	491.3356	464.5884	442.7487	424.3439	426.1631	440.3223	460.8045	492.0343	513.3667	(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	4.5400	10.6334	0.7200	0.7000	0.7700	16.8613	(74)
East	1.4600	19.6403	0.7200	0.7000	0.7700	10.0153	(76)
South	8.3500	46.7521	0.7200	0.7000	0.7700	136.3487	(78)
South	0.9600	26.0000	0.7200	0.7000	1.0000	11.3219	(82)

Solar gains	174.5472	298.6336	413.2733	521.8151	594.7665	595.3632	571.9281	516.5086	450.5773	331.1992	209.2783	149.2549	(83)
Total gains	699.1560	834.4600	925.8443	1013.1507	1059.3549	1038.1119	996.2719	942.6717	890.8997	792.0037	701.3126	662.6216	(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	44.8689	44.9471	45.0240	45.3890	45.4579	45.7816	45.7816	45.8421	45.6564	45.4579	45.3187	45.1740	
alpha	3.9913	3.9965	4.0016	4.0259	4.0305	4.0521	4.0521	4.0561	4.0438	4.0305	4.0212	4.0116	
util living area													
	0.9847	0.9691	0.9415	0.8775	0.7629	0.5950	0.4453	0.4870	0.7047	0.9035	0.9714	0.9874	(86)
MIT	19.4280	19.7011	20.0444	20.4542	20.7665	20.9368	20.9846	20.9779	20.8729	20.4615	19.8689	19.3770	(87)
Th 2	19.8142	19.8160	19.8178	19.8261	19.8276	19.8349	19.8349	19.8363	19.8321	19.8276	19.8245	19.8212	(88)
util rest of house													
	0.9804	0.9607	0.9255	0.8444	0.7020	0.5020	0.3324	0.3712	0.6165	0.8697	0.9621	0.9839	(89)
MIT 2	18.4212	18.6898	19.0228	19.4109	19.6787	19.8068	19.8310	19.8301	19.7673	19.4293	18.8644	18.3762	(90)
Living area fraction										fLA = Living area / (4) =		0.3833	(91)
MIT	18.8071	19.0774	19.4144	19.8108	20.0956	20.2399	20.2732	20.2700	20.1911	19.8249	19.2494	18.7598	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.6571	18.9274	19.2644	19.6608	19.9456	20.0899	20.1232	20.1200	20.0411	19.6749	19.0994	18.6098	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9747	0.9526	0.9163	0.8390	0.7087	0.5234	0.3610	0.4003	0.6336	0.8644	0.9546	0.9789	(94)
Useful gains	681.4673	794.9232	848.3973	850.0819	750.7318	543.3097	359.6541	377.3918	564.5146	684.6184	669.5010	648.6480	(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													
	1511.6731	1474.3947	1339.3465	1120.0352	856.9423	566.5133	363.5632	383.3707	614.7535	943.1270	1250.8947	1506.9771	(97)
Space heating kWh													
	617.6730	456.6048	365.2662	194.3664	79.0206	0.0000	0.0000	0.0000	0.0000	192.3304	418.6035	638.5968	(98a)
Space heating requirement - total per year (kWh/year)												2962.4618	
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													
	617.6730	456.6048	365.2662	194.3664	79.0206	0.0000	0.0000	0.0000	0.0000	192.3304	418.6035	638.5968	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2962.4618	
Space heating per m2											(98c) / (4) =	37.5375	(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 %)												89.5000	(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													
	617.6730	456.6048	365.2662	194.3664	79.0206	0.0000	0.0000	0.0000	0.0000	192.3304	418.6035	638.5968	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	690.1375	510.1730	408.1187	217.1692	88.2912	0.0000	0.0000	0.0000	0.0000	214.8943	467.7134	713.5160	(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													
	313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	349.8570	309.5016	328.3247	286.6921	276.7422	248.0220	243.4423	253.6247	257.0476	288.3086	308.7310	345.7067	(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	29.5507	23.7067	21.3453	15.6384	12.0796	9.8691	11.0194	14.3234	18.6047	24.4104	27.5715	30.3720	(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												3310.0132	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												3496.0004	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:

central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	238.4914	(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	7130.5050	(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	3310.0132	0.2100	695.1028	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3496.0004	0.2100	734.1601	(264)
Space and water heating			1429.2629	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	238.4914	0.1443	34.4217	(268)
Total CO2, kg/year			1475.6138	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			18.7000	(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	3310.0132	1.1300	3740.3149	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3496.0004	1.1300	3950.4805	(278)
Space and water heating			7690.7954	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	238.4914	1.5338	365.8061	(282)
Total Primary energy kWh/year			8186.7022	(286)
Dwelling Primary energy Rate (DPER)			103.7300	(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		38.2900 (1b)	x	2.5000 (2b)	=	95.7250	(1b) - (3b)
First floor		40.6300 (1c)	x	2.8000 (2c)	=	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9200						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	209.4890	(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) =	0.1432	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3932	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3342	(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	0.4261	0.4178	0.4094	0.3676	0.3593	0.3175	0.3175	0.3092	0.3342	0.3593	0.3760	0.3927	(22b)
Effective ac	0.5908	0.5873	0.5838	0.5676	0.5645	0.5504	0.5504	0.5478	0.5559	0.5645	0.5707	0.5771	(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			2.4000	1.0000	2.4000			(26)
TER Opening Type (Uw = 1.20)			14.3500	1.1450	16.4313			(27)
rl			0.9600	2.0221	1.9412			(27a)
ground floor			38.2900	0.1300	4.9777			(28a)
exposed upper			8.0000	0.1300	1.0400			(28b)
External Wall 1	106.0000	16.7500	89.2500	0.1800	16.0650			(29a)
main flat roof	40.6300		40.6300	0.1100	4.4693			(30)
lower terrace	3.2000	0.9600	2.2400	0.1100	0.2464			(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.5709			(33)
Party Wall 1			34.9800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 215.5025 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.6000	0.0500	0.5800
E3 Sill	10.6000	0.0500	0.5300
E4 Jamb	23.9600	0.0500	1.1980
R11 Upstands or kerbs of rooflights	4.0000	0.0800	0.3200
E5 Ground floor (normal)	20.0000	0.1600	3.2000
E6 Intermediate floor within a dwelling	7.9400	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	5.0000	0.2400	1.2000
E15 Flat roof with parapet	20.0000	0.5600	11.2000
E21 Exposed floor (inverted)	6.8000	0.3200	2.1760
E20 Exposed floor (normal)	7.5000	0.3200	2.4000
E16 Corner (normal)	17.5000	0.0900	1.5750
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0900	-0.6750
E18 Party wall between dwellings	10.0000	0.0600	0.6000
P1 Party wall - Ground floor	6.8000	0.0800	0.5440
P2 Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.8000	0.1200	0.8160

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 25.6640 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 73.2349 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.8426	40.5988	40.3599	39.2377	39.0278	38.0504	38.0504	37.8694	38.4269	39.0278	39.4525	39.8966	(38)
Heat transfer coeff	114.0774	113.8337	113.5948	112.4726	112.2627	111.2853	111.2853	111.1043	111.6618	112.2627	112.6874	113.1314	(39)
Average = Sum(39)m / 12 =												112.4716	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4455	1.4424	1.4394	1.4251	1.4225	1.4101	1.4101	1.4078	1.4149	1.4225	1.4279	1.4335	(40)
HLP (average)												1.4251	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4420 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.1648	64.1855	62.7585	60.0281	58.0132	55.7661	54.4889	55.9052	57.4576	59.8703	62.6593	64.9152	(42a)

Hot water usage for baths

28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511	(42b)

Hot water usage for other uses

39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390	(42c)

Average daily hot water use (litres/day) 122.2113 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.9501	130.1114	126.6543	121.3971	117.1281	112.5384	110.7745	114.2166	117.8470	122.6653	128.0034	132.6053	(44)
Energy conte	210.5605	185.2769	194.6629	166.1866	157.6769	138.3791	133.9721	141.4240	145.3171	166.4556	182.3644	207.6278	(45)
Energy content (annual)										Total = Sum(45)m =		2029.9040	
Distribution loss (46)m = 0.15 x (45)m	31.5841	27.7915	29.1994	24.9280	23.6515	20.7569	20.0958	21.2136	21.7976	24.9683	27.3547	31.1442	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	261.5194	231.3043	245.6218	215.5017	208.6358	187.6942	184.9310	192.3830	194.6321	217.4145	231.6794	258.5867	(62)
WWHRS	-29.7906	-26.3471	-27.5892	-22.8449	-21.2906	-18.2185	-17.0770	-18.1597	-18.8496	-22.2216	-25.1744	-29.2390	(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	231.7287	204.9572	218.0327	192.6568	187.3452	169.4757	167.8540	174.2233	175.7825	195.1929	206.5050	229.3478	(64)
										Total per year (kWh/year) = Sum(64)m =		2353.1018	(64)
12Total per year (kWh/year)												2353	(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	82.7511	73.1114	77.4651	67.5858	65.1673	58.3398	57.2854	59.7632	60.6467	68.0862	72.9649	81.7760	(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	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.5233	122.3651	110.5233	114.2074	110.5233	114.2074	110.5233	110.5233	114.2074	110.5233	114.2074	110.5233	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.1685	219.4221	213.7433	201.6537	186.3928	172.0498	162.4677	160.2142	165.8930	177.9825	193.2434	207.5865	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	(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)													

	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	(71)
Water heating gains (Table 5)													
	111.2246	108.7967	104.1198	93.8692	87.5904	81.0275	76.9966	80.3269	84.2315	91.5137	101.3402	109.9140	(72)
Total internal gains													
	501.5471	513.2146	491.0171	472.3610	447.1373	426.9154	409.6183	410.6951	423.9627	442.6503	471.4217	490.6545	(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	4.5400	10.6334	0.6300	0.7000	0.7700	14.7537	(74)
East	1.4600	19.6403	0.6300	0.7000	0.7700	8.7634	(76)
South	8.3500	46.7521	0.6300	0.7000	0.7700	119.3051	(78)
South	0.9600	26.0000	0.6300	0.7000	1.0000	9.9066	(82)

Solar gains	152.7288	261.3044	361.6142	456.5883	520.4207	520.9428	500.4371	451.9450	394.2552	289.7993	183.1185	130.5981	(83)
Total gains	654.2759	774.5190	852.6313	928.9493	967.5580	947.8582	910.0554	862.6401	818.2178	732.4496	654.5402	621.2525	(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	41.4131	41.5017	41.5890	42.0040	42.0825	42.4521	42.4521	42.5213	42.3090	42.0825	41.9239	41.7593	
alpha	3.7609	3.7668	3.7726	3.8003	3.8055	3.8301	3.8301	3.8348	3.8206	3.8055	3.7949	3.7840	
util living area													
	0.9881	0.9771	0.9580	0.9115	0.8209	0.6679	0.5137	0.5572	0.7681	0.9293	0.9784	0.9902	(86)
MIT	19.1905	19.4521	19.8048	20.2578	20.6393	20.8854	20.9679	20.9560	20.7946	20.2969	19.6642	19.1475	(87)
Th 2	19.7286	19.7310	19.7333	19.7441	19.7461	19.7556	19.7556	19.7574	19.7519	19.7461	19.7420	19.7377	(88)
util rest of house													
	0.9847	0.9705	0.9454	0.8839	0.7639	0.5670	0.3796	0.4224	0.6797	0.9013	0.9711	0.9873	(89)
MIT 2	17.6700	18.0021	18.4456	19.0059	19.4418	19.6881	19.7450	19.7413	19.6128	19.0667	18.2814	17.6214	(90)
Living area fraction										fLA = Living area / (4) =		0.3833	(91)
MIT	18.2528	18.5579	18.9665	19.4857	19.9008	20.1470	20.2138	20.2069	20.0658	19.5382	18.8114	18.2064	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2528	18.5579	18.9665	19.4857	19.9008	20.1470	20.2138	20.2069	20.0658	19.5382	18.8114	18.2064	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9789	0.9623	0.9356	0.8771	0.7718	0.6010	0.4309	0.4735	0.7045	0.8955	0.9635	0.9822	(94)
Useful gains	640.4685	745.3014	797.7188	814.7477	746.7469	569.6449	392.1325	408.4814	576.4053	655.8786	630.6637	610.2024	(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													
	1591.7018	1554.7261	1416.1340	1190.6037	920.6462	617.3049	402.1592	422.9591	666.1532	1003.4275	1319.7320	1584.5624	(97)
Space heating kWh													
	707.7175	543.9334	460.1009	270.6163	129.3810	0.0000	0.0000	0.0000	0.0000	258.5764	496.1292	724.9238	(98a)
Space heating requirement - total per year (kWh/year)												3591.3785	
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													
	707.7175	543.9334	460.1009	270.6163	129.3810	0.0000	0.0000	0.0000	0.0000	258.5764	496.1292	724.9238	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3591.3785	
Space heating per m2											(98c) / (4) =	45.5066	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	707.7175	543.9334	460.1009	270.6163	129.3810	0.0000	0.0000	0.0000	0.0000	258.5764	496.1292	724.9238	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	765.9280	588.6725	497.9447	292.8748	140.0228	0.0000	0.0000	0.0000	0.0000	279.8446	536.9363	784.5495	(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													
	231.7287	204.9572	218.0327	192.6568	187.3452	169.4757	167.8540	174.2233	175.7825	195.1929	206.5050	229.3478	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.6119	86.3685	85.9407	85.1094	83.6038	80.3000	80.3000	80.3000	80.3000	84.9848	86.1871	86.6692	(217)
Fuel for water heating, kWh/month													
	267.5483	237.3056	253.7013	226.3637	224.0870	211.0531	209.0336	216.9655	218.9073	229.6798	239.6008	264.6245	(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	22.9646	18.4230	16.5879	12.1530	9.3873	7.6695	8.5634	11.1311	14.4582	18.9699	21.4264	23.6028	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-35.9499	-50.7499	-73.0501	-82.2590	-88.8095	-82.9322	-81.8986	-77.2537	-69.0866	-58.0731	-39.5426	-31.0721	(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	-20.1142	-42.3348	-84.1836	-126.4992	-167.3255	-168.1481	-166.1781	-140.6845	-103.0877	-60.5752	-26.8659	-15.9051	(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	3886.7733	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2798.8703	(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)	185.3371	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1892.5792	(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	5064.4015	(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	3886.7733	0.2100	816.2224	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2798.8703	0.2100	587.7628	(264)
Space and water heating			1403.9851	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	185.3371	0.1443	26.7499	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-770.6773	0.1346	-103.6996	
PV Unit electricity exported	-1121.9019	0.1259	-141.2259	
Total			-244.9255	(269)
Total CO2, kg/year			1197.7388	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.1800	(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	3886.7733	1.1300	4392.0538	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2798.8703	1.1300	3162.7234	(278)
Space and water heating			7554.7772	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	185.3371	1.5338	284.2762	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-770.6773	1.4973	-1153.9322	
PV Unit electricity exported	-1121.9019	0.4621	-518.3953	
Total			-1672.3275	(283)
Total Primary energy kWh/year			6296.8267	(286)
Target Primary Energy Rate (TPER)			79.7900	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	38.2900 (1b)	x	2.5000 (2b)	=	95.7250	(1b) - (3b)
First floor	40.6300 (1c)	x	2.8000 (2c)	=	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 78.9200						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	209.4890	(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	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) =	0.1432	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2932	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2492	(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													
	0.3178	0.3115	0.3053	0.2741	0.2679	0.2368	0.2368	0.2305	0.2492	0.2679	0.2804	0.2928	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5505	0.5485	0.5466	0.5376	0.5359	0.5280	0.5280	0.5266	0.5311	0.5359	0.5393	0.5429	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.4000	1.2000	2.8800			(26)
window (Uw = 1.20)			14.3500	1.1450	16.4313			(27)
rl			0.9600	1.2357	1.1863			(27a)
ground floor			38.2900	0.1000	3.8290	75.0000	2871.7500	(28a)
exposed upper			8.0000	0.1300	1.0400	20.0000	160.0000	(28b)
External Wall 1	106.0000	16.7500	89.2500	0.1300	11.6025	70.0000	6247.5000	(29a)
main flat roof	40.6300		40.6300	0.1000	4.0630	9.0000	365.6700	(30)
lower terrace	3.2000	0.9600	2.2400	0.1000	0.2240	9.0000	20.1600	(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.2561			(33)
Party Wall 1			34.9800	0.0000	0.0000	180.0000	6296.4000	(32)
Internal Wall 1			50.9600			9.0000	458.6400	(32c)
Internal Floor 1			32.6300			18.0000	587.3400	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17007.4600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		215.5025 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.6000	0.0600	0.6960
E3 Sill	10.6000	0.0400	0.4240
E4 Jamb	23.9600	0.0200	0.4792
R11 Upstands or kerbs of rooflights	4.0000	0.2400	0.9600
E5 Ground floor (normal)	20.0000	0.1300	2.6000
E6 Intermediate floor within a dwelling	7.9400	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	5.0000	0.1500	0.7500
E15 Flat roof with parapet	20.0000	0.3000	6.0000
E21 Exposed floor (inverted)	6.8000	0.3200	2.1760
E20 Exposed floor (normal)	7.5000	0.3200	2.4000
E16 Corner (normal)	17.5000	0.0500	0.8750
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0600	-0.4500
E18 Party wall between dwellings	10.0000	0.2400	2.4000
P1 Party wall - Ground floor	6.8000	0.3200	2.1760
P2 Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.8000	0.4800	3.2640

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		24.7502 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	66.0063 (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	38.0559	37.9203	37.7875	37.1635	37.0468	36.5033	36.5033	36.4027	36.7127	37.0468	37.2830	37.5299	(38)
Heat transfer coeff													
	104.0622	103.9266	103.7938	103.1698	103.0531	102.5096	102.5096	102.4090	102.7190	103.0531	103.2893	103.5362	(39)
Average = Sum(39)m / 12 =												103.1693	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3186	1.3169	1.3152	1.3073	1.3058	1.2989	1.2989	1.2976	1.3016	1.3058	1.3088	1.3119	(40)
HLP (average)												1.3073	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4420 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511	(42b)

Hot water usage for other uses

39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390	(42c)

Average daily hot water use (litres/day)	62.1315 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	67.7853	65.9258	63.8958	61.3690	59.1149	56.7723	56.2855	58.3115	60.3893	62.7950	65.3442	67.6901	(44)
Energy conte	107.3553	93.8775	98.2054	84.0111	79.5800	69.8082	68.0725	72.2018	74.4661	85.2123	93.0947	105.9864	(45)
Energy content (annual)										Total = Sum(45)m =		1031.8712	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)

Combi loss	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													
	91.2520	79.7959	83.4746	71.4094	67.6430	59.3369	57.8616	61.3715	63.2962	72.4304	79.1305	90.0884	(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													
	91.2520	79.7959	83.4746	71.4094	67.6430	59.3369	57.8616	61.3715	63.2962	72.4304	79.1305	90.0884	(64)
										Total per year (kWh/year) = Sum(64)m =		877.0905	(64)
12Total per year (kWh/year)												877	(64)
Electric shower(s)													
	52.1862	46.4983	50.7744	48.4534	49.3626	47.0871	48.6567	49.3626	48.4534	50.7744	49.8196	52.1862	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		593.6147	(64a)
Heat gains from water heating, kWh/month													
	35.8595	31.5736	33.5622	29.9657	29.2514	26.6060	26.6296	27.6835	27.9374	30.8012	32.2375	35.5686	(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	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	110.5233	122.3651	110.5233	114.2074	110.5233	114.2074	110.5233	110.5233	114.2074	110.5233	114.2074	110.5233	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	217.1685	219.4221	213.7433	201.6537	186.3928	172.0498	162.4677	160.2142	165.8930	177.9825	193.2434	207.5865	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	(71)
Water heating gains (Table 5)													
	48.1983	46.9845	45.1105	41.6190	39.3164	36.9528	35.7924	37.2090	38.8019	41.3995	44.7744	47.8073	(72)
Total internal gains													
	435.5209	448.4023	429.0078	417.1109	395.8632	382.8407	368.4142	367.5772	378.5331	389.5360	411.8559	425.5478	(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	4.5400	10.6334	0.7200	0.7000	0.7700	16.8613	(74)
East	1.4600	19.6403	0.7200	0.7000	0.7700	10.0153	(76)
South	8.3500	46.7521	0.7200	0.7000	0.7700	136.3487	(78)
South	0.9600	26.0000	0.7200	0.7000	1.0000	11.3219	(82)

Solar gains	174.5472	298.6336	413.2733	521.8151	594.7665	595.3632	571.9281	516.5086	450.5773	331.1992	209.2783	149.2549	(83)
Total gains	610.0681	747.0359	842.2811	938.9260	990.6297	978.2039	940.3422	884.0858	829.1104	720.7352	621.1342	574.8028	(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	45.3988	45.4580	45.5162	45.7914	45.8433	46.0863	46.0863	46.1316	45.9924	45.8433	45.7385	45.6294	
alpha	4.0266	4.0305	4.0344	4.0528	4.0562	4.0724	4.0724	4.0754	4.0662	4.0562	4.0492	4.0420	
util living area													
	0.9904	0.9782	0.9552	0.8976	0.7887	0.6207	0.4668	0.5129	0.7352	0.9243	0.9806	0.9923	(86)
MIT	19.3292	19.6105	19.9670	20.4009	20.7384	20.9276	20.9821	20.9739	20.8533	20.4008	19.7794	19.2748	(87)
Th 2	19.8263	19.8276	19.8290	19.8351	19.8363	19.8417	19.8417	19.8427	19.8396	19.8363	19.8340	19.8315	(88)
util rest of house													
	0.9876	0.9720	0.9424	0.8682	0.7304	0.5266	0.3501	0.3931	0.6486	0.8959	0.9741	0.9901	(89)
MIT 2	18.3330	18.6110	18.9593	19.3728	19.6665	19.8089	19.8371	19.8352	19.7630	19.3840	18.7852	18.2830	(90)
Living area fraction										fLA = Living area / (4) =		0.3833	(91)
MIT	18.7149	18.9941	19.3456	19.7668	20.0773	20.2377	20.2760	20.2717	20.1809	19.7737	19.1663	18.6632	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7149	18.9941	19.3456	19.7668	20.0773	20.2377	20.2760	20.2717	20.1809	19.7737	19.1663	18.6632	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9840	0.9664	0.9359	0.8662	0.7436	0.5603	0.3949	0.4389	0.6763	0.8941	0.9692	0.9870	(94)
Useful gains	600.2932	721.9259	788.3075	813.2783	736.6049	548.1205	371.3195	388.0222	560.6972	644.3919	601.9915	567.3572	(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													
	1500.0413	1464.7507	1333.2895	1121.1298	863.3103	577.9183	376.8228	396.4940	624.6286	945.3804	1246.3146	1497.4603	(97)
Space heating kWh													
	669.4125	499.1783	405.4666	221.6531	94.2688	0.0000	0.0000	0.0000	0.0000	223.9355	463.9126	691.9967	(98a)
Space heating requirement - total per year (kWh/year)												3269.8242	
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													
	669.4125	499.1783	405.4666	221.6531	94.2688	0.0000	0.0000	0.0000	0.0000	223.9355	463.9126	691.9967	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3269.8242	
Space heating per m2											(98c) / (4) =	41.4321	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

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

Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	963.5906	758.5714	778.3084	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8476	0.9072	0.8842	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	816.7061	688.1971	688.1740	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1085.5245	1044.2584	983.0211	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	193.5492	264.9096	219.3663	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction											fC = cooled area / (4) =	1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	48.3873	66.2274	54.8416	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												169.4563	(107)
Energy for space heating												41.4321	(99)
Energy for space cooling												2.1472	(108)
Total												43.5793	(109)
Fabric Energy Efficiency (DFEE)												43.6	(109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	38.2900	(1b)	x 2.5000	(2b) =	95.7250	(1b) - (3b)
First floor	40.6300	(1c)	x 2.8000	(2c) =	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		209.4890	(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	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) =	0.1432	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3932	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3342	(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													
	0.4261	0.4178	0.4094	0.3676	0.3593	0.3175	0.3175	0.3092	0.3342	0.3593	0.3760	0.3927	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5908	0.5873	0.5838	0.5676	0.5645	0.5504	0.5504	0.5478	0.5559	0.5645	0.5707	0.5771	(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			2.4000	1.0000	2.4000			(26)
TER Opening Type (Uw = 1.20)			14.3500	1.1450	16.4313			(27)
rl			0.9600	2.0221	1.9412			(27a)
ground floor			38.2900	0.1300	4.9777			(28a)
exposed upper			8.0000	0.1300	1.0400			(28b)
External Wall 1	106.0000	16.7500	89.2500	0.1800	16.0650			(29a)
main flat roof	40.6300		40.6300	0.1100	4.4693			(30)
lower terrace	3.2000	0.9600	2.2400	0.1100	0.2464			(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.5709			(33)
Party Wall 1			34.9800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	215.5025 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.6000	0.0500	0.5800
E3 Sill	10.6000	0.0500	0.5300
E4 Jamb	23.9600	0.0500	1.1980
R11 Upstands or kerbs of rooflights	4.0000	0.0800	0.3200
E5 Ground floor (normal)	20.0000	0.1600	3.2000
E6 Intermediate floor within a dwelling	7.9400	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	5.0000	0.2400	1.2000
E15 Flat roof with parapet	20.0000	0.5600	11.2000

E21 Exposed floor (inverted)	6.8000	0.3200	2.1760
E20 Exposed floor (normal)	7.5000	0.3200	2.4000
E16 Corner (normal)	17.5000	0.0900	1.5750
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0900	-0.6750
E18 Party wall between dwellings	10.0000	0.0600	0.6000
P1 Party wall - Ground floor	6.8000	0.0800	0.5440
P2 Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.8000	0.1200	0.8160

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 25.6640 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 73.2349 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.8426	40.5988	40.3599	39.2377	39.0278	38.0504	38.0504	37.8694	38.4269	39.0278	39.4525	39.8966	(38)
Heat transfer coeff	114.0774	113.8337	113.5948	112.4726	112.2627	111.2853	111.2853	111.1043	111.6618	112.2627	112.6874	113.1314	(39)
Average = Sum(39)m / 12 =												112.4716	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4455	1.4424	1.4394	1.4251	1.4225	1.4101	1.4101	1.4078	1.4149	1.4225	1.4279	1.4335	(40)
HLP (average)												1.4251	
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 2.4420 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511	(42b)

Hot water usage for other uses

39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390	(42c)

Average daily hot water use (litres/day) 62.1315 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	67.7853	65.9258	63.8958	61.3690	59.1149	56.7723	56.2855	58.3115	60.3893	62.7950	65.3442	67.6901	(44)
Energy conte	107.3553	93.8775	98.2054	84.0111	79.5800	69.8082	68.0725	72.2018	74.4661	85.2123	93.0947	105.9864	(45)
Energy content (annual)										Total = Sum(45)m =		1031.8712	

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

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 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

91.2520	79.7959	83.4746	71.4094	67.6430	59.3369	57.8616	61.3715	63.2962	72.4304	79.1305	90.0884	(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

91.2520	79.7959	83.4746	71.4094	67.6430	59.3369	57.8616	61.3715	63.2962	72.4304	79.1305	90.0884	(64)
								Total per year (kWh/year) = Sum(64)m =			877.0905	(64)
12Total per year (kWh/year)											877	(64)

Electric shower(s)

52.1862	46.4983	50.7744	48.4534	49.3626	47.0871	48.6567	49.3626	48.4534	50.7744	49.8196	52.1862	(64a)
				Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							593.6147	(64a)

Heat gains from water heating, kWh/month

35.8595	31.5736	33.5622	29.9657	29.2514	26.6060	26.6296	27.6835	27.9374	30.8012	32.2375	35.5686	(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	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.5233	122.3651	110.5233	114.2074	110.5233	114.2074	110.5233	110.5233	114.2074	110.5233	114.2074	110.5233	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.1685	219.4221	213.7433	201.6537	186.3928	172.0498	162.4677	160.2142	165.8930	177.9825	193.2434	207.5865	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	(71)
Water heating gains (Table 5)	48.1983	46.9845	45.1105	41.6190	39.3164	36.9528	35.7924	37.2090	38.8019	41.3995	44.7744	47.8073	(72)
Total internal gains	435.5209	448.4023	429.0078	417.1109	395.8632	382.8407	368.4142	367.5772	378.5331	389.5360	411.8559	425.5478	(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	4.5400	10.6334	0.6300	0.7000	0.7700	14.7537	(74)
East	1.4600	19.6403	0.6300	0.7000	0.7700	8.7634	(76)
South	8.3500	46.7521	0.6300	0.7000	0.7700	119.3051	(78)
South	0.9600	26.0000	0.6300	0.7000	1.0000	9.9066	(82)

Solar gains	152.7288	261.3044	361.6142	456.5883	520.4207	520.9428	500.4371	451.9450	394.2552	289.7993	183.1185	130.5981	(83)
Total gains	588.2497	709.7067	790.6220	873.6991	916.2839	903.7835	868.8512	819.5222	772.7882	679.3353	594.9744	556.1459	(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	41.4131	41.5017	41.5890	42.0040	42.0825	42.4521	42.4521	42.5213	42.3090	42.0825	41.9239	41.7593	
alpha	3.7609	3.7668	3.7726	3.8003	3.8055	3.8301	3.8301	3.8348	3.8206	3.8055	3.7949	3.7840	
util living area	0.9916	0.9826	0.9664	0.9246	0.8402	0.6899	0.5344	0.5809	0.7914	0.9425	0.9841	0.9932	(86)
MIT	19.0996	19.3667	19.7288	20.2016	20.6040	20.8716	20.9633	20.9493	20.7702	20.2385	19.5850	19.0571	(87)
Th 2	19.7286	19.7310	19.7333	19.7441	19.7461	19.7556	19.7556	19.7574	19.7519	19.7461	19.7420	19.7377	(88)
util rest of house	0.9891	0.9775	0.9560	0.9000	0.7862	0.5891	0.3966	0.4428	0.7059	0.9185	0.9785	0.9912	(89)
MIT 2	18.0347	18.3002	18.6574	19.1186	19.4820	19.6957	19.7460	19.7426	19.6281	19.1645	18.5267	17.9990	(90)
Living area fraction										fLA = Living area / (4) =		0.3833	(91)
MIT	18.4429	18.7090	19.0681	19.5337	19.9121	20.1464	20.2126	20.2051	20.0659	19.5762	18.9323	18.4045	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4429	18.7090	19.0681	19.5337	19.9121	20.1464	20.2126	20.2051	20.0659	19.5762	18.9323	18.4045	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9856	0.9719	0.9490	0.8950	0.7943	0.6232	0.4494	0.4953	0.7301	0.9145	0.9735	0.9881	(94)
Useful gains	579.7723	689.7856	750.2649	781.9934	727.8243	563.2586	390.4651	405.9095	564.1907	621.2326	579.2320	549.5435	(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	1613.3822	1571.9279	1427.6678	1196.0032	921.9097	617.2365	402.0316	422.7672	666.1584	1007.6877	1333.3552	1606.9802	(97)
Space heating kWh	769.0057	592.7996	503.9877	298.0871	144.3995	0.0000	0.0000	0.0000	0.0000	287.5226	542.9687	786.7329	(98a)
Space heating requirement - total per year (kWh/year)												3925.5039	
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	769.0057	592.7996	503.9877	298.0871	144.3995	0.0000	0.0000	0.0000	0.0000	287.5226	542.9687	786.7329	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3925.5039	
Space heating per m2											(98c) / (4) =	49.7403	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1046.0818	823.5112	844.3927	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7749	0.8498	0.8213	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	810.6011	699.8354	693.5311	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1000.3776	962.4344	909.0000	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	136.6391	195.3736	160.3089	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	34.1598	48.8434	40.0772	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												123.0804	(107)
Energy for space heating												49.7403	(99)
Energy for space cooling												1.5596	(108)
Total												51.2999	(109)
Fabric Energy Efficiency (TFEE)												51.3	(109)

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

CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	38.2900	(1b)	x 2.5000	(2b) =	95.7250	(1b) - (3b)
First floor	40.6300	(1c)	x 2.8000	(2c) =	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		209.4890	(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	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1909	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3409	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2898	(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													
	0.3695	0.3622	0.3550	0.3188	0.3115	0.2753	0.2753	0.2681	0.2898	0.3115	0.3260	0.3405	(22b)
Effective ac	0.5683	0.5656	0.5630	0.5508	0.5485	0.5379	0.5379	0.5359	0.5420	0.5485	0.5531	0.5580	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.4000	1.2000	2.8800			(26)
window (Uw = 1.20)			14.3500	1.1450	16.4313			(27)
rl			0.9600	1.2357	1.1863			(27a)
ground floor			38.2900	0.1000	3.8290	75.0000	2871.7500	(28a)
exposed upper			8.0000	0.1300	1.0400	20.0000	160.0000	(28b)
External Wall 1	106.0000	16.7500	89.2500	0.1300	11.6025	70.0000	6247.5000	(29a)
main flat roof	40.6300		40.6300	0.1000	4.0630	9.0000	365.6700	(30)
lower terrace	3.2000	0.9600	2.2400	0.1000	0.2240	9.0000	20.1600	(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.2561			(33)
Party Wall 1			34.9800	0.0000	0.0000	180.0000	6296.4000	(32)
Internal Wall 1			50.9600			9.0000	458.6400	(32c)
Internal Floor 1			32.6300			18.0000	587.3400	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17007.4600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		215.5025 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.6000	0.0600	0.6960
E3 Sill	10.6000	0.0400	0.4240
E4 Jamb	23.9600	0.0200	0.4792
R11 Upstands or kerbs of rooflights	4.0000	0.2400	0.9600
E5 Ground floor (normal)	20.0000	0.1300	2.6000
E6 Intermediate floor within a dwelling	7.9400	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	5.0000	0.1500	0.7500
E15 Flat roof with parapet	20.0000	0.3000	6.0000
E21 Exposed floor (inverted)	6.8000	0.3200	2.1760
E20 Exposed floor (normal)	7.5000	0.3200	2.4000
E16 Corner (normal)	17.5000	0.0500	0.8750
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0600	-0.4500
E18 Party wall between dwellings	10.0000	0.2400	2.4000
P1 Party wall - Ground floor	6.8000	0.3200	2.1760
P2 Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.8000	0.4800	3.2640

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		24.7502 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	66.0063 (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	39.2848	39.1016	38.9219	38.0783	37.9204	37.1856	37.1856	37.0495	37.4686	37.9204	38.2397	38.5736	(38)
Heat transfer coeff													
	105.2911	105.1079	104.9282	104.0846	103.9267	103.1919	103.1919	103.0558	103.4750	103.9267	104.2461	104.5799	(39)
Average = Sum(39)m / 12 =												104.0838	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3342	1.3318	1.3296	1.3189	1.3169	1.3076	1.3076	1.3058	1.3111	1.3169	1.3209	1.3251	(40)
HLP (average)												1.3189	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4420 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
97.7473	96.2783	94.1378	90.0422	87.0198	83.6492	81.7334	83.8577	86.1864	89.8054	93.9889	97.3728	(42a)

Hot water usage for baths

28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511	(42b)

Hot water usage for other uses

39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390	(42c)

Average daily hot water use (litres/day)	152.2512 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	165.5325	162.2042	158.0335	151.4112	146.1347	140.4215	138.0189	142.1692	146.5758	152.6004	159.3331	165.0629	(44)
Energy conte	262.1631	230.9766	242.8917	207.2744	196.7253	172.6646	166.9219	176.0352	180.7426	207.0773	226.9992	258.4486	(45)
Energy content (annual)										Total = Sum(45)m =		2528.9204	
Distribution loss (46)m = 0.15 x (45)m													
	39.3245	34.6465	36.4337	31.0912	29.5088	25.8997	25.0383	26.4053	27.1114	31.0616	34.0499	38.7673	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(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

	313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075 (64)
Total per year (kWh/year) = Sum(64)m =												3128.9204 (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

	99.9089	88.3066	93.5012	81.2475	78.1509	69.7398	68.2413	71.2714	72.4257	81.5929	87.8060	98.6739 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	(66)

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

	33.7609	29.9862	24.3864	18.4621	13.8006	11.6511	12.5894	16.3641	21.9639	27.8882	32.5497	34.6992	(67)

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

	324.1322	327.4956	319.0198	300.9757	278.1983	256.7907	242.4891	239.1256	247.6015	265.6456	288.4230	309.8306	(68)

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

	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	(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)

	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	(71)

Water heating gains (Table 5)

	134.2862	131.4086	125.6737	112.8437	105.0415	96.8608	91.7221	95.7949	100.5912	109.6679	121.9528	132.6262	(72)

Total internal gains

	596.1146	592.8257	573.0152	536.2168	500.9757	466.2379	447.7360	452.2201	471.0920	507.1371	546.8608	581.0913	(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	4.5400	10.6334	0.7200	0.7000	0.7700	16.8613	(74)
East	1.4600	19.6403	0.7200	0.7000	0.7700	10.0153	(76)
South	8.3500	46.7521	0.7200	0.7000	0.7700	136.3487	(78)
South	0.9600	26.0000	0.7200	0.7000	1.0000	11.3219	(82)

Solar gains	174.5472	298.6336	413.2733	521.8151	594.7665	595.3632	571.9281	516.5086	450.5773	331.1992	209.2783	149.2549	(83)
Total gains	770.6618	891.4593	986.2885	1058.0320	1095.7422	1061.6011	1019.6640	968.7286	921.6693	838.3363	756.1391	730.3463	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	44.8689	44.9471	45.0240	45.3890	45.4579	45.7816	45.7816	45.8421	45.6564	45.4579	45.3187	45.1740	
alpha	3.9913	3.9965	4.0016	4.0259	4.0305	4.0521	4.0521	4.0561	4.0438	4.0305	4.0212	4.0116	
util living area	0.9788	0.9619	0.9299	0.8641	0.7481	0.5843	0.4358	0.4752	0.6888	0.8883	0.9636	0.9825	(86)
MIT	19.5247	19.7730	20.1113	20.4913	20.7835	20.9407	20.9857	20.9797	20.8832	20.5044	19.9388	19.4701	(87)
Th 2	19.8142	19.8160	19.8178	19.8261	19.8276	19.8349	19.8349	19.8363	19.8321	19.8276	19.8245	19.8212	(88)
util rest of house	0.9730	0.9520	0.9116	0.8288	0.6861	0.4921	0.3250	0.3616	0.6003	0.8511	0.9523	0.9777	(89)
MIT 2	18.5159	18.7588	19.0849	19.4425	19.6907	19.8087	19.8313	19.8306	19.7732	19.4658	18.9312	18.4676	(90)
Living area fraction									fLA = Living area / (4) =			0.3833	(91)
MIT	18.9026	19.1476	19.4783	19.8445	20.1096	20.2426	20.2738	20.2711	20.1987	19.8639	19.3174	18.8519	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.7526	18.9976	19.3283	19.6945	19.9596	20.0926	20.1238	20.1211	20.0487	19.7139	19.1674	18.7019	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9662	0.9432	0.9024	0.8243	0.6937	0.5135	0.3531	0.3902	0.6180	0.8469	0.9442	0.9716	(94)
Useful gains	744.6183	840.8551	890.0181	872.1742	760.0963	545.1070	360.0227	378.0290	569.5800	709.9738	713.9113	709.6228	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1521.7266	1481.7649	1346.0500	1123.5406	858.3900	566.7930	363.6283	383.4800	615.5411	947.1763	1257.9780	1516.6074	(97)
Space heating kWh	578.1686	430.6914	339.2877	180.9838	73.1306	0.0000	0.0000	0.0000	0.0000	176.4786	391.7280	600.3965	(98a)
Space heating requirement - total per year (kWh/year)												2770.8652	
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	578.1686	430.6914	339.2877	180.9838	73.1306	0.0000	0.0000	0.0000	0.0000	176.4786	391.7280	600.3965	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2770.8652	
Space heating per m2											(98c) / (4) =	35.1098	(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 %)	89.5000	(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	578.1686	430.6914	339.2877	180.9838	73.1306	0.0000	0.0000	0.0000	0.0000	176.4786	391.7280	600.3965	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)

Space heating fuel (main heating system)

645.9984	481.2194	379.0924	202.2165	81.7101	0.0000	0.0000	0.0000	0.0000	197.1828	437.6849	670.8341	(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

313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(64)

Efficiency of water heater

											89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)

Fuel for water heating, kWh/month

349.8570	309.5016	328.3247	286.6921	276.7422	248.0220	243.4423	253.6247	257.0476	288.3086	308.7310	345.7067	(219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	29.5507	23.7067	21.3453	15.6384	12.0796	9.8691	11.0194	14.3234	18.6047	24.4104	27.5715	30.3720	(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	(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	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	(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	3095.9387	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	3496.0004	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	238.4914	(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	6916.4305	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3095.9387	3.6400	112.6922	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3496.0004	3.6400	127.2544	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	238.4914	16.4900	39.3272	(250)
Additional standing charges			92.0000	(251)
Total energy cost			385.4552	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1198	(257)
SAP value		81.8483	
SAP rating (Section 12)		82	(258)
SAP band		B	

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	3095.9387	0.2100	650.1471	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3496.0004	0.2100	734.1601	(264)
Space and water heating			1384.3072	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	238.4914	0.1443	34.4217	(268)
Total CO2, kg/year			1430.6582	(272)
CO2 emissions per m2			18.1300	(273)
EI value			84.5297	
EI rating			85	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	38.2900 (1b)	x	2.5000 (2b)	=	95.7250	(1b) - (3b)
First floor	40.6300 (1c)	x	2.8000 (2c)	=	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	209.4890	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1909	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3409	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2898	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000	(22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750	(22a)
Adj infilt rate	0.3333	0.3115	0.3188	0.2898	0.2898	0.2536	0.2608	0.2753	0.2681	0.2826	0.2826	0.3115	(22b)
Effective ac	0.5555	0.5485	0.5508	0.5420	0.5420	0.5322	0.5340	0.5379	0.5359	0.5399	0.5399	0.5485	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.4000	1.2000	2.8800			(26)
window (Uw = 1.20)			14.3500	1.1450	16.4313			(27)
rl			0.9600	1.2357	1.1863			(27a)
ground floor			38.2900	0.1000	3.8290	75.0000	2871.7500	(28a)
exposed upper			8.0000	0.1300	1.0400	20.0000	160.0000	(28b)
External Wall 1	106.0000	16.7500	89.2500	0.1300	11.6025	70.0000	6247.5000	(29a)
main flat roof	40.6300		40.6300	0.1000	4.0630	9.0000	365.6700	(30)
lower terrace	3.2000	0.9600	2.2400	0.1000	0.2240	9.0000	20.1600	(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.2561			(33)
Party Wall 1			34.9800	0.0000	0.0000	180.0000	6296.4000	(32)
Internal Wall 1			50.9600			9.0000	458.6400	(32c)
Internal Floor 1			32.6300			18.0000	587.3400	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17007.4600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		215.5025 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.6000	0.0600	0.6960
E3 Sill	10.6000	0.0400	0.4240
E4 Jamb	23.9600	0.0200	0.4792
R11 Upstands or kerbs of rooflights	4.0000	0.2400	0.9600
E5 Ground floor (normal)	20.0000	0.1300	2.6000
E6 Intermediate floor within a dwelling	7.9400	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	5.0000	0.1500	0.7500
E15 Flat roof with parapet	20.0000	0.3000	6.0000
E21 Exposed floor (inverted)	6.8000	0.3200	2.1760
E20 Exposed floor (normal)	7.5000	0.3200	2.4000
E16 Corner (normal)	17.5000	0.0500	0.8750
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0600	-0.4500
E18 Party wall between dwellings	10.0000	0.2400	2.4000
P1 Party wall - Ground floor	6.8000	0.3200	2.1760
P2 Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.8000	0.4800	3.2640

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		24.7502	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	66.0063	(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	38.4048	37.9204	38.0783	37.4686	37.4686	36.7883	36.9171	37.1856	37.0495	37.3253	37.3253	37.9204	(38)
Heat transfer coeff	104.4112	103.9267	104.0846	103.4750	103.4750	102.7946	102.9234	103.1919	103.0558	103.3316	103.3316	103.9267	(39)
Average = Sum(39)m / 12 =												103.4940	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3230	1.3169	1.3189	1.3111	1.3111	1.3025	1.3041	1.3076	1.3058	1.3093	1.3093	1.3169	(40)
HLP (average)												1.3114	

Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4420	(42)
Hot water usage for mixer showers													
	97.7473	96.2783	94.1378	90.0422	87.0198	83.6492	81.7334	83.8577	86.1864	89.8054	93.9889	97.3728	(42a)
Hot water usage for baths													
	28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511	(42b)
Hot water usage for other uses													
	39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390	(42c)
Average daily hot water use (litres/day)												152.2512	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	165.5325	162.2042	158.0335	151.4112	146.1347	140.4215	138.0189	142.1692	146.5758	152.6004	159.3331	165.0629	(44)
Energy conte	262.1631	230.9766	242.8917	207.2744	196.7253	172.6646	166.9219	176.0352	180.7426	207.0773	226.9992	258.4486	(45)
Energy content (annual)											Total = Sum(45)m =	2528.9204	
Distribution loss (46)m = 0.15 x (45)m													
	39.3245	34.6465	36.4337	31.0912	29.5088	25.8997	25.0383	26.4053	27.1114	31.0616	34.0499	38.7673	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(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													
	313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(64)
										Total per year (kWh/year) = Sum(64)m =		3128.9204	(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													
	99.9089	88.3066	93.5012	81.2475	78.1509	69.7398	68.2413	71.2714	72.4257	81.5929	87.8060	98.6739	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	33.7609	29.9862	24.3864	18.4621	13.8006	11.6511	12.5894	16.3641	21.9639	27.8882	32.5497	34.6992	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	324.1322	327.4956	319.0198	300.9757	278.1983	256.7907	242.4891	239.1256	247.6015	265.6456	288.4230	309.8306	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	(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)													
	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	(71)
Water heating gains (Table 5)													
	134.2862	131.4086	125.6737	112.8437	105.0415	96.8608	91.7221	95.7949	100.5912	109.6679	121.9528	132.6262	(72)
Total internal gains													
	596.1146	592.8257	573.0152	536.2168	500.9757	466.2379	447.7360	452.2201	471.0920	507.1371	546.8608	581.0913	(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	4.5400	11.5821	0.7200	0.7000	0.7700	18.3656	(74)
East	1.4600	21.5869	0.7200	0.7000	0.7700	11.0080	(76)
South	8.3500	49.2853	0.7200	0.7000	0.7700	143.7368	(78)
South	0.9600	29.0000	0.7200	0.7000	1.0000	12.6282	(82)

Solar gains	185.7386	285.3620	397.3794	524.1828	580.6602	624.8533	601.3168	552.3774	480.3898	345.8613	229.9642	162.7264	(83)
Total gains	781.8532	878.1877	970.3946	1060.3996	1081.6359	1091.0912	1049.0528	1004.5975	951.4818	852.9984	776.8250	743.8178	(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	45.2470	45.4579	45.3890	45.6564	45.6564	45.9586	45.9011	45.7816	45.8421	45.7197	45.7197	45.4579	
alpha	4.0165	4.0305	4.0259	4.0438	4.0438	4.0639	4.0601	4.0521	4.0561	4.0480	4.0480	4.0305	
util living area													
	0.9720	0.9560	0.9123	0.8187	0.6587	0.4250	0.2447	0.2762	0.5553	0.8309	0.9474	0.9761	(86)
MIT	19.7206	19.9089	20.2799	20.6471	20.8908	20.9866	20.9990	20.9984	20.9585	20.6886	20.1490	19.6802	(87)
Th 2	19.8229	19.8276	19.8261	19.8321	19.8321	19.8389	19.8376	19.8349	19.8363	19.8335	19.8335	19.8276	(88)
util rest of house													
	0.9641	0.9441	0.8883	0.7717	0.5790	0.3217	0.1312	0.1576	0.4481	0.7749	0.9304	0.9692	(89)
MIT 2	18.7153	18.9006	19.2517	19.5841	19.7741	19.8352	19.8375	19.8348	19.8212	19.6296	19.1410	18.6799	(90)
Living area fraction										fLA = Living area / (4) =		0.3833	(91)
MIT	19.1007	19.2871	19.6458	19.9916	20.2021	20.2765	20.2827	20.2808	20.2571	20.0355	19.5274	19.0633	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.9507	19.1371	19.4958	19.8416	20.0521	20.1265	20.1327	20.1308	20.1071	19.8855	19.3774	18.9133	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9565	0.9353	0.8803	0.7721	0.5949	0.3478	0.1601	0.1879	0.4742	0.7778	0.9221	0.9622	(94)
Useful gains	747.8131	821.3284	854.1960	818.7587	643.4953	379.5173	167.9642	188.7475	451.1597	663.4240	716.2930	715.6658	(95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000	(96)
Heat loss rate W	1414.8396	1386.0803	1217.3516	987.3127	688.3281	383.0673	168.0475	188.9234	464.4830	804.4883	1144.6448	1404.3937	(97)
Space heating kWh	496.2677	379.5133	270.1877	121.3589	33.3556	0.0000	0.0000	0.0000	0.0000	104.9519	308.4133	512.4136	(98a)
Space heating requirement - total per year (kWh/year)												2226.4620	
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	496.2677	379.5133	270.1877	121.3589	33.3556	0.0000	0.0000	0.0000	0.0000	104.9519	308.4133	512.4136	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2226.4620	
Space heating per m2											(98c) / (4) =	28.2116	(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 %)	89.5000	(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	496.2677	379.5133	270.1877	121.3589	33.3556	0.0000	0.0000	0.0000	0.0000	104.9519	308.4133	512.4136	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	554.4890	424.0372	301.8857	135.5965	37.2688	0.0000	0.0000	0.0000	0.0000	117.2647	344.5959	572.5291	(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	313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	349.8570	309.5016	328.3247	286.6921	276.7422	248.0220	243.4423	253.6247	257.0476	288.3086	308.7310	345.7067	(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	29.5507	23.7067	21.3453	15.6384	12.0796	9.8691	11.0194	14.3234	18.6047	24.4104	27.5715	30.3720	(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	2487.6670	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	3496.0004	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	238.4914	(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	6308.1588	(238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2487.6670	6.1900	153.9866	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3496.0004	6.1900	216.4024	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	25.1600	21.6376	(249)
Energy for lighting	238.4914	25.1600	60.0044	(250)
Additional standing charges			102.0000	(251)
Total energy cost			554.0310	(255)

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	2487.6670	0.2100	522.4101	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3496.0004	0.2100	734.1601	(264)
Space and water heating			1256.5702	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	238.4914	0.1443	34.4217	(268)
Total CO2, kg/year			1302.9211	(272)

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	2487.6670	1.1300	2811.0637	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3496.0004	1.1300	3950.4805	(278)
Space and water heating			6761.5442	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	238.4914	1.5338	365.8061	(282)
Total Primary energy kWh/year			7257.4511	(286)

SAP 10 EPC IMPROVEMENTS

Be Lean

Current energy efficiency rating: B 82
Current environmental impact rating: B 85

N	Solar water heating	SAP increase too small
U	Solar photovoltaic panels	Recommended
V2	Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
U Solar photovoltaic panels	+ 5.7	-£ 189	-101 kg (7.8%)

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.6	-£ 28	-153 kg (11.7%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar photovoltaic panels	£189	1.28 kg/m²	B 88	B 86
Total Savings	£189	1.28 kg/m²		

Potential energy efficiency rating: B 88
Potential environmental impact rating: B 86

Fuel prices for cost data on this page from database revision number 538 TEST (29 Feb 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£82	£82	£0
Mains gas	£472	£472	£0
Space heating	£278	£278	£0
Water heating	£216	£216	£0
Lighting	£60	£60	£0
Generated (PV)	-£0	-£189	£189
Total cost of fuels	£554	£365	£189
Total cost of uses	£554	£365	£189
Delivered energy	80 kWh/m²	70 kWh/m²	10 kWh/m²
Carbon dioxide emissions	1.3 tonnes	1.2 tonnes	0.1 tonnes
CO2 emissions per m²	17 kg/m²	15 kg/m²	1 kg/m²
Primary energy	92 kWh/m²	78 kWh/m²	14 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	38.2900 (1b)	x	2.5000 (2b)	=	95.7250	(1b) - (3b)
First floor	40.6300 (1c)	x	2.8000 (2c)	=	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	209.4890	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1909	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3409	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2898	(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	0.3695	0.3622	0.3550	0.3188	0.3115	0.2753	0.2753	0.2681	0.2898	0.3115	0.3260	0.3405	(22b)
Effective ac	0.5683	0.5656	0.5630	0.5508	0.5485	0.5379	0.5379	0.5359	0.5420	0.5485	0.5531	0.5580	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.4000	1.2000	2.8800			(26)
window (Uw = 1.20)			14.3500	1.1450	16.4313			(27)
rl			0.9600	1.2357	1.1863			(27a)
ground floor			38.2900	0.1000	3.8290	75.0000	2871.7500	(28a)
exposed upper			8.0000	0.1300	1.0400	20.0000	160.0000	(28b)
External Wall 1	106.0000	16.7500	89.2500	0.1300	11.6025	70.0000	6247.5000	(29a)
main flat roof	40.6300		40.6300	0.1000	4.0630	9.0000	365.6700	(30)
lower terrace	3.2000	0.9600	2.2400	0.1000	0.2240	9.0000	20.1600	(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.2561			(33)
Party Wall 1			34.9800	0.0000	0.0000	180.0000	6296.4000	(32)
Internal Wall 1			50.9600			9.0000	458.6400	(32c)
Internal Floor 1			32.6300			18.0000	587.3400	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17007.4600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		215.5025 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.6000	0.0600	0.6960
E3 Sill	10.6000	0.0400	0.4240
E4 Jamb	23.9600	0.0200	0.4792
R11 Upstands or kerbs of rooflights	4.0000	0.2400	0.9600
E5 Ground floor (normal)	20.0000	0.1300	2.6000
E6 Intermediate floor within a dwelling	7.9400	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	5.0000	0.1500	0.7500
E15 Flat roof with parapet	20.0000	0.3000	6.0000
E21 Exposed floor (inverted)	6.8000	0.3200	2.1760
E20 Exposed floor (normal)	7.5000	0.3200	2.4000
E16 Corner (normal)	17.5000	0.0500	0.8750
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0600	-0.4500
E18 Party wall between dwellings	10.0000	0.2400	2.4000
P1 Party wall - Ground floor	6.8000	0.3200	2.1760
P2 Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.8000	0.4800	3.2640

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		24.7502	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	66.0063	(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	39.2848	39.1016	38.9219	38.0783	37.9204	37.1856	37.1856	37.0495	37.4686	37.9204	38.2397	38.5736	(38)
Heat transfer coeff	105.2911	105.1079	104.9282	104.0846	103.9267	103.1919	103.1919	103.0558	103.4750	103.9267	104.2461	104.5799	(39)
Average = Sum(39)m / 12 =												104.0838	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3342	1.3318	1.3296	1.3189	1.3169	1.3076	1.3076	1.3058	1.3111	1.3169	1.3209	1.3251	(40)
HLP (average)												1.3189	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4420	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
97.7473	96.2783	94.1378	90.0422	87.0198	83.6492	81.7334	83.8577	86.1864	89.8054	93.9889	97.3728	(42a)

Hot water usage for baths

28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511	(42b)

Hot water usage for other uses

39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390	(42c)

Average daily hot water use (litres/day)	152.2512 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												
165.5325	162.2042	158.0335	151.4112	146.1347	140.4215	138.0189	142.1692	146.5758	152.6004	159.3331	165.0629	(44)

Energy conte	262.1631	230.9766	242.8917	207.2744	196.7253	172.6646	166.9219	176.0352	180.7426	207.0773	226.9992	258.4486	(45)
Energy content (annual)										Total = Sum(45)m =		2528.9204	
Distribution loss (46)m = 0.15 x (45)m													
	39.3245	34.6465	36.4337	31.0912	29.5088	25.8997	25.0383	26.4053	27.1114	31.0616	34.0499	38.7673	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(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													
	313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(64)
										Total per year (kWh/year) = Sum(64)m =		3128.9204	(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													
	99.9089	88.3066	93.5012	81.2475	78.1509	69.7398	68.2413	71.2714	72.4257	81.5929	87.8060	98.6739	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	33.7609	29.9862	24.3864	18.4621	13.8006	11.6511	12.5894	16.3641	21.9639	27.8882	32.5497	34.6992	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	324.1322	327.4956	319.0198	300.9757	278.1983	256.7907	242.4891	239.1256	247.6015	265.6456	288.4230	309.8306	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	(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)													
	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	(71)
Water heating gains (Table 5)													
	134.2862	131.4086	125.6737	112.8437	105.0415	96.8608	91.7221	95.7949	100.5912	109.6679	121.9528	132.6262	(72)
Total internal gains													
	596.1146	592.8257	573.0152	536.2168	500.9757	466.2379	447.7360	452.2201	471.0920	507.1371	546.8608	581.0913	(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	4.5400	10.6334	0.7200	0.7000	0.7700	16.8613	(74)
East	1.4600	19.6403	0.7200	0.7000	0.7700	10.0153	(76)
South	8.3500	46.7521	0.7200	0.7000	0.7700	136.3487	(78)
South	0.9600	26.0000	0.7200	0.7000	1.0000	11.3219	(82)

Solar gains	174.5472	298.6336	413.2733	521.8151	594.7665	595.3632	571.9281	516.5086	450.5773	331.1992	209.2783	149.2549	(83)
Total gains	770.6618	891.4593	986.2885	1058.0320	1095.7422	1061.6011	1019.6640	968.7286	921.6693	838.3363	756.1391	730.3463	(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	44.8689	44.9471	45.0240	45.3890	45.4579	45.7816	45.7816	45.8421	45.6564	45.4579	45.3187	45.1740	
alpha	3.9913	3.9965	4.0016	4.0259	4.0305	4.0521	4.0521	4.0561	4.0438	4.0305	4.0212	4.0116	
util living area													
	0.9788	0.9619	0.9299	0.8641	0.7481	0.5843	0.4358	0.4752	0.6888	0.8883	0.9636	0.9825	(86)
MIT	19.5247	19.7730	20.1113	20.4913	20.7835	20.9407	20.9857	20.9797	20.8832	20.5044	19.9388	19.4701	(87)
Th 2	19.8142	19.8160	19.8178	19.8261	19.8276	19.8349	19.8349	19.8363	19.8321	19.8276	19.8245	19.8212	(88)
util rest of house													
	0.9730	0.9520	0.9116	0.8288	0.6861	0.4921	0.3250	0.3616	0.6003	0.8511	0.9523	0.9777	(89)
MIT 2	18.5159	18.7588	19.0849	19.4425	19.6907	19.8087	19.8313	19.8306	19.7732	19.4658	18.9312	18.4676	(90)
Living area fraction										fLA = Living area / (4) =		0.3833	(91)
MIT	18.9026	19.1476	19.4783	19.8445	20.1096	20.2426	20.2738	20.2711	20.1987	19.8639	19.3174	18.8519	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.7526	18.9976	19.3283	19.6945	19.9596	20.0926	20.1238	20.1211	20.0487	19.7139	19.1674	18.7019	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9662	0.9432	0.9024	0.8243	0.6937	0.5135	0.3531	0.3902	0.6180	0.8469	0.9442	0.9716	(94)
Useful gains	744.6183	840.8551	890.0181	872.1742	760.0963	545.1070	360.0227	378.0290	569.5800	709.9738	713.9113	709.6228	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1521.7266	1481.7649	1346.0500	1123.5406	858.3900	566.7930	363.6283	383.4800	615.5411	947.1763	1257.9780	1516.6074	(97)
Space heating kWh													
	578.1686	430.6914	339.2877	180.9838	73.1306	0.0000	0.0000	0.0000	0.0000	176.4786	391.7280	600.3965	(98a)
Space heating requirement - total per year (kWh/year)												2770.8652	
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													
	578.1686	430.6914	339.2877	180.9838	73.1306	0.0000	0.0000	0.0000	0.0000	176.4786	391.7280	600.3965	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2770.8652	
Space heating per m2											(98c) / (4) =	35.1098	(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 %)												89.5000	(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													
	578.1686	430.6914	339.2877	180.9838	73.1306	0.0000	0.0000	0.0000	0.0000	176.4786	391.7280	600.3965	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	645.9984	481.2194	379.0924	202.2165	81.7101	0.0000	0.0000	0.0000	0.0000	197.1828	437.6849	670.8341	(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													
	313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	349.8570	309.5016	328.3247	286.6921	276.7422	248.0220	243.4423	253.6247	257.0476	288.3086	308.7310	345.7067	(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	29.5507	23.7067	21.3453	15.6384	12.0796	9.8691	11.0194	14.3234	18.6047	24.4104	27.5715	30.3720	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.0844	-47.3487	-69.1266	-78.8762	-85.8942	-80.4589	-79.4682	-74.6389	-66.1304	-54.6987	-36.6224	-28.5145	(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												3095.9387	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												3496.0004	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												238.4914	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-734.8622	(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												6181.5684	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3095.9387	3.6400	112.6922	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3496.0004	3.6400	127.2544	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	238.4914	16.4900	39.3272	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-734.8622	16.4900	-121.1788	
PV Unit electricity exported	0.0000	5.5900	0.0000	
Total			-121.1788	(252)
Total energy cost			264.2764	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7677	(257)
SAP value		87.5548	
SAP rating (Section 12)		88	(258)
SAP band		B	

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	3095.9387	0.2100	650.1471	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3496.0004	0.2100	734.1601	(264)
Space and water heating			1384.3072	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	238.4914	0.1443	34.4217	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-734.8622	0.1343	-98.6826	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-98.6826	(269)
Total CO2, kg/year			1331.9755	(272)
CO2 emissions per m2			16.8800	(273)
EI value			85.5968	
EI rating			86	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	38.2900	(1b)	x 2.5000	(2b) =	95.7250	(1b) - (3b)
First floor	40.6300	(1c)	x 2.8000	(2c) =	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		209.4890	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1909 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.3409 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2898 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000	(22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750	(22a)
Adj infilt rate	0.3333	0.3115	0.3188	0.2898	0.2898	0.2536	0.2608	0.2753	0.2681	0.2826	0.2826	0.3115	(22b)
Effective ac	0.5555	0.5485	0.5508	0.5420	0.5420	0.5322	0.5340	0.5379	0.5359	0.5399	0.5399	0.5485	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.4000	1.2000	2.8800			(26)
window (Uw = 1.20)			14.3500	1.1450	16.4313			(27)
rl			0.9600	1.2357	1.1863			(27a)
ground floor			38.2900	0.1000	3.8290	75.0000	2871.7500	(28a)
exposed upper			8.0000	0.1300	1.0400	20.0000	160.0000	(28b)
External Wall 1	106.0000	16.7500	89.2500	0.1300	11.6025	70.0000	6247.5000	(29a)
main flat roof	40.6300		40.6300	0.1000	4.0630	9.0000	365.6700	(30)
lower terrace	3.2000	0.9600	2.2400	0.1000	0.2240	9.0000	20.1600	(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.2561			(33)
Party Wall 1			34.9800	0.0000	0.0000	180.0000	6296.4000	(32)
Internal Wall 1			50.9600			9.0000	458.6400	(32c)
Internal Floor 1			32.6300			18.0000	587.3400	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17007.4600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		215.5025 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.6000	0.0600	0.6960
E3 Sill	10.6000	0.0400	0.4240
E4 Jamb	23.9600	0.0200	0.4792

R11 Upstands or kerbs of rooflights	4.0000	0.2400	0.9600	
E5 Ground floor (normal)	20.0000	0.1300	2.6000	
E6 Intermediate floor within a dwelling	7.9400	0.0000	0.0000	
E24 Eaves (insulation at ceiling level - inverted)	5.0000	0.1500	0.7500	
E15 Flat roof with parapet	20.0000	0.3000	6.0000	
E21 Exposed floor (inverted)	6.8000	0.3200	2.1760	
E20 Exposed floor (normal)	7.5000	0.3200	2.4000	
E16 Corner (normal)	17.5000	0.0500	0.8750	
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0600	-0.4500	
E18 Party wall between dwellings	10.0000	0.2400	2.4000	
P1 Party wall - Ground floor	6.8000	0.3200	2.1760	
P2 Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	6.8000	0.4800	3.2640	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 24.7502 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 66.0063 (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	38.4048	37.9204	38.0783	37.4686	37.4686	36.7883	36.9171	37.1856	37.0495	37.3253	37.3253	37.9204	(38)
Heat transfer coeff	104.4112	103.9267	104.0846	103.4750	103.4750	102.7946	102.9234	103.1919	103.0558	103.3316	103.3316	103.9267	(39)
Average = Sum(39)m / 12 =												103.4940	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3230	1.3169	1.3189	1.3111	1.3111	1.3025	1.3041	1.3076	1.3058	1.3093	1.3093	1.3169	(40)
HLP (average)												1.3114	
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 2.4420 (42)
Hot water usage for mixer showers

97.7473	96.2783	94.1378	90.0422	87.0198	83.6492	81.7334	83.8577	86.1864	89.8054	93.9889	97.3728	(42a)

Hot water usage for baths

28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511	(42b)

Hot water usage for other uses

39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390	(42c)

Average daily hot water use (litres/day) 152.2512 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	165.5325	162.2042	158.0335	151.4112	146.1347	140.4215	138.0189	142.1692	146.5758	152.6004	159.3331	165.0629	(44)
Energy conte	262.1631	230.9766	242.8917	207.2744	196.7253	172.6646	166.9219	176.0352	180.7426	207.0773	226.9992	258.4486	(45)
Energy content (annual)										Total = Sum(45)m =		2528.9204	
Distribution loss (46)m = 0.15 x (45)m	39.3245	34.6465	36.4337	31.0912	29.5088	25.8997	25.0383	26.4053	27.1114	31.0616	34.0499	38.7673	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(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	313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(64)
										Total per year (kWh/year) = Sum(64)m =		3128.9204	(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	99.9089	88.3066	93.5012	81.2475	78.1509	69.7398	68.2413	71.2714	72.4257	81.5929	87.8060	98.6739	(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	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	146.5230	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.7609	29.9862	24.3864	18.4621	13.8006	11.6511	12.5894	16.3641	21.9639	27.8882	32.5497	34.6992	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	324.1322	327.4956	319.0198	300.9757	278.1983	256.7907	242.4891	239.1256	247.6015	265.6456	288.4230	309.8306	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	52.0943	(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)	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	(71)
Water heating gains (Table 5)	134.2862	131.4086	125.6737	112.8437	105.0415	96.8608	91.7221	95.7949	100.5912	109.6679	121.9528	132.6262	(72)
Total internal gains	596.1146	592.8257	573.0152	536.2168	500.9757	466.2379	447.7360	452.2201	471.0920	507.1371	546.8608	581.0913	(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	4.5400	11.5821	0.7200	0.7000	0.7700	18.3656	(74)
East	1.4600	21.5869	0.7200	0.7000	0.7700	11.0080	(76)
South	8.3500	49.2853	0.7200	0.7000	0.7700	143.7368	(78)
South	0.9600	29.0000	0.7200	0.7000	1.0000	12.6282	(82)

Solar gains	185.7386	285.3620	397.3794	524.1828	580.6602	624.8533	601.3168	552.3774	480.3898	345.8613	229.9642	162.7264	(83)

Total gains	781.8532	878.1877	970.3946	1060.3996	1081.6359	1091.0912	1049.0528	1004.5975	951.4818	852.9984	776.8250	743.8178	(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	45.2470	45.4579	45.3890	45.6564	45.6564	45.9586	45.9011	45.7816	45.8421	45.7197	45.7197	45.4579	
alpha	4.0165	4.0305	4.0259	4.0438	4.0438	4.0639	4.0601	4.0521	4.0561	4.0480	4.0480	4.0305	
util living area													
	0.9720	0.9560	0.9123	0.8187	0.6587	0.4250	0.2447	0.2762	0.5553	0.8309	0.9474	0.9761	(86)
MIT	19.7206	19.9089	20.2799	20.6471	20.8908	20.9866	20.9990	20.9984	20.9585	20.6886	20.1490	19.6802	(87)
Th 2	19.8229	19.8276	19.8261	19.8321	19.8321	19.8389	19.8376	19.8349	19.8363	19.8335	19.8335	19.8276	(88)
util rest of house													
	0.9641	0.9441	0.8883	0.7717	0.5790	0.3217	0.1312	0.1576	0.4481	0.7749	0.9304	0.9692	(89)
MIT 2	18.7153	18.9006	19.2517	19.5841	19.7741	19.8352	19.8375	19.8348	19.8212	19.6296	19.1410	18.6799	(90)
Living area fraction										fLA = Living area / (4) =		0.3833	(91)
MIT	19.1007	19.2871	19.6458	19.9916	20.2021	20.2765	20.2827	20.2808	20.2571	20.0355	19.5274	19.0633	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.9507	19.1371	19.4958	19.8416	20.0521	20.1265	20.1327	20.1308	20.1071	19.8855	19.3774	18.9133	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9565	0.9353	0.8803	0.7721	0.5949	0.3478	0.1601	0.1879	0.4742	0.7778	0.9221	0.9622	(94)
Useful gains	747.8131	821.3284	854.1960	818.7587	643.4953	379.5173	167.9642	188.7475	451.1597	663.4240	716.2930	715.6658	(95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000	(96)
Heat loss rate W													
	1414.8396	1386.0803	1217.3516	987.3127	688.3281	383.0673	168.0475	188.9234	464.4830	804.4883	1144.6448	1404.3937	(97)
Space heating kWh													
	496.2677	379.5133	270.1877	121.3589	33.3556	0.0000	0.0000	0.0000	0.0000	104.9519	308.4133	512.4136	(98a)
Space heating requirement - total per year (kWh/year)												2226.4620	
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													
	496.2677	379.5133	270.1877	121.3589	33.3556	0.0000	0.0000	0.0000	0.0000	104.9519	308.4133	512.4136	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2226.4620	
Space heating per m2											(98c) / (4) =	28.2116	(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 %)												89.5000	(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													
	496.2677	379.5133	270.1877	121.3589	33.3556	0.0000	0.0000	0.0000	0.0000	104.9519	308.4133	512.4136	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	554.4890	424.0372	301.8857	135.5965	37.2688	0.0000	0.0000	0.0000	0.0000	117.2647	344.5959	572.5291	(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													
	313.1220	277.0040	293.8506	256.5894	247.6842	221.9797	217.8808	226.9941	230.0576	258.0362	276.3143	309.4075	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	349.8570	309.5016	328.3247	286.6921	276.7422	248.0220	243.4423	253.6247	257.0476	288.3086	308.7310	345.7067	(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	29.5507	23.7067	21.3453	15.6384	12.0796	9.8691	11.0194	14.3234	18.6047	24.4104	27.5715	30.3720	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-35.2337	-46.4562	-68.1618	-79.5924	-85.1929	-82.4240	-81.5077	-77.4915	-69.0865	-56.9482	-39.8327	-30.9869	(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												2487.6670	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												3496.0004	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)

Electricity for lighting (calculated in Appendix L)	238.4914	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-752.9144	(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	5555.2444	(238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2487.6670	6.1900	153.9866	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3496.0004	6.1900	216.4024	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	25.1600	21.6376	(249)
Energy for lighting	238.4914	25.1600	60.0044	(250)
Additional standing charges			102.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-752.9144	25.1600	-189.4333	
PV Unit electricity exported	0.0000	5.8100	0.0000	
Total			-189.4333	(252)
Total energy cost			364.5978	(255)

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	2487.6670	0.2100	522.4101	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3496.0004	0.2100	734.1601	(264)
Space and water heating			1256.5702	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	238.4914	0.1443	34.4217	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-752.9144	0.1343	-101.0884	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-101.0884	(269)
Total CO2, kg/year			1201.8327	(272)

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	2487.6670	1.1300	2811.0637	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3496.0004	1.1300	3950.4805	(278)
Space and water heating			6761.5442	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	238.4914	1.5338	365.8061	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-752.9144	1.4962	-1126.4980	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1126.4980	(283)
Total Primary energy kWh/year			6130.9531	(286)

Appendix 3



Full SAP Calculation Printout

Property Reference	Flat 1 Block B	**Issued on Date**	13/03/2024
Assessment Reference	Design stage for ES condition	**Prop Type Ref**	
Property	Flat 7 Block C, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	85 B	**DER**	3.92	**TER**	12.82
Environmental	97 A	**% DER < TER**			69.42
CO_2 Emissions (t/year)	0.23	**DFEE**	36.11	**TFEE**	38.54
Compliance Check	See BREL	**% DFEE < TFEE**			6.28
% DPER < TPER	37.97	**DPER**	41.66	**TPER**	67.16

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.2000	(1b)	x 2.5900	(2b) =	166.2780	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	166.2780	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(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) =		81.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			10.6300	1.1450	12.1718			(27)
Heatloss Floor 1			64.2000	0.1000	6.4200	75.0000	4815.0000	(28a)
External Wall 1	43.4900	10.6300	32.8600	0.1400	4.6004	70.0000	2300.2000	(29a)
sheltered	15.4800	2.1000	13.3800	0.1300	1.7394	70.0000	936.6000	(29a)
Total net area of external elements Aum(A, m2)			123.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.8716			(33)
Party Wall 1			27.3200	0.0000	0.0000	180.0000	4917.6000	(32)
Party Floor 1			64.1600			30.0000	1924.8000	(32d)
Party Ceiling 1			64.2000			20.0000	1284.0000	(32b)
Internal Wall 1			104.0000			9.0000	936.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17114.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		266.5763 (35)
List of Thermal Bridges		

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	6.9200	0.0600	0.4152	
E3 Sill	5.9200	0.0400	0.2368	
E4 Jamb	25.3200	0.0200	0.5064	
E5 Ground floor (normal)	17.0000	0.1300	2.2100	
E5 Ground floor (normal)	5.9000	0.3200	1.8880	
E7 Party floor between dwellings (in blocks of flats)	17.0000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	5.9000	0.2800	1.6520	
E16 Corner (normal)	7.8000	0.0500	0.3900	
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0600	-0.1560	
P1 Party wall - Ground floor	10.6000	0.3200	3.3920	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.6000	0.0000	0.0000	
E18 Party wall between dwellings	2.6000	0.2400	0.6240	
E18 Party wall between dwellings	2.6000	0.2400	0.6240	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.7824	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	39.6540	(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	14.1329	13.9580	13.7831	12.9086	12.7337	11.8592	11.8592	11.6843	12.2090	12.7337	13.0835	13.4333	(38)
Heat transfer coeff	53.7869	53.6120	53.4371	52.5625	52.3876	51.5131	51.5131	51.3382	51.8629	52.3876	52.7374	53.0872	(39)
Average = Sum(39)m / 12 =												52.5188	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8351	0.8324	0.8187	0.8160	0.8024	0.8024	0.7997	0.8078	0.8160	0.8215	0.8269	(40)
HLP (average)												0.8180	
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											2.0976	(42)
Hot water usage for mixer showers												
89.0832	87.7444	85.7936	82.0611	79.3066	76.2347	74.4887	76.4248	78.5471	81.8452	85.6580	88.7419	(42a)
Hot water usage for baths												
25.6623	25.2812	24.7445	23.7550	23.0140	22.1923	21.7485	22.2815	22.8618	23.7409	24.7509	25.5756	(42b)
Hot water usage for other uses												
36.1111	34.7980	33.4848	32.1717	30.8586	29.5455	29.5455	30.8586	32.1717	33.4848	34.7980	36.1111	(42c)
Average daily hot water use (litres/day)											138.7530	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	150.8566	147.8236	144.0230	137.9877	133.1791	127.9725	125.7827	129.5648	133.5805	139.0710	145.2068	150.4286	(44)
Energy conte	238.9200	210.4989	221.3580	188.8983	179.2847	157.3572	152.1233	160.4283	164.7181	188.7181	206.8737	235.5348	(45)
Energy content (annual)										Total = Sum(45)m =		2304.7134	
Distribution loss (46)m = 0.15 x (45)m													
	35.8380	31.5748	33.2037	28.3347	26.8927	23.6036	22.8185	24.0643	24.7077	28.3077	31.0311	35.3302	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.5400	(55)
Total storage loss													
	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(56)
If cylinder contains dedicated solar storage													
	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(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													
	278.9224	246.6301	261.3604	227.6103	219.2871	196.0692	192.1257	200.4307	203.4301	228.7205	245.5857	275.5372	(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													
	278.9224	246.6301	261.3604	227.6103	219.2871	196.0692	192.1257	200.4307	203.4301	228.7205	245.5857	275.5372	(64)
										Total per year (kWh/year) = Sum(64)m =		2775.7094	(64)
12Total per year (kWh/year)												2776	(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													
	111.4428	98.8958	105.6034	93.7783	91.6141	83.2909	82.5829	85.3443	85.7384	94.7507	99.7551	110.3172	(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	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	95.8725	106.1446	95.8725	99.0683	95.8725	99.0683	95.8725	95.8725	99.0683	95.8725	99.0683	95.8725	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	183.4018	185.3050	180.5091	170.2993	157.4113	145.2984	137.2062	135.3031	140.0989	150.3087	163.1967	175.3096	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	(71)
Water heating gains (Table 5)													
	149.7888	147.1664	141.9401	130.2476	123.1372	115.6817	110.9985	114.7101	119.0811	127.3531	138.5488	148.2759	(72)
Total internal gains													
	483.5265	493.0793	472.7851	454.0786	430.8844	414.5118	398.5407	400.3491	412.7117	427.9977	455.2772	473.9214	(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	4.5900	10.6334	0.7200	0.7000	0.7700	17.0470	(74)

East				6.0400		19.6403		0.7200		0.7000		0.7700	41.4332 (76)
Solar gains	58.4802	113.6298	188.8387	283.5927	358.3618	372.4591	352.2351	294.7097	221.8018	134.9546	72.6920	48.2838 (83)	
Total gains	542.0066	606.7091	661.6238	737.6713	789.2463	786.9709	750.7758	695.0588	634.5134	562.9523	527.9691	522.2053 (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	88.3849	88.6732	88.9635	90.4436	90.7456	92.2861	92.2861	92.6005	91.6637	90.7456	90.1436	89.5497	
alpha	6.8923	6.9115	6.9309	7.0296	7.0497	7.1524	7.1524	7.1734	7.1109	7.0497	7.0096	6.9700	
util living area													
	0.9876	0.9723	0.9316	0.8020	0.6093	0.4184	0.3019	0.3397	0.5598	0.8610	0.9698	0.9899 (86)	
Living	20.3912	20.5415	20.7339	20.9253	20.9893	20.9994	20.9999	20.9999	20.9955	20.8987	20.6282	20.3699	
Non living	19.6789	19.8266	20.0094	20.1847	20.2335	20.2510	20.2513	20.2536	20.2445	20.1697	19.9222	19.6660	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.6886	20.5415	20.7339	20.9253	20.9893	20.9994	20.9999	20.9999	20.9955	20.8987	20.6282	20.4581 (87)	
Th 2	20.2207	20.2230	20.2254	20.2371	20.2395	20.2513	20.2513	20.2536	20.2465	20.2395	20.2348	20.2301 (88)	
util rest of house													
	0.9839	0.9646	0.9141	0.7656	0.5623	0.3697	0.2505	0.2846	0.5005	0.8234	0.9600	0.9869 (89)	
MIT 2	19.9435	19.8266	20.0094	20.1847	20.2335	20.2510	20.2513	20.2536	20.2445	20.1697	19.9222	19.7449 (90)	
Living area fraction										fLA = Living area / (4) =		0.4737 (91)	
MIT	20.2964	20.1652	20.3526	20.5355	20.5915	20.6055	20.6059	20.6071	20.6002	20.5150	20.2566	20.0827 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.2964	20.1652	20.3526	20.5355	20.5915	20.6055	20.6059	20.6071	20.6002	20.5150	20.2566	20.0827 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9843	0.9639	0.9173	0.7803	0.5842	0.3928	0.2748	0.3107	0.5285	0.8378	0.9603	0.9862 (94)	
Useful gains	533.4858	584.8295	606.8873	575.6110	461.0983	309.1250	206.3415	215.9508	335.3504	471.6599	507.0252	514.9982 (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													
	860.3977	818.3978	740.2421	611.5900	465.8039	309.3613	206.3560	215.9848	337.1214	519.4237	693.8441	843.1698 (97)	
Space heating kWh													
	243.2225	156.9579	99.2160	25.9049	3.5009	0.0000	0.0000	0.0000	0.0000	35.5363	134.5096	244.1597 (98a)	
Space heating requirement - total per year (kWh/year)												943.0077	
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													
	243.2225	156.9579	99.2160	25.9049	3.5009	0.0000	0.0000	0.0000	0.0000	35.5363	134.5096	244.1597 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												943.0077	
Space heating per m2											(98c) / (4) =	14.6886 (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 %)												279.3363 (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													
	243.2225	156.9579	99.2160	25.9049	3.5009	0.0000	0.0000	0.0000	0.0000	35.5363	134.5096	244.1597 (98)	
Space heating efficiency (main heating system 1)													
	279.3363	279.3363	279.3363	279.3363	279.3363	0.0000	0.0000	0.0000	0.0000	279.3363	279.3363	279.3363 (210)	
Space heating fuel (main heating system)													
	87.0716	56.1896	35.5185	9.2737	1.2533	0.0000	0.0000	0.0000	0.0000	12.7217	48.1533	87.4071 (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													
	278.9224	246.6301	261.3604	227.6103	219.2871	196.0692	192.1257	200.4307	203.4301	228.7205	245.5857	275.5372 (64)	
Efficiency of water heater												276.1678 (216)	
(217)m	276.1678	276.1678	276.1678	276.1678	276.1678	276.1678	276.1678	276.1678	276.1678	276.1678	276.1678	276.1678 (217)	
Fuel for water heating, kWh/month													
	100.9975	89.3044	94.6383	82.4174	79.4036	70.9964	69.5685	72.5757	73.6618	82.8194	88.9263	99.7717 (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	16.1092	14.5503	16.1092	15.5896	16.1092	15.5896	16.1092	16.1092	15.5896	16.1092	15.5896	16.1092 (231)	
Lighting	26.0929	20.9327	18.8476	13.8086	10.6661	8.7143	9.7300	12.6474	16.4278	21.5541	24.3453	26.8181 (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												337.5887 (211)	
Space heating fuel - main system 2												0.0000 (213)	

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	276.1678	
Water heating fuel used	1005.0808	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.7000, SFP = 0.9350)		
mechanical ventilation fans (SFP = 0.9350)	189.6733	(230a)
Total electricity for the above, kWh/year	189.6733	(231)
Electricity for lighting (calculated in Appendix L)	210.5850	(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	1742.9278	(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	337.5887	0.1581	53.3575	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1005.0808	0.1411	141.8089	(264)
Space and water heating			195.1664	(265)
Pumps, fans and electric keep-hot	189.6733	0.1387	26.3100	(267)
Energy for lighting	210.5850	0.1443	30.3939	(268)
Total CO2, kg/year			251.8704	(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	337.5887	1.5851	535.1012	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1005.0808	1.5217	1529.4484	(278)
Space and water heating			2064.5496	(279)
Pumps, fans and electric keep-hot	189.6733	1.5128	286.9378	(281)
Energy for lighting	210.5850	1.5338	323.0023	(282)
Total Primary energy kWh/year			2674.4897	(286)
Dwelling Primary energy Rate (DPER)			41.6600	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.2000 (1b)	x	2.5900 (2b)	=	166.2780	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	166.2780	(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) =	0.1203	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3703	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3147	(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	0.4013	0.3934	0.3856	0.3462	0.3383	0.2990	0.2990	0.2911	0.3147	0.3383	0.3541	0.3698	(22b)
Effective ac	0.5805	0.5774	0.5743	0.5599	0.5572	0.5447	0.5447	0.5424	0.5495	0.5572	0.5627	0.5684	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			10.6300	1.1450	12.1718			(27)
Heatloss Floor 1			64.2000	0.1300	8.3460			(28a)
External Wall 1	43.4900	10.6300	32.8600	0.1800	5.9148			(29a)
sheltered	15.4800	2.1000	13.3800	0.1800	2.4084			(29a)
Total net area of external elements Aum(A, m2)			123.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.9410			(33)
Party Wall 1			27.3200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 276.5763 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	6.9200	0.0500	0.3460
E3	Sill	5.9200	0.0500	0.2960
E4	Jamb	25.3200	0.0500	1.2660
E5	Ground floor (normal)	17.0000	0.1600	2.7200
E5	Ground floor (normal)	5.9000	0.1600	0.9440
E7	Party floor between dwellings (in blocks of flats)	17.0000	0.0700	1.1900
E7	Party floor between dwellings (in blocks of flats)	5.9000	0.0700	0.4130
E16	Corner (normal)	7.8000	0.0900	0.7020
E17	Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340
P1	Party wall - Ground floor	10.6000	0.0800	0.8480
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	10.6000	0.0000	0.0000
E18	Party wall between dwellings	2.6000	0.0600	0.1560
E18	Party wall between dwellings	2.6000	0.0600	0.1560

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.8030 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 39.7440 (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	31.8540	31.6824	31.5143	30.7244	30.5766	29.8887	29.8887	29.7613	30.1537	30.5766	30.8756	31.1881	(38)
Heat transfer coeff	71.5980	71.4264	71.2582	70.4684	70.3206	69.6326	69.6326	69.5052	69.8976	70.3206	70.6195	70.9321	(39)

Average = Sum(39)m / 12 = 70.4677

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1152	1.1126	1.1099	1.0976	1.0953	1.0846	1.0846	1.0826	1.0887	1.0953	1.1000	1.1049	(40)
HLP (average)												1.0976	
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 2.0976 (42)

Hot water usage for mixer showers

59.3888	58.4963	57.1957	54.7074	52.8710	50.8232	49.6592	50.9499	52.3647	54.5635	57.1053	59.1612	(42a)

Hot water usage for baths

25.6623	25.2812	24.7445	23.7550	23.0140	22.1923	21.7485	22.2815	22.8618	23.7409	24.7509	25.5756	(42b)

Hot water usage for other uses

36.1111	34.7980	33.4848	32.1717	30.8586	29.5455	29.5455	30.8586	32.1717	33.4848	34.7980	36.1111	(42c)

Average daily hot water use (litres/day) 111.3758 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	121.1622	118.5755	115.4251	110.6341	106.7436	102.5610	100.9531	104.0899	107.3982	111.7893	116.6542	120.8479	(44)
Energy conte	191.8914	168.8499	177.4041	151.4525	143.6974	126.1107	122.0941	128.8851	132.4327	151.6970	166.1953	189.2187	(45)
Energy content (annual)										Total = Sum(45)m =		1849.9287	
Distribution loss (46)m = 0.15 x (45)m	28.7837	25.3275	26.6106	22.7179	21.5546	18.9166	18.3141	19.3328	19.8649	22.7545	24.9293	28.3828	(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

238.4863	210.9356	223.9990	196.5443	190.2923	171.2025	168.6890	175.4800	177.5245	198.2919	211.2871	235.8136	(62)
WWHRS -27.1501	-24.0117	-25.1437	-20.8200	-19.4035	-16.6037	-15.5633	-16.5500	-17.1788	-20.2519	-22.9430	-26.6473	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

211.3362	186.9239	198.8553	175.7243	170.8888	154.5988	153.1256	158.9299	160.3457	178.0400	188.3441	209.1663	(64)

Total per year (kWh/year) = Sum(64)m = 2146.2789 (64)

12Total per year (kWh/year) 2146 (64)

Electric shower(s)

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

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

Heat gains from water heating, kWh/month

101.0798	89.8112	96.2628	86.4314	85.0553	78.0053	77.8722	80.1302	80.1073	87.7152	91.3334	100.1911	(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	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	95.8725	106.1446	95.8725	99.0683	95.8725	99.0683	95.8725	95.8725	99.0683	95.8725	99.0683	95.8725	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	183.4018	185.3050	180.5091	170.2993	157.4113	145.2984	137.2062	135.3031	140.0989	150.3087	163.1967	175.3096	(68)

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

	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	(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)													
	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	(71)
Water heating gains (Table 5)													
	135.8600	133.6476	129.3855	120.0436	114.3216	108.3406	104.6669	107.7019	111.2602	117.8967	126.8519	134.6655	(72)
Total internal gains													
	472.5977	482.5605	463.2305	446.8746	425.0689	407.1707	392.2091	393.3409	404.8908	421.5414	446.5803	463.3111	(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	4.5900	10.6334	0.6300	0.7000	0.7700	14.9161	(74)
East	6.0400	19.6403	0.6300	0.7000	0.7700	36.2540	(76)

Solar gains	51.1701	99.4260	165.2338	248.1436	313.5666	325.9017	308.2057	257.8710	194.0766	118.0853	63.6055	42.2484	(83)
Total gains	523.7678	581.9865	628.4643	695.0182	738.6355	733.0724	700.4148	651.2119	598.9673	539.6266	510.1858	505.5594	(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	68.8885	69.0540	69.2170	69.9928	70.1399	70.8328	70.8328	70.9627	70.5643	70.1399	69.8430	69.5352	
alpha	5.5926	5.6036	5.6145	5.6662	5.6760	5.7222	5.7222	5.7308	5.7043	5.6760	5.6562	5.6357	
util living area													
	0.9944	0.9890	0.9750	0.9220	0.7940	0.5936	0.4353	0.4867	0.7457	0.9463	0.9880	0.9954	(86)
MIT	19.9544	20.1097	20.3480	20.6707	20.8950	20.9837	20.9976	20.9957	20.9445	20.6569	20.2582	19.9315	(87)
Th 2	19.9884	19.9906	19.9927	20.0028	20.0046	20.0134	20.0134	20.0150	20.0100	20.0046	20.0008	19.9969	(88)
util rest of house													
	0.9925	0.9852	0.9661	0.8954	0.7355	0.5086	0.3389	0.3848	0.6617	0.9219	0.9831	0.9938	(89)
MIT 2	18.7887	18.9871	19.2877	19.6836	19.9234	20.0052	20.0128	20.0137	19.9765	19.6778	19.1846	18.7659	(90)
Living area fraction									fLA = Living area / (4) =			0.4737	(91)
MIT	19.3409	19.5189	19.7899	20.1512	20.3837	20.4687	20.4793	20.4788	20.4350	20.1416	19.6931	19.3180	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3409	19.5189	19.7899	20.1512	20.3837	20.4687	20.4793	20.4788	20.4350	20.1416	19.6931	19.3180	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9908	0.9829	0.9640	0.8999	0.7591	0.5486	0.3846	0.4332	0.6996	0.9258	0.9811	0.9923	(94)
Useful gains	518.9496	572.0399	605.8111	625.4307	560.6878	402.1387	269.4111	282.1328	419.0633	499.6029	500.5622	501.6743	(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													
	1076.8973	1044.1731	947.0182	792.8527	610.6402	408.6503	270.1238	283.5010	442.8041	670.9679	889.3222	1072.3527	(97)
Space heating kWh													
	415.1131	317.2736	253.8581	120.5438	37.1646	0.0000	0.0000	0.0000	0.0000	127.4956	279.9072	424.5848	(98a)
Space heating requirement - total per year (kWh/year)												1975.9406	
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													
	415.1131	317.2736	253.8581	120.5438	37.1646	0.0000	0.0000	0.0000	0.0000	127.4956	279.9072	424.5848	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1975.9406	
Space heating per m2											(98c) / (4) =	30.7779	(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													
	415.1131	317.2736	253.8581	120.5438	37.1646	0.0000	0.0000	0.0000	0.0000	127.4956	279.9072	424.5848	(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)													
	449.7433	343.7417	275.0358	130.6000	40.2650	0.0000	0.0000	0.0000	0.0000	138.1317	303.2581	460.0052	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	211.3362	186.9239	198.8553	175.7243	170.8888	154.5988	153.1256	158.9299	160.3457	178.0400	188.3441	209.1663	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.5452	85.2361	84.6085	83.2323	81.2714	79.8000	79.8000	79.8000	79.8000	83.3240	84.9465	85.6132	(217)
Fuel for water heating, kWh/month													
	247.0462	219.3014	235.0299	211.1253	210.2694	193.7328	191.8868	199.1603	200.9345	213.6719	221.7209	244.3154	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	19.9204	15.9809	14.3890	10.5420	8.1430	6.6529	7.4283	9.6556	12.5416	16.4553	18.5862	20.4741	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-30.2873	-42.8302	-61.7623	-69.6930	-75.3878	-70.4802	-69.6359	-65.6378	-58.5951	-49.1151	-33.3540	-26.1720	(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	-16.7134	-35.2064	-70.0528	-105.3172	-139.3402	-140.0101	-138.3364	-117.0684	-85.7452	-50.3524	-22.3188	-13.2109	(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	2140.7808	(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	2588.1947	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	160.7692	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1586.6229	(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	3389.1217	(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	2140.7808	0.2100	449.5640	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2588.1947	0.2100	543.5209	(264)
Space and water heating			993.0849	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	160.7692	0.1443	23.2040	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-652.9506	0.1345	-87.8260	
PV Unit electricity exported	-933.6723	0.1259	-117.5231	
Total			-205.3491	(269)
Total CO2, kg/year			822.8690	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.8200	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2140.7808	1.1300	2419.0823	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2588.1947	1.1300	2924.6601	(278)
Space and water heating			5343.7423	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	160.7692	1.5338	246.5931	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-652.9506	1.4971	-977.5375	
PV Unit electricity exported	-933.6723	0.4620	-431.3901	
Total			-1408.9276	(283)
Total Primary energy kWh/year			4311.5087	(286)
Target Primary Energy Rate (TPER)			67.1600	(287)

Full SAP Calculation Printout

Property Reference	Flat 1 Block B	**Issued on Date**	13/03/2024
Assessment Reference	Design stage for ES condition	**Prop Type Ref**	
Property	Flat 7 Block C, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	85 B	**DER**	3.92	**TER**	12.82
Environmental	97 A	**% DER < TER**			69.42
CO_2 Emissions (t/year)	0.23	**DFEE**	36.11	**TFEE**	38.54
Compliance Check	See BREL	**% DFEE < TFEE**			6.28
% DPER < TPER	37.97	**DPER**	41.66	**TPER**	67.16

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.2000 (1b)	x	2.5900 (2b)	=	166.2780	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	166.2780	(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	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) =	0.1203	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2703	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2297	(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	0.2929	0.2872	0.2814	0.2527	0.2470	0.2183	0.2183	0.2125	0.2297	0.2470	0.2585	0.2699	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5429	0.5412	0.5396	0.5319	0.5305	0.5238	0.5238	0.5226	0.5264	0.5305	0.5334	0.5364	(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	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			10.6300	1.1450	12.1718			(27)
Heatloss Floor 1			64.2000	0.1000	6.4200	75.0000	4815.0000	(28a)
External Wall 1	43.4900	10.6300	32.8600	0.1400	4.6004	70.0000	2300.2000	(29a)
sheltered	15.4800	2.1000	13.3800	0.1300	1.7394	70.0000	936.6000	(29a)
Total net area of external elements Aum(A, m2)			123.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.8716			(33)
Party Wall 1			27.3200	0.0000	0.0000	180.0000	4917.6000	(32)
Party Floor 1			64.1600			30.0000	1924.8000	(32d)
Party Ceiling 1			64.2000			30.0000	1926.0000	(32b)
Internal Wall 1			104.0000			9.0000	936.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17756.2000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	276.5763	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.9200	0.0600	0.4152
E3 Sill	5.9200	0.0400	0.2368

E4 Jamb	25.3200	0.0200	0.5064	
E5 Ground floor (normal)	17.0000	0.1300	2.2100	
E5 Ground floor (normal)	5.9000	0.3200	1.8880	
E7 Party floor between dwellings (in blocks of flats)	17.0000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	5.9000	0.2800	1.6520	
E16 Corner (normal)	7.8000	0.0500	0.3900	
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0600	-0.1560	
P1 Party wall - Ground floor	10.6000	0.3200	3.3920	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.6000	0.0000	0.0000	
E18 Party wall between dwellings	2.6000	0.2400	0.6240	
E18 Party wall between dwellings	2.6000	0.2400	0.6240	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				11.7824 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	39.6540 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.7899	29.6985	29.6089	29.1880	29.1093	28.7427	28.7427	28.6749	28.8839	29.1093	29.2686	29.4351	(38)
Heat transfer coeff	69.4438	69.3524	69.2628	68.8420	68.7632	68.3967	68.3967	68.3288	68.5379	68.7632	68.9225	69.0891	(39)
Average = Sum(39)m / 12 =												68.8416	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0817	1.0803	1.0789	1.0723	1.0711	1.0654	1.0654	1.0643	1.0676	1.0711	1.0736	1.0762	(40)
HLP (average)												1.0723	
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 2.0976 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

25.6623	25.2812	24.7445	23.7550	23.0140	22.1923	21.7485	22.2815	22.8618	23.7409	24.7509	25.5756	(42b)

Hot water usage for other uses

36.1111	34.7980	33.4848	32.1717	30.8586	29.5455	29.5455	30.8586	32.1717	33.4848	34.7980	36.1111	(42c)

Average daily hot water use (litres/day) 56.6213 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	61.7735	60.0792	58.2294	55.9267	53.8726	51.7378	51.2940	53.1401	55.0335	57.2258	59.5489	61.6867	(44)
Energy conte	97.8341	85.5520	89.4964	76.5608	72.5228	63.6176	62.0356	65.7985	67.8618	77.6548	84.8383	96.5865	(45)
Energy content (annual)											Total = Sum(45)m =	940.3592	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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	83.1590	72.7192	76.0719	65.0767	61.6444	54.0750	52.7303	55.9287	57.6825	66.0066	72.1125	82.0985	(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	83.1590	72.7192	76.0719	65.0767	61.6444	54.0750	52.7303	55.9287	57.6825	66.0066	72.1125	82.0985	(64)
										Total per year (kWh/year) = Sum(64)m =		799.3053	(64)
12Total per year (kWh/year)												799	(64)
Electric shower(s)	47.5605	42.3768	46.2739	44.1586	44.9872	42.9134	44.3439	44.9872	44.1586	46.2739	45.4037	47.5605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		540.9981	(64a)
Heat gains from water heating, kWh/month	32.6799	28.7740	30.5864	27.3088	26.6579	24.2471	24.2685	25.2290	25.4603	28.0701	29.3791	32.4148	(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	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	95.8725	106.1446	95.8725	99.0683	95.8725	99.0683	95.8725	95.8725	99.0683	95.8725	99.0683	95.8725	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	183.4018	185.3050	180.5091	170.2993	157.4113	145.2984	137.2062	135.3031	140.0989	150.3087	163.1967	175.3096	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	(71)
Water heating gains (Table 5)	43.9246	42.8185	41.1108	37.9289	35.8305	33.6765	32.6190	33.9099	35.3615	37.7287	40.8043	43.5682	(72)
Total internal gains	377.6623	388.7314	371.9558	361.7599	343.5777	332.5066	320.1611	319.5489	328.9921	338.3733	357.5326	369.2138	(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	4.5900	10.6334	0.7200	0.7000	0.7700	17.0470	(74)
East	6.0400	19.6403	0.7200	0.7000	0.7700	41.4332	(76)

Solar gains	58.4802	113.6298	188.8387	283.5927	358.3618	372.4591	352.2351	294.7097	221.8018	134.9546	72.6920	48.2838	(83)
Total gains	436.1424	502.3611	560.7945	645.3526	701.9396	704.9656	672.3963	614.2586	550.7938	473.3279	430.2246	417.4976	(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	71.0254	71.1190	71.2110	71.6464	71.7284	72.1128	72.1128	72.1844	71.9643	71.7284	71.5626	71.3902	
alpha	5.7350	5.7413	5.7474	5.7764	5.7819	5.8075	5.8075	5.8123	5.7976	5.7819	5.7708	5.7593	
util living area	0.9977	0.9944	0.9842	0.9373	0.8101	0.6055	0.4452	0.5066	0.7809	0.9669	0.9945	0.9982	(86)
MIT	19.8710	20.0383	20.2948	20.6440	20.8894	20.9831	20.9976	20.9951	20.9331	20.5981	20.1728	19.8397	(87)
Th 2	20.0158	20.0170	20.0181	20.0235	20.0245	20.0292	20.0292	20.0301	20.0274	20.0245	20.0225	20.0204	(88)
util rest of house	0.9969	0.9923	0.9782	0.9147	0.7537	0.5206	0.3483	0.4026	0.6996	0.9503	0.9922	0.9976	(89)
MIT 2	18.9927	19.1599	19.4137	19.7497	19.9569	20.0225	20.0287	20.0289	19.9948	19.7150	19.2988	18.9652	(90)
Living area fraction										fLA = Living area / (4) =		0.4737	(91)
MIT	19.4087	19.5760	19.8310	20.1733	20.3986	20.4775	20.4876	20.4865	20.4392	20.1333	19.7128	19.3794	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4087	19.5760	19.8310	20.1733	20.3986	20.4775	20.4876	20.4865	20.4392	20.1333	19.7128	19.3794	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9962	0.9911	0.9768	0.9187	0.7767	0.5606	0.3944	0.4520	0.7362	0.9525	0.9912	0.9970	(94)
Useful gains	434.4788	497.9077	547.8099	592.8561	545.1874	395.2344	265.1638	277.6635	405.5103	450.8425	426.4408	416.2467	(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	1049.2093	1017.8162	923.3460	776.0773	598.1417	402.0007	265.9001	279.2289	434.4783	655.5403	869.3062	1048.7335	(97)
Space heating kWh	457.3595	349.3785	279.3988	131.9193	39.3980	0.0000	0.0000	0.0000	0.0000	152.2952	318.8631	470.5702	(98a)
Space heating requirement - total per year (kWh/year)												2199.1827	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	457.3595	349.3785	279.3988	131.9193	39.3980	0.0000	0.0000	0.0000	0.0000	152.2952	318.8631	470.5702	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2199.1827	
Space heating per m2											(98c) / (4) =	34.2552	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	642.9290	506.1356	519.2990	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9239	0.9644	0.9426	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	594.0215	488.1106	489.4793	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	785.9042	749.8060	683.7366	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	138.1555	194.7013	144.5274	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	34.5389	48.6753	36.1319	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												119.3461	(107)
Energy for space heating												34.2552	(99)
Energy for space cooling												1.8590	(108)
Total												36.1142	(109)
Fabric Energy Efficiency (DFEE)												36.1	(109)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		64.2000 (1b)	x	2.5900 (2b)	=	166.2780	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.2000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	166.2780	(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) =	0.1203	(8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												5.0000	(17)
Infiltration rate												0.3703	(18)
Number of sides sheltered												2	(19)
Shelter factor										(20) = 1 - [0.075 x (19)] =		0.8500	(20)
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =		0.3147	(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													
	0.4013	0.3934	0.3856	0.3462	0.3383	0.2990	0.2990	0.2911	0.3147	0.3383	0.3541	0.3698	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5805	0.5774	0.5743	0.5599	0.5572	0.5447	0.5447	0.5424	0.5495	0.5572	0.5627	0.5684	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			10.6300	1.1450	12.1718			(27)
Heatloss Floor 1			64.2000	0.1300	8.3460			(28a)
External Wall 1	43.4900	10.6300	32.8600	0.1800	5.9148			(29a)
sheltered	15.4800	2.1000	13.3800	0.1800	2.4084			(29a)
Total net area of external elements Aum(A, m2)			123.1700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.9410			(33)
Party Wall 1			27.3200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			276.5763 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.9200	0.0500	0.3460
E3 Sill	5.9200	0.0500	0.2960
E4 Jamb	25.3200	0.0500	1.2660
E5 Ground floor (normal)	17.0000	0.1600	2.7200
E5 Ground floor (normal)	5.9000	0.1600	0.9440
E7 Party floor between dwellings (in blocks of flats)	17.0000	0.0700	1.1900
E7 Party floor between dwellings (in blocks of flats)	5.9000	0.0700	0.4130
E16 Corner (normal)	7.8000	0.0900	0.7020
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340
P1 Party wall - Ground floor	10.6000	0.0800	0.8480
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.6000	0.0000	0.0000
E18 Party wall between dwellings	2.6000	0.0600	0.1560
E18 Party wall between dwellings	2.6000	0.0600	0.1560
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.8030 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	39.7440 (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	31.8540	31.6824	31.5143	30.7244	30.5766	29.8887	29.8887	29.7613	30.1537	30.5766	30.8756	31.1881	(38)
Heat transfer coeff													
	71.5980	71.4264	71.2582	70.4684	70.3206	69.6326	69.6326	69.5052	69.8976	70.3206	70.6195	70.9321	(39)
Average = Sum(39)m / 12 =												70.4677	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1152	1.1126	1.1099	1.0976	1.0953	1.0846	1.0846	1.0826	1.0887	1.0953	1.1000	1.1049	(40)
HLP (average)												1.0976	
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												2.0976	(42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	25.6623	25.2812	24.7445	23.7550	23.0140	22.1923	21.7485	22.2815	22.8618	23.7409	24.7509	25.5756	(42b)
Hot water usage for other uses													
	36.1111	34.7980	33.4848	32.1717	30.8586	29.5455	29.5455	30.8586	32.1717	33.4848	34.7980	36.1111	(42c)
Average daily hot water use (litres/day)												56.6213	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	61.7735	60.0792	58.2294	55.9267	53.8726	51.7378	51.2940	53.1401	55.0335	57.2258	59.5489	61.6867	(44)
Energy conte	97.8341	85.5520	89.4964	76.5608	72.5228	63.6176	62.0356	65.7985	67.8618	77.6548	84.8383	96.5865	(45)
Energy content (annual)											Total = Sum(45)m =	940.3592	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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													
	83.1590	72.7192	76.0719	65.0767	61.6444	54.0750	52.7303	55.9287	57.6825	66.0066	72.1125	82.0985	(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													
	83.1590	72.7192	76.0719	65.0767	61.6444	54.0750	52.7303	55.9287	57.6825	66.0066	72.1125	82.0985	(64)
											Total per year (kWh/year) = Sum(64)m =	799.3053	(64)
12Total per year (kWh/year)												799	(64)
Electric shower(s)													
	47.5605	42.3768	46.2739	44.1586	44.9872	42.9134	44.3439	44.9872	44.1586	46.2739	45.4037	47.5605	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 540.9981 (64a)

Heat gains from water heating, kWh/month

	32.6799	28.7740	30.5864	27.3088	26.6579	24.2471	24.2685	25.2290	25.4603	28.0701	29.3791	32.4148 (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	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	(66)

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

	95.8725	106.1446	95.8725	99.0683	95.8725	99.0683	95.8725	95.8725	99.0683	95.8725	99.0683	95.8725	(67)

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

	183.4018	185.3050	180.5091	170.2993	157.4113	145.2984	137.2062	135.3031	140.0989	150.3087	163.1967	175.3096	(68)

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

	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

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

	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	(71)

Water heating gains (Table 5)

	43.9246	42.8185	41.1108	37.9289	35.8305	33.6765	32.6190	33.9099	35.3615	37.7287	40.8043	43.5682	(72)

Total internal gains

	377.6623	388.7314	371.9558	361.7599	343.5777	332.5066	320.1611	319.5489	328.9921	338.3733	357.5326	369.2138	(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	4.5900	10.6334	0.6300	0.7000	0.7700	14.9161	(74)
East	6.0400	19.6403	0.6300	0.7000	0.7700	36.2540	(76)

Solar gains	51.1701	99.4260	165.2338	248.1436	313.5666	325.9017	308.2057	257.8710	194.0766	118.0853	63.6055	42.2484	(83)
Total gains	428.8324	488.1574	537.1897	609.9035	657.1443	658.4083	628.3669	577.4199	523.0686	456.4585	421.1381	411.4621	(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	68.8885	69.0540	69.2170	69.9928	70.1399	70.8328	70.8328	70.9627	70.5643	70.1399	69.8430	69.5352	
alpha	5.5926	5.6036	5.6145	5.6662	5.6760	5.7222	5.7222	5.7308	5.7043	5.6760	5.6562	5.6357	
util living area	0.9979	0.9953	0.9876	0.9522	0.8482	0.6516	0.4835	0.5452	0.8142	0.9730	0.9952	0.9984	(86)
MIT	19.8105	19.9706	20.2205	20.5775	20.8498	20.9741	20.9960	20.9923	20.9122	20.5535	20.1263	19.7880	(87)
Th 2	19.9884	19.9906	19.9927	20.0028	20.0046	20.0134	20.0134	20.0150	20.0100	20.0046	20.0008	19.9969	(88)
util rest of house	0.9972	0.9935	0.9828	0.9336	0.7958	0.5622	0.3774	0.4331	0.7354	0.9588	0.9931	0.9978	(89)
MIT 2	18.9106	19.0716	19.3205	19.6718	19.9098	20.0028	20.0125	20.0132	19.9658	19.6569	19.2353	18.8950	(90)
Living area fraction										fLA = Living area / (4) =		0.4737	(91)
MIT	19.3369	19.4974	19.7468	20.1008	20.3550	20.4629	20.4784	20.4770	20.4141	20.0816	19.6573	19.3180	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3369	19.4974	19.7468	20.1008	20.3550	20.4629	20.4784	20.4770	20.4141	20.0816	19.6573	19.3180	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9965	0.9924	0.9814	0.9358	0.8158	0.6041	0.4278	0.4865	0.7702	0.9601	0.9922	0.9972	(94)
Useful gains	427.3296	484.4385	527.1769	570.7181	536.0709	397.7602	268.8288	280.9090	402.8571	438.2501	417.8380	410.3129	(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	1076.6095	1042.6414	943.9419	789.3026	608.6275	408.2491	270.0601	283.3710	441.3399	666.7506	886.7941	1072.3506	(97)
Space heating kWh	483.0642	375.1123	310.0732	157.3808	53.9821	0.0000	0.0000	0.0000	0.0000	170.0043	337.6484	492.5560	(98a)
Space heating requirement - total per year (kWh/year)												2379.8214	
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	483.0642	375.1123	310.0732	157.3808	53.9821	0.0000	0.0000	0.0000	0.0000	170.0043	337.6484	492.5560	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2379.8214	
Space heating per m2										(98c) / (4) =		37.0689	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	654.5469	515.2816	528.2399	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8942	0.9471	0.9201	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	585.2827	488.0312	486.0532	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	731.4864	698.3430	640.6784	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	105.2667	156.4720	115.0412	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	26.3167	39.1180	28.7603	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												94.1949	(107)
Energy for space heating												37.0689	(99)
Energy for space cooling												1.4672	(108)
Total												38.5361	(109)

Full SAP Calculation Printout

Property Reference	Flat 1 Block B	**Issued on Date**	13/03/2024
Assessment Reference	Design stage for ES condition	**Prop Type Ref**	
Property	Flat 7 Block C, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	85 B	**DER**	3.92	**TER**	12.82
Environmental	97 A	**% DER < TER**			69.42
CO_2 Emissions (t/year)	0.23	**DFEE**	36.11	**TFEE**	38.54
Compliance Check	See BREL	**% DFEE < TFEE**			6.28
% DPER < TPER	37.97	**DPER**	41.66	**TPER**	67.16

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.2000	(1b)	x 2.5900	(2b) =	166.2780	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	166.2780	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(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) =		81.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			10.6300	1.1450	12.1718			(27)
Heatloss Floor 1			64.2000	0.1000	6.4200	75.0000	4815.0000	(28a)
External Wall 1	43.4900	10.6300	32.8600	0.1400	4.6004	70.0000	2300.2000	(29a)
sheltered	15.4800	2.1000	13.3800	0.1300	1.7394	70.0000	936.6000	(29a)
Total net area of external elements Aum(A, m2)			123.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.8716			(33)
Party Wall 1			27.3200	0.0000	0.0000	180.0000	4917.6000	(32)
Party Floor 1			64.1600			30.0000	1924.8000	(32d)
Party Ceiling 1			64.2000			20.0000	1284.0000	(32b)
Internal Wall 1			104.0000			9.0000	936.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17114.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		266.5763 (35)
List of Thermal Bridges		

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	6.9200	0.0600	0.4152	
E3 Sill	5.9200	0.0400	0.2368	
E4 Jamb	25.3200	0.0200	0.5064	
E5 Ground floor (normal)	17.0000	0.1300	2.2100	
E5 Ground floor (normal)	5.9000	0.3200	1.8880	
E7 Party floor between dwellings (in blocks of flats)	17.0000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	5.9000	0.2800	1.6520	
E16 Corner (normal)	7.8000	0.0500	0.3900	
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0600	-0.1560	
P1 Party wall - Ground floor	10.6000	0.3200	3.3920	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.6000	0.0000	0.0000	
E18 Party wall between dwellings	2.6000	0.2400	0.6240	
E18 Party wall between dwellings	2.6000	0.2400	0.6240	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.7824	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	39.6540	(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	14.1329	13.9580	13.7831	12.9086	12.7337	11.8592	11.8592	11.6843	12.2090	12.7337	13.0835	13.4333	(38)
Heat transfer coeff	53.7869	53.6120	53.4371	52.5625	52.3876	51.5131	51.5131	51.3382	51.8629	52.3876	52.7374	53.0872	(39)
Average = Sum(39)m / 12 =												52.5188	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8351	0.8324	0.8187	0.8160	0.8024	0.8024	0.7997	0.8078	0.8160	0.8215	0.8269	(40)
HLP (average)												0.8180	
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											2.0976	(42)
Hot water usage for mixer showers												
89.0832	87.7444	85.7936	82.0611	79.3066	76.2347	74.4887	76.4248	78.5471	81.8452	85.6580	88.7419	(42a)
Hot water usage for baths												
25.6623	25.2812	24.7445	23.7550	23.0140	22.1923	21.7485	22.2815	22.8618	23.7409	24.7509	25.5756	(42b)
Hot water usage for other uses												
36.1111	34.7980	33.4848	32.1717	30.8586	29.5455	29.5455	30.8586	32.1717	33.4848	34.7980	36.1111	(42c)
Average daily hot water use (litres/day)											138.7530	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	150.8566	147.8236	144.0230	137.9877	133.1791	127.9725	125.7827	129.5648	133.5805	139.0710	145.2068	150.4286	(44)
Energy conte	238.9200	210.4989	221.3580	188.8983	179.2847	157.3572	152.1233	160.4283	164.7181	188.7181	206.8737	235.5348	(45)
Energy content (annual)										Total = Sum(45)m =		2304.7134	
Distribution loss (46)m = 0.15 x (45)m													
	35.8380	31.5748	33.2037	28.3347	26.8927	23.6036	22.8185	24.0643	24.7077	28.3077	31.0311	35.3302	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.5400	(55)
Total storage loss													
	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(56)
If cylinder contains dedicated solar storage													
	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(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													
	278.9224	246.6301	261.3604	227.6103	219.2871	196.0692	192.1257	200.4307	203.4301	228.7205	245.5857	275.5372	(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													
	278.9224	246.6301	261.3604	227.6103	219.2871	196.0692	192.1257	200.4307	203.4301	228.7205	245.5857	275.5372	(64)
										Total per year (kWh/year) = Sum(64)m =		2775.7094	(64)
12Total per year (kWh/year)												2776	(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													
	111.4428	98.8958	105.6034	93.7783	91.6141	83.2909	82.5829	85.3443	85.7384	94.7507	99.7551	110.3172	(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	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	95.8725	106.1446	95.8725	99.0683	95.8725	99.0683	95.8725	95.8725	99.0683	95.8725	99.0683	95.8725	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	183.4018	185.3050	180.5091	170.2993	157.4113	145.2984	137.2062	135.3031	140.0989	150.3087	163.1967	175.3096	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	(71)
Water heating gains (Table 5)													
	149.7888	147.1664	141.9401	130.2476	123.1372	115.6817	110.9985	114.7101	119.0811	127.3531	138.5488	148.2759	(72)
Total internal gains													
	483.5265	493.0793	472.7851	454.0786	430.8844	414.5118	398.5407	400.3491	412.7117	427.9977	455.2772	473.9214	(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	4.5900	10.6334	0.7200	0.7000	0.7700	17.0470	(74)

East				6.0400		19.6403		0.7200		0.7000		0.7700	41.4332 (76)
Solar gains	58.4802	113.6298	188.8387	283.5927	358.3618	372.4591	352.2351	294.7097	221.8018	134.9546	72.6920	48.2838 (83)	
Total gains	542.0066	606.7091	661.6238	737.6713	789.2463	786.9709	750.7758	695.0588	634.5134	562.9523	527.9691	522.2053 (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	88.3849	88.6732	88.9635	90.4436	90.7456	92.2861	92.2861	92.6005	91.6637	90.7456	90.1436	89.5497	
alpha	6.8923	6.9115	6.9309	7.0296	7.0497	7.1524	7.1524	7.1734	7.1109	7.0497	7.0096	6.9700	
util living area													
	0.9876	0.9723	0.9316	0.8020	0.6093	0.4184	0.3019	0.3397	0.5598	0.8610	0.9698	0.9899 (86)	
Living	20.3912	20.5415	20.7339	20.9253	20.9893	20.9994	20.9999	20.9999	20.9955	20.8987	20.6282	20.3699	
Non living	19.6789	19.8266	20.0094	20.1847	20.2335	20.2510	20.2513	20.2536	20.2445	20.1697	19.9222	19.6660	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.6886	20.5415	20.7339	20.9253	20.9893	20.9994	20.9999	20.9999	20.9955	20.8987	20.6282	20.4581 (87)	
Th 2	20.2207	20.2230	20.2254	20.2371	20.2395	20.2513	20.2513	20.2536	20.2465	20.2395	20.2348	20.2301 (88)	
util rest of house													
	0.9839	0.9646	0.9141	0.7656	0.5623	0.3697	0.2505	0.2846	0.5005	0.8234	0.9600	0.9869 (89)	
MIT 2	19.9435	19.8266	20.0094	20.1847	20.2335	20.2510	20.2513	20.2536	20.2445	20.1697	19.9222	19.7449 (90)	
Living area fraction										fLA = Living area / (4) =		0.4737 (91)	
MIT	20.2964	20.1652	20.3526	20.5355	20.5915	20.6055	20.6059	20.6071	20.6002	20.5150	20.2566	20.0827 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.2964	20.1652	20.3526	20.5355	20.5915	20.6055	20.6059	20.6071	20.6002	20.5150	20.2566	20.0827 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9843	0.9639	0.9173	0.7803	0.5842	0.3928	0.2748	0.3107	0.5285	0.8378	0.9603	0.9862 (94)	
Useful gains	533.4858	584.8295	606.8873	575.6110	461.0983	309.1250	206.3415	215.9508	335.3504	471.6599	507.0252	514.9982 (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													
	860.3977	818.3978	740.2421	611.5900	465.8039	309.3613	206.3560	215.9848	337.1214	519.4237	693.8441	843.1698 (97)	
Space heating kWh													
	243.2225	156.9579	99.2160	25.9049	3.5009	0.0000	0.0000	0.0000	0.0000	35.5363	134.5096	244.1597 (98a)	
Space heating requirement - total per year (kWh/year)												943.0077	
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													
	243.2225	156.9579	99.2160	25.9049	3.5009	0.0000	0.0000	0.0000	0.0000	35.5363	134.5096	244.1597 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												943.0077	
Space heating per m2											(98c) / (4) =	14.6886 (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 %)												279.3363 (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													
	243.2225	156.9579	99.2160	25.9049	3.5009	0.0000	0.0000	0.0000	0.0000	35.5363	134.5096	244.1597 (98)	
Space heating efficiency (main heating system 1)													
	279.3363	279.3363	279.3363	279.3363	279.3363	0.0000	0.0000	0.0000	0.0000	279.3363	279.3363	279.3363 (210)	
Space heating fuel (main heating system)													
	87.0716	56.1896	35.5185	9.2737	1.2533	0.0000	0.0000	0.0000	0.0000	12.7217	48.1533	87.4071 (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													
	278.9224	246.6301	261.3604	227.6103	219.2871	196.0692	192.1257	200.4307	203.4301	228.7205	245.5857	275.5372 (64)	
Efficiency of water heater												276.1678 (216)	
(217)m	276.1678	276.1678	276.1678	276.1678	276.1678	276.1678	276.1678	276.1678	276.1678	276.1678	276.1678	276.1678 (217)	
Fuel for water heating, kWh/month													
	100.9975	89.3044	94.6383	82.4174	79.4036	70.9964	69.5685	72.5757	73.6618	82.8194	88.9263	99.7717 (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	16.1092	14.5503	16.1092	15.5896	16.1092	15.5896	16.1092	16.1092	15.5896	16.1092	15.5896	16.1092 (231)	
Lighting	26.0929	20.9327	18.8476	13.8086	10.6661	8.7143	9.7300	12.6474	16.4278	21.5541	24.3453	26.8181 (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												337.5887 (211)	
Space heating fuel - main system 2												0.0000 (213)	

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	276.1678	
Water heating fuel used	1005.0808	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.7000, SFP = 0.9350)		
mechanical ventilation fans (SFP = 0.9350)	189.6733	(230a)
Total electricity for the above, kWh/year	189.6733	(231)
Electricity for lighting (calculated in Appendix L)	210.5850	(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	1742.9278	(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	337.5887	0.1581	53.3575	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1005.0808	0.1411	141.8089	(264)
Space and water heating			195.1664	(265)
Pumps, fans and electric keep-hot	189.6733	0.1387	26.3100	(267)
Energy for lighting	210.5850	0.1443	30.3939	(268)
Total CO2, kg/year			251.8704	(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	337.5887	1.5851	535.1012	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1005.0808	1.5217	1529.4484	(278)
Space and water heating			2064.5496	(279)
Pumps, fans and electric keep-hot	189.6733	1.5128	286.9378	(281)
Energy for lighting	210.5850	1.5338	323.0023	(282)
Total Primary energy kWh/year			2674.4897	(286)
Dwelling Primary energy Rate (DPER)			41.6600	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.2000 (1b)	x	2.5900 (2b)	=	166.2780	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	166.2780	(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) =	0.1203	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3703	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3147	(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	0.4013	0.3934	0.3856	0.3462	0.3383	0.2990	0.2990	0.2911	0.3147	0.3383	0.3541	0.3698	(22b)
Effective ac	0.5805	0.5774	0.5743	0.5599	0.5572	0.5447	0.5447	0.5424	0.5495	0.5572	0.5627	0.5684	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			10.6300	1.1450	12.1718			(27)
Heatloss Floor 1			64.2000	0.1300	8.3460			(28a)
External Wall 1	43.4900	10.6300	32.8600	0.1800	5.9148			(29a)
sheltered	15.4800	2.1000	13.3800	0.1800	2.4084			(29a)
Total net area of external elements Aum(A, m2)			123.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.9410			(33)
Party Wall 1			27.3200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 276.5763 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	6.9200	0.0500	0.3460
E3	Sill	5.9200	0.0500	0.2960
E4	Jamb	25.3200	0.0500	1.2660
E5	Ground floor (normal)	17.0000	0.1600	2.7200
E5	Ground floor (normal)	5.9000	0.1600	0.9440
E7	Party floor between dwellings (in blocks of flats)	17.0000	0.0700	1.1900
E7	Party floor between dwellings (in blocks of flats)	5.9000	0.0700	0.4130
E16	Corner (normal)	7.8000	0.0900	0.7020
E17	Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340
P1	Party wall - Ground floor	10.6000	0.0800	0.8480
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	10.6000	0.0000	0.0000
E18	Party wall between dwellings	2.6000	0.0600	0.1560
E18	Party wall between dwellings	2.6000	0.0600	0.1560

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.8030 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 39.7440 (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	31.8540	31.6824	31.5143	30.7244	30.5766	29.8887	29.8887	29.7613	30.1537	30.5766	30.8756	31.1881	(38)
Heat transfer coeff	71.5980	71.4264	71.2582	70.4684	70.3206	69.6326	69.6326	69.5052	69.8976	70.3206	70.6195	70.9321	(39)

Average = Sum(39)m / 12 = 70.4677

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1152	1.1126	1.1099	1.0976	1.0953	1.0846	1.0846	1.0826	1.0887	1.0953	1.1000	1.1049	(40)
HLP (average)												1.0976	
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 2.0976 (42)

Hot water usage for mixer showers

59.3888	58.4963	57.1957	54.7074	52.8710	50.8232	49.6592	50.9499	52.3647	54.5635	57.1053	59.1612	(42a)

Hot water usage for baths

25.6623	25.2812	24.7445	23.7550	23.0140	22.1923	21.7485	22.2815	22.8618	23.7409	24.7509	25.5756	(42b)

Hot water usage for other uses

36.1111	34.7980	33.4848	32.1717	30.8586	29.5455	29.5455	30.8586	32.1717	33.4848	34.7980	36.1111	(42c)

Average daily hot water use (litres/day) 111.3758 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	121.1622	118.5755	115.4251	110.6341	106.7436	102.5610	100.9531	104.0899	107.3982	111.7893	116.6542	120.8479	(44)
Energy conte	191.8914	168.8499	177.4041	151.4525	143.6974	126.1107	122.0941	128.8851	132.4327	151.6970	166.1953	189.2187	(45)
Energy content (annual)										Total = Sum(45)m =		1849.9287	
Distribution loss (46)m = 0.15 x (45)m	28.7837	25.3275	26.6106	22.7179	21.5546	18.9166	18.3141	19.3328	19.8649	22.7545	24.9293	28.3828	(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

238.4863	210.9356	223.9990	196.5443	190.2923	171.2025	168.6890	175.4800	177.5245	198.2919	211.2871	235.8136	(62)
WWHRS -27.1501	-24.0117	-25.1437	-20.8200	-19.4035	-16.6037	-15.5633	-16.5500	-17.1788	-20.2519	-22.9430	-26.6473	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

211.3362	186.9239	198.8553	175.7243	170.8888	154.5988	153.1256	158.9299	160.3457	178.0400	188.3441	209.1663	(64)

Total per year (kWh/year) = Sum(64)m = 2146.2789 (64)

12Total per year (kWh/year) 2146 (64)

Electric shower(s)

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

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

Heat gains from water heating, kWh/month

101.0798	89.8112	96.2628	86.4314	85.0553	78.0053	77.8722	80.1302	80.1073	87.7152	91.3334	100.1911	(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	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	104.8780	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	95.8725	106.1446	95.8725	99.0683	95.8725	99.0683	95.8725	95.8725	99.0683	95.8725	99.0683	95.8725	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	183.4018	185.3050	180.5091	170.2993	157.4113	145.2984	137.2062	135.3031	140.0989	150.3087	163.1967	175.3096	(68)

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

	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	33.4878	(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)													
	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	-83.9024	(71)
Water heating gains (Table 5)													
	135.8600	133.6476	129.3855	120.0436	114.3216	108.3406	104.6669	107.7019	111.2602	117.8967	126.8519	134.6655	(72)
Total internal gains													
	472.5977	482.5605	463.2305	446.8746	425.0689	407.1707	392.2091	393.3409	404.8908	421.5414	446.5803	463.3111	(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	4.5900	10.6334	0.6300	0.7000	0.7700	14.9161	(74)
East	6.0400	19.6403	0.6300	0.7000	0.7700	36.2540	(76)

Solar gains	51.1701	99.4260	165.2338	248.1436	313.5666	325.9017	308.2057	257.8710	194.0766	118.0853	63.6055	42.2484	(83)
Total gains	523.7678	581.9865	628.4643	695.0182	738.6355	733.0724	700.4148	651.2119	598.9673	539.6266	510.1858	505.5594	(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	68.8885	69.0540	69.2170	69.9928	70.1399	70.8328	70.8328	70.9627	70.5643	70.1399	69.8430	69.5352	
alpha	5.5926	5.6036	5.6145	5.6662	5.6760	5.7222	5.7222	5.7308	5.7043	5.6760	5.6562	5.6357	
util living area													
	0.9944	0.9890	0.9750	0.9220	0.7940	0.5936	0.4353	0.4867	0.7457	0.9463	0.9880	0.9954	(86)
MIT	19.9544	20.1097	20.3480	20.6707	20.8950	20.9837	20.9976	20.9957	20.9445	20.6569	20.2582	19.9315	(87)
Th 2	19.9884	19.9906	19.9927	20.0028	20.0046	20.0134	20.0134	20.0150	20.0100	20.0046	20.0008	19.9969	(88)
util rest of house													
	0.9925	0.9852	0.9661	0.8954	0.7355	0.5086	0.3389	0.3848	0.6617	0.9219	0.9831	0.9938	(89)
MIT 2	18.7887	18.9871	19.2877	19.6836	19.9234	20.0052	20.0128	20.0137	19.9765	19.6778	19.1846	18.7659	(90)
Living area fraction									fLA = Living area / (4) =			0.4737	(91)
MIT	19.3409	19.5189	19.7899	20.1512	20.3837	20.4687	20.4793	20.4788	20.4350	20.1416	19.6931	19.3180	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3409	19.5189	19.7899	20.1512	20.3837	20.4687	20.4793	20.4788	20.4350	20.1416	19.6931	19.3180	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9908	0.9829	0.9640	0.8999	0.7591	0.5486	0.3846	0.4332	0.6996	0.9258	0.9811	0.9923	(94)
Useful gains	518.9496	572.0399	605.8111	625.4307	560.6878	402.1387	269.4111	282.1328	419.0633	499.6029	500.5622	501.6743	(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													
	1076.8973	1044.1731	947.0182	792.8527	610.6402	408.6503	270.1238	283.5010	442.8041	670.9679	889.3222	1072.3527	(97)
Space heating kWh													
	415.1131	317.2736	253.8581	120.5438	37.1646	0.0000	0.0000	0.0000	0.0000	127.4956	279.9072	424.5848	(98a)
Space heating requirement - total per year (kWh/year)												1975.9406	
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													
	415.1131	317.2736	253.8581	120.5438	37.1646	0.0000	0.0000	0.0000	0.0000	127.4956	279.9072	424.5848	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1975.9406	
Space heating per m2											(98c) / (4) =	30.7779	(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													
	415.1131	317.2736	253.8581	120.5438	37.1646	0.0000	0.0000	0.0000	0.0000	127.4956	279.9072	424.5848	(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)													
	449.7433	343.7417	275.0358	130.6000	40.2650	0.0000	0.0000	0.0000	0.0000	138.1317	303.2581	460.0052	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	211.3362	186.9239	198.8553	175.7243	170.8888	154.5988	153.1256	158.9299	160.3457	178.0400	188.3441	209.1663	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.5452	85.2361	84.6085	83.2323	81.2714	79.8000	79.8000	79.8000	79.8000	83.3240	84.9465	85.6132	(217)
Fuel for water heating, kWh/month													
	247.0462	219.3014	235.0299	211.1253	210.2694	193.7328	191.8868	199.1603	200.9345	213.6719	221.7209	244.3154	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	19.9204	15.9809	14.3890	10.5420	8.1430	6.6529	7.4283	9.6556	12.5416	16.4553	18.5862	20.4741	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-30.2873	-42.8302	-61.7623	-69.6930	-75.3878	-70.4802	-69.6359	-65.6378	-58.5951	-49.1151	-33.3540	-26.1720	(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	-16.7134	-35.2064	-70.0528	-105.3172	-139.3402	-140.0101	-138.3364	-117.0684	-85.7452	-50.3524	-22.3188	-13.2109	(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	2140.7808	(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	2588.1947	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	160.7692	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1586.6229	(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	3389.1217	(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	2140.7808	0.2100	449.5640	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2588.1947	0.2100	543.5209	(264)
Space and water heating			993.0849	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	160.7692	0.1443	23.2040	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-652.9506	0.1345	-87.8260	
PV Unit electricity exported	-933.6723	0.1259	-117.5231	
Total			-205.3491	(269)
Total CO2, kg/year			822.8690	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.8200	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2140.7808	1.1300	2419.0823	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2588.1947	1.1300	2924.6601	(278)
Space and water heating			5343.7423	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	160.7692	1.5338	246.5931	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-652.9506	1.4971	-977.5375	
PV Unit electricity exported	-933.6723	0.4620	-431.3901	
Total			-1408.9276	(283)
Total Primary energy kWh/year			4311.5087	(286)
Target Primary Energy Rate (TPER)			67.1600	(287)

Full SAP Calculation Printout

Property Reference	Flat 2 Block B	**Issued on Date**	13/03/2024
Assessment Reference	Design stage for ES condition	**Prop Type Ref**	
Property	Flat 7 Block C, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	85 B	**DER**	4.05	**TER**	13.58
Environmental	97 A	**% DER < TER**			70.18
CO_2 Emissions (t/year)	0.24	**DFEE**	40.27	**TFEE**	42.19
Compliance Check	See BREL	**% DFEE < TFEE**			4.54
% DPER < TPER	39.93	**DPER**	42.78	**TPER**	71.21

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.1600	(1b)	x 2.4000	(2b) =	153.9840	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.1600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		153.9840	(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		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(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) =		81.0000 (23c)

Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448	(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	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			10.9000	1.1450	12.4809			(27)
rooflight			1.6800	1.2357	2.0760			(27a)
External Wall 1	40.3200	10.9000	29.4200	0.1300	3.8246	70.0000	2059.4000	(29a)
sheltered	14.1600	2.1000	12.0600	0.1300	1.5678	70.0000	844.2000	(29a)
External Roof 1	64.1600	1.6800	62.4800	0.1100	6.8728	9.0000	562.3200	(30)
Total net area of external elements Aum(A, m2)			118.6400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.7622			(33)
Party Wall 1			25.7700	0.0000	0.0000	180.0000	4638.6000	(32)
Party Floor 1			64.1600			30.0000	1924.8000	(32d)
Internal Wall 1			99.8400			9.0000	898.5600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10927.8800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		170.3223 (35)
List of Thermal Bridges		

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	6.9700	0.0600	0.4182	
E3 Sill	5.9700	0.0400	0.2388	
E4 Jamb	25.6400	0.0200	0.5128	
R11 Upstands or kerbs of rooflights	7.6000	0.2400	1.8240	
E7 Party floor between dwellings (in blocks of flats)	16.9000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	5.8000	0.2800	1.6240	
E15 Flat roof with parapet	16.9000	0.3000	5.0700	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.9000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	10.9000	0.4800	5.2320	
P4 Party wall - Roof (insulation at ceiling level)	5.8000	0.4800	2.7840	
E18 Party wall between dwellings	2.4000	0.2400	0.5760	
E18 Party wall between dwellings	2.4000	0.2400	0.5760	
E16 Corner (normal)	7.2000	0.0500	0.3600	
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0600	-0.1440	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			19.0718	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	48.8340	(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	13.0880	12.9260	12.7640	11.9542	11.7922	10.9823	10.9823	10.8204	11.3063	11.7922	12.1161	12.4401	(38)
Heat transfer coeff	61.9219	61.7600	61.5980	60.7881	60.6262	59.8163	59.8163	59.6543	60.1402	60.6262	60.9501	61.2740	(39)
Average = Sum(39)m / 12 =												60.7476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9651	0.9626	0.9601	0.9474	0.9449	0.9323	0.9323	0.9298	0.9373	0.9449	0.9500	0.9550	(40)
HLP (average)												0.9468	
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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Assumed occupancy												2.0965	(42)
Hot water usage for mixer showers	89.0562	87.7178	85.7676	82.0362	79.2825	76.2116	74.4661	76.4016	78.5232	81.8204	85.6320	88.7149	(42a)
Hot water usage for baths	25.6546	25.2736	24.7371	23.7478	23.0070	22.1856	21.7420	22.2747	22.8549	23.7338	24.7434	25.5679	(42b)
Hot water usage for other uses	36.1001	34.7874	33.4746	32.1619	30.8492	29.5365	29.5365	30.8492	32.1619	33.4746	34.7874	36.1001	(42c)
Average daily hot water use (litres/day)												138.7109	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.8109	147.7788	143.9793	137.9459	133.1387	127.9337	125.7445	129.5255	133.5400	139.0288	145.1628	150.3829	(44)
Energy conte	238.8475	210.4350	221.2908	188.8410	179.2303	157.3094	152.0771	160.3797	164.6682	188.6608	206.8110	235.4633	(45)
Energy content (annual)										Total = Sum(45)m =		2304.0141	
Distribution loss (46)m = 0.15 x (45)m	35.8271	31.5653	33.1936	28.3262	26.8845	23.5964	22.8116	24.0569	24.7002	28.2991	31.0216	35.3195	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.5400	(55)
Total storage loss	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(56)
If cylinder contains dedicated solar storage	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(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	278.8499	246.5662	261.2932	227.5530	219.2327	196.0214	192.0795	200.3821	203.3802	228.6632	245.5230	275.4657	(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	278.8499	246.5662	261.2932	227.5530	219.2327	196.0214	192.0795	200.3821	203.3802	228.6632	245.5230	275.4657	(64)
										Total per year (kWh/year) = Sum(64)m =		2775.0101	(64)
12Total per year (kWh/year)												2775	(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	111.4187	98.8746	105.5811	93.7592	91.5960	83.2750	82.5676	85.3282	85.7218	94.7316	99.7342	110.2935	(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	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	93.0390	103.0075	93.0390	96.1403	93.0390	96.1403	93.0390	93.0390	96.1403	93.0390	96.1403	93.0390	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	183.3037	185.2058	180.4125	170.2082	157.3271	145.2206	137.1328	135.2307	140.0239	150.2283	163.1094	175.2158	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	(71)
Water heating gains (Table 5)	149.7564	147.1348	141.9101	130.2212	123.1129	115.6597	110.9779	114.6884	119.0580	127.3275	138.5198	148.2439	(72)
Total internal gains	480.5463	489.7954	469.8089	451.0169	427.9263	411.4679	395.5970	397.4053	409.6695	425.0420	452.2168	470.9460	(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				4.5900	10.6334	0.7200	0.7000	0.7700	17.0470	(74)			
East				6.3100	19.6403	0.7200	0.7000	0.7700	43.2853	(76)			
South				1.6800	26.0000	0.7200	0.7000	1.0000	19.8132	(82)			
Solar gains	80.1456	158.4035	267.9622	406.6022	515.3401	535.7862	506.6562	423.2795	316.3770	189.5490	100.1490	65.8100	(83)
Total gains	560.6919	648.1989	737.7711	857.6191	943.2663	947.2541	902.2532	820.6849	726.0466	614.5910	552.3657	536.7560	(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	49.0218	49.1503	49.2796	49.9361	50.0695	50.7474	50.7474	50.8852	50.4741	50.0695	49.8034	49.5401	
alpha	4.2681	4.2767	4.2853	4.3291	4.3380	4.3832	4.3832	4.3923	4.3649	4.3380	4.3202	4.3027	
util living area	0.9650	0.9376	0.8794	0.7453	0.5702	0.3996	0.2908	0.3326	0.5491	0.8229	0.9389	0.9700	(86)
Living	19.8469	20.0953	20.4277	20.7736	20.9389	20.9898	20.9980	20.9965	20.9617	20.7067	20.2285	19.8071	
Non living	19.0790	19.3206	19.6364	19.9543	20.0894	20.1350	20.1395	20.1410	20.1146	19.9080	19.4619	19.0469	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4101	20.0953	20.4277	20.7736	20.9389	20.9898	20.9980	20.9965	20.9617	20.7067	20.2285	19.9739	(87)
Th 2	20.1125	20.1146	20.1167	20.1274	20.1295	20.1401	20.1401	20.1423	20.1359	20.1295	20.1252	20.1210	(88)
util rest of house	0.9582	0.9262	0.8589	0.7099	0.5237	0.3476	0.2344	0.2714	0.4875	0.7867	0.9257	0.9641	(89)
MIT 2	19.5838	19.3206	19.6364	19.9543	20.0894	20.1350	20.1395	20.1410	20.1146	19.9080	19.4619	19.1971	(90)
Living area fraction										fLA = Living area / (4) =		0.4749	(91)
MIT	19.9762	19.6885	20.0122	20.3434	20.4928	20.5410	20.5472	20.5473	20.5169	20.2873	19.8259	19.5660	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9762	19.6885	20.0122	20.3434	20.4928	20.5410	20.5472	20.5473	20.5169	20.2873	19.8259	19.5660	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9570	0.9199	0.8562	0.7190	0.5434	0.3719	0.2611	0.3004	0.5152	0.7938	0.9205	0.9596	(94)
Useful gains	536.5999	596.2813	631.7052	616.6602	512.6041	352.3294	235.6172	246.5100	374.0553	487.8357	508.4729	515.0948	(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	970.7033	913.3384	832.3248	695.6222	533.0753	355.3658	236.1066	247.4030	385.9126	587.3026	775.6473	941.5396	(97)
Space heating kWh	322.9730	213.0624	149.2609	56.8526	15.2306	0.0000	0.0000	0.0000	0.0000	74.0034	192.3656	317.2750	(98a)
Space heating requirement - total per year (kWh/year)												1341.0235	
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	322.9730	213.0624	149.2609	56.8526	15.2306	0.0000	0.0000	0.0000	0.0000	74.0034	192.3656	317.2750	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1341.0235	
Space heating per m2											(98c) / (4) =	20.9012	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												282.4346	(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	322.9730	213.0624	149.2609	56.8526	15.2306	0.0000	0.0000	0.0000	0.0000	74.0034	192.3656	317.2750	(98)
Space heating efficiency (main heating system 1)	282.4346	282.4346	282.4346	282.4346	282.4346	0.0000	0.0000	0.0000	0.0000	282.4346	282.4346	282.4346	(210)
Space heating fuel (main heating system)	114.3532	75.4378	52.8480	20.1295	5.3926	0.0000	0.0000	0.0000	0.0000	26.2019	68.1098	112.3357	(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	278.8499	246.5662	261.2932	227.5530	219.2327	196.0214	192.0795	200.3821	203.3802	228.6632	245.5230	275.4657	(64)
Efficiency of water heater												279.9227	(216)
(217)m	279.9227	279.9227	279.9227	279.9227	279.9227	279.9227	279.9227	279.9227	279.9227	279.9227	279.9227	279.9227	(217)
Fuel for water heating, kWh/month	99.6168	88.0837	93.3448	81.2914	78.3190	70.0270	68.6188	71.5848	72.6558	81.6880	87.7110	98.4078	(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	9.6529	8.7188	9.6529	9.3416	9.6529	9.3416	9.6529	9.6529	9.3416	9.6529	9.3416	9.6529	(231)
Lighting	25.3205	20.3131	18.2897	13.3998	10.3504	8.4563	9.4420	12.2730	15.9414	20.9160	23.6246	26.0242	(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	474.8085	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.9227	
Water heating fuel used	991.3487	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)		
mechanical ventilation fans (SFP = 0.6050)	113.6556	(230a)
Total electricity for the above, kWh/year	113.6556	(231)
Electricity for lighting (calculated in Appendix L)	204.3510	(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	1784.1637	(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	474.8085	0.1570	74.5445	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	991.3487	0.1411	139.8713	(264)
Space and water heating			214.4157	(265)
Pumps, fans and electric keep-hot	113.6556	0.1387	15.7654	(267)
Energy for lighting	204.3510	0.1443	29.4942	(268)
Total CO2, kg/year			259.6753	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.0500	(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	474.8085	1.5812	750.7580	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	991.3487	1.5217	1508.5515	(278)
Space and water heating			2259.3095	(279)
Pumps, fans and electric keep-hot	113.6556	1.5128	171.9382	(281)
Energy for lighting	204.3510	1.5338	313.4404	(282)
Total Primary energy kWh/year			2744.6881	(286)
Dwelling Primary energy Rate (DPER)			42.7800	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.1600	(1b)	x 2.4000	(2b) =	153.9840	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.1600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		153.9840	(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) =	0.1299	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3799	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3229	(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													

	0.4117	0.4036	0.3956	0.3552	0.3471	0.3068	0.3068	0.2987	0.3229	0.3471	0.3633	0.3794	(22b)
Effective ac	0.5847	0.5815	0.5782	0.5631	0.5602	0.5470	0.5470	0.5446	0.5521	0.5602	0.5660	0.5720	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			10.9000	1.1450	12.4809			(27)
rooflight			1.6800	2.0221	3.3971			(27a)
External Wall 1	40.3200	10.9000	29.4200	0.1800	5.2956			(29a)
sheltered	14.1600	2.1000	12.0600	0.1800	2.1708			(29a)
External Roof 1	64.1600	1.6800	62.4800	0.1100	6.8728			(30)
Total net area of external elements Aum(A, m2)			118.6400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.3172			(33)
Party Wall 1			25.7700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 170.3223 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.9700	0.0500	0.3485
E3 Sill	5.9700	0.0500	0.2985
E4 Jamb	25.6400	0.0500	1.2820
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080
E7 Party floor between dwellings (in blocks of flats)	16.9000	0.0700	1.1830
E7 Party floor between dwellings (in blocks of flats)	5.8000	0.0700	0.4060
E15 Flat roof with parapet	16.9000	0.5600	9.4640
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.9000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	10.9000	0.1200	1.3080
P4 Party wall - Roof (insulation at ceiling level)	5.8000	0.1200	0.6960
E18 Party wall between dwellings	2.4000	0.0600	0.1440
E18 Party wall between dwellings	2.4000	0.0600	0.1440
E16 Corner (normal)	7.2000	0.0900	0.6480
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0900	-0.2160

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.3140 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 48.6312 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.7138	29.5466	29.3827	28.6128	28.4687	27.7982	27.7982	27.6740	28.0565	28.4687	28.7601	29.0648	(38)
Heat transfer coeff	78.3450	78.1778	78.0138	77.2439	77.0999	76.4293	76.4293	76.3052	76.6876	77.0999	77.3913	77.6960	(39)
Average = Sum(39)m / 12 =												77.2433	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2211	1.2185	1.2159	1.2039	1.2017	1.1912	1.1912	1.1893	1.1953	1.2017	1.2062	1.2110	(40)
HLP (average)												1.2039	
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 2.0965 (42)

Hot water usage for mixer showers

59.3708	58.4785	57.1784	54.6908	52.8550	50.8077	49.6441	50.9344	52.3488	54.5469	57.0880	59.1433	(42a)

Hot water usage for baths

25.6546	25.2736	24.7371	23.7478	23.0070	22.1856	21.7420	22.2747	22.8549	23.7338	24.7434	25.5679	(42b)

Hot water usage for other uses

36.1001	34.7874	33.4746	32.1619	30.8492	29.5365	29.5365	30.8492	32.1619	33.4746	34.7874	36.1001	(42c)

Average daily hot water use (litres/day) 111.3420 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	121.1255	118.5395	115.3901	110.6005	106.7112	102.5298	100.9225	104.0583	107.3656	111.7554	116.6188	120.8113	(44)
Energy conte	191.8332	168.7987	177.3503	151.4065	143.6538	126.0724	122.0570	128.8459	132.3925	151.6510	166.1448	189.1613	(45)
Energy content (annual)										Total = Sum(45)m =		1849.3673	

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

28.7750	25.3198	26.6025	22.7110	21.5481	18.9109	18.3086	19.3269	19.8589	22.7476	24.9217	28.3742	(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

238.4281	210.8844	223.9452	196.4984	190.2487	171.1642	168.6519	175.4408	177.4843	198.2459	211.2367	235.7562	(62)
WWHRS -27.1418	-24.0045	-25.1361	-20.8137	-19.3976	-16.5987	-15.5586	-16.5450	-17.1736	-20.2458	-22.9360	-26.6392	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
211.2862	186.8799	198.8091	175.6847	170.8511	154.5656	153.0933	158.8958	160.3107	178.0001	188.3006	209.1170	(64)
									Total per year (kWh/year) = Sum(64)m =		2145.7941	(64)
12Total per year (kWh/year)											2146	(64)	

Electric shower(s)

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

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

Heat gains from water heating, kWh/month

101.0604	89.7941	96.2449	86.4161	85.0408	77.9925	77.8599	80.1172	80.0940	87.6999	91.3166	100.1720	(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	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	(66)

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

	93.0390	103.0075	93.0390	96.1403	93.0390	96.1403	93.0390	93.0390	96.1403	93.0390	96.1403	93.0390	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	183.3037	185.2058	180.4125	170.2082	157.3271	145.2206	137.1328	135.2307	140.0239	150.2283	163.1094	175.2158	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	(71)
Water heating gains (Table 5)													
	135.8339	133.6222	129.3614	120.0224	114.3022	108.3230	104.6504	107.6844	111.2416	117.8762	126.8286	134.6398	(72)
Total internal gains													
	469.6239	479.2828	460.2602	443.8182	422.1155	404.1312	389.2695	390.4014	401.8532	418.5907	443.5256	460.3420	(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	4.5900	10.6334	0.6300	0.7000	0.7700	14.9161	(74)
East	6.3100	19.6403	0.6300	0.7000	0.7700	37.8746	(76)
South	1.6800	26.0000	0.6300	0.7000	1.0000	17.3366	(82)

Solar gains	70.1274	138.6031	234.4669	355.7769	450.9226	468.8129	443.3241	370.3696	276.8299	165.8554	87.6303	57.5837	(83)
Total gains	539.7513	617.8859	694.7271	799.5951	873.0381	872.9441	832.5936	760.7709	678.6831	584.4461	531.1560	517.9257	(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	38.7456	38.8285	38.9100	39.2979	39.3713	39.7167	39.7167	39.7813	39.5829	39.3713	39.2230	39.0692	
alpha	3.5830	3.5886	3.5940	3.6199	3.6248	3.6478	3.6478	3.6521	3.6389	3.6248	3.6149	3.6046	
util living area													
	0.9750	0.9588	0.9251	0.8401	0.7010	0.5284	0.3950	0.4462	0.6783	0.8879	0.9589	0.9781	(86)
MIT	19.2828	19.5364	19.9262	20.4204	20.7683	20.9383	20.9835	20.9745	20.8479	20.3759	19.7520	19.2422	(87)
Th 2	19.9032	19.9052	19.9073	19.9169	19.9187	19.9270	19.9270	19.9286	19.9238	19.9187	19.9150	19.9112	(88)
util rest of house													
	0.9694	0.9499	0.9089	0.8073	0.6452	0.4505	0.3026	0.3487	0.6008	0.8565	0.9485	0.9733	(89)
MIT 2	17.9334	18.2529	18.7381	19.3355	19.7195	19.8877	19.9204	19.9174	19.8135	19.3020	18.5354	17.8875	(90)
Living area fraction									fLA = Living area / (4) =			0.4749	(91)
MIT	18.5743	18.8625	19.3023	19.8507	20.2176	20.3867	20.4253	20.4194	20.3048	19.8120	19.1132	18.5309	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5743	18.8625	19.3023	19.8507	20.2176	20.3867	20.4253	20.4194	20.3048	19.8120	19.1132	18.5309	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9606	0.9392	0.8982	0.8050	0.6615	0.4848	0.3461	0.3943	0.6298	0.8529	0.9387	0.9651	(94)
Useful gains	518.4648	580.3365	624.0124	643.6954	577.5130	423.1949	288.1606	299.9701	427.4467	498.4869	498.6034	499.8413	(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													
	1118.3159	1091.5531	998.7585	845.8790	656.7062	442.2710	292.3628	306.7012	475.8308	710.2437	929.7161	1113.4490	(97)
Space heating kWh													
	446.2892	343.5376	278.8111	145.5722	58.9197	0.0000	0.0000	0.0000	0.0000	157.5470	310.4012	456.5241	(98a)
Space heating requirement - total per year (kWh/year)												2197.6022	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	446.2892	343.5376	278.8111	145.5722	58.9197	0.0000	0.0000	0.0000	0.0000	157.5470	310.4012	456.5241	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2197.6022	
Space heating per m2										(98c) / (4) =		34.2519	(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													
	446.2892	343.5376	278.8111	145.5722	58.9197	0.0000	0.0000	0.0000	0.0000	157.5470	310.4012	456.5241	(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)													
	483.5203	372.1967	302.0706	157.7164	63.8350	0.0000	0.0000	0.0000	0.0000	170.6902	336.2960	494.6090	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	211.2862	186.8799	198.8091	175.6847	170.8511	154.5656	153.0933	158.8958	160.3107	178.0001	188.3006	209.1170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.6946	85.4063	84.8182	83.6413	81.9293	79.8000	79.8000	79.8000	79.8000	83.7872	85.1730	85.7614	(217)
Fuel for water heating, kWh/month													
	246.5572	218.8128	234.3944	210.0454	208.5348	193.6912	191.8463	199.1176	200.8906	212.4431	221.0803	243.8359	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)

Lighting	19.3317	15.5086	13.9638	10.2304	7.9023	6.4562	7.2087	9.3702	12.1709	15.9689	18.0369	19.8690	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-30.2534	-42.7779	-61.6851	-69.6076	-75.3003	-70.4010	-69.5524	-65.5495	-58.5097	-49.0461	-33.3127	-26.1428	(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	-16.7181	-35.2100	-70.0479	-105.2935	-139.2939	-139.9582	-138.2903	-117.0429	-85.7408	-50.3594	-22.3255	-13.2155	(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	2380.9342	(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	2581.2498	(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)	156.0176	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1585.6344	(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	3618.5672	(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	2380.9342	0.2100	499.9962	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2581.2498	0.2100	542.0624	(264)
Space and water heating			1042.0586	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	156.0176	0.1443	22.5182	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-652.1384	0.1345	-87.7170	
PV Unit electricity exported	-933.4959	0.1259	-117.5047	
Total			-205.2217	(269)
Total CO2, kg/year			871.2844	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.5800	(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	2380.9342	1.1300	2690.4556	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2581.2498	1.1300	2916.8122	(278)
Space and water heating			5607.2678	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	156.0176	1.5338	239.3051	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-652.1384	1.4971	-976.3228	
PV Unit electricity exported	-933.4959	0.4621	-431.3224	
Total			-1407.6452	(283)
Total Primary energy kWh/year			4569.0285	(286)
Target Primary Energy Rate (TPER)			71.2100	(287)

Full SAP Calculation Printout

Property Reference	Flat 2 Block B	**Issued on Date**	13/03/2024
Assessment Reference	Design stage for ES condition	**Prop Type Ref**	
Property	Flat 7 Block C, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	85 B	**DER**	4.05	**TER**	13.58
Environmental	97 A	**% DER < TER**			70.18
CO_2 Emissions (t/year)	0.24	**DFEE**	40.27	**TFEE**	42.19
Compliance Check	See BREL	**% DFEE < TFEE**			4.54
% DPER < TPER	39.93	**DPER**	42.78	**TPER**	71.21

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.1600	(1b)	x 2.4000	(2b) =	153.9840	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.1600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	153.9840	(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) =	0.1299	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2799	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2379	(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	0.3033	0.2974	0.2914	0.2617	0.2557	0.2260	0.2260	0.2201	0.2379	0.2557	0.2676	0.2795	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5460	0.5442	0.5425	0.5342	0.5327	0.5255	0.5255	0.5242	0.5283	0.5327	0.5358	0.5391	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			10.9000	1.1450	12.4809			(27)
rooflight			1.6800	1.2357	2.0760			(27a)
External Wall 1	40.3200	10.9000	29.4200	0.1300	3.8246	70.0000	2059.4000	(29a)
sheltered	14.1600	2.1000	12.0600	0.1300	1.5678	70.0000	844.2000	(29a)
External Roof 1	64.1600	1.6800	62.4800	0.1100	6.8728	9.0000	562.3200	(30)
Total net area of external elements Aum(A, m2)			118.6400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.7622			(33)
Party Wall 1			25.7700	0.0000	0.0000	180.0000	4638.6000	(32)
Party Floor 1			64.1600			30.0000	1924.8000	(32d)
Internal Wall 1			99.8400			9.0000	898.5600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 10927.8800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	170.3223	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.9700	0.0600	0.4182
E3 Sill	5.9700	0.0400	0.2388

E4 Jamb	25.6400	0.0200	0.5128	
R11 Upstands or kerbs of rooflights	7.6000	0.2400	1.8240	
E7 Party floor between dwellings (in blocks of flats)	16.9000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	5.8000	0.2800	1.6240	
E15 Flat roof with parapet	16.9000	0.3000	5.0700	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.9000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	10.9000	0.4800	5.2320	
P4 Party wall - Roof (insulation at ceiling level)	5.8000	0.4800	2.7840	
E18 Party wall between dwellings	2.4000	0.2400	0.5760	
E18 Party wall between dwellings	2.4000	0.2400	0.5760	
E16 Corner (normal)	7.2000	0.0500	0.3600	
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0600	-0.1440	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			19.0718	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	48.8340	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.7450	27.6542	27.5652	27.1473	27.0691	26.7051	26.7051	26.6377	26.8453	27.0691	27.2273	27.3927	(38)
Heat transfer coeff	76.5789	76.4882	76.3992	75.9813	75.9031	75.5391	75.5391	75.4717	75.6793	75.9031	76.0613	76.2266	(39)
Average = Sum(39)m / 12 =												75.9809	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1936	1.1921	1.1908	1.1842	1.1830	1.1774	1.1774	1.1763	1.1795	1.1830	1.1855	1.1881	(40)
HLP (average)												1.1842	
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												2.0965	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	25.6546	25.2736	24.7371	23.7478	23.0070	22.1856	21.7420	22.2747	22.8549	23.7338	24.7434	25.5679	(42b)
Hot water usage for other uses	36.1001	34.7874	33.4746	32.1619	30.8492	29.5365	29.5365	30.8492	32.1619	33.4746	34.7874	36.1001	(42c)
Average daily hot water use (litres/day)												56.6041	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	61.7547	60.0610	58.2117	55.9097	53.8562	51.7221	51.2784	53.1239	55.0168	57.2084	59.5308	61.6680	(44)
Energy conte	97.8044	85.5260	89.4692	76.5376	72.5008	63.5983	62.0168	65.7785	67.8412	77.6313	84.8125	96.5572	(45)
Energy content (annual)										Total = Sum(45)m =		940.0737	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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	83.1337	72.6971	76.0488	65.0569	61.6257	54.0586	52.7143	55.9117	57.6650	65.9866	72.0906	82.0736	(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	83.1337	72.6971	76.0488	65.0569	61.6257	54.0586	52.7143	55.9117	57.6650	65.9866	72.0906	82.0736	(64)
										Total per year (kWh/year) = Sum(64)m =		799.0627	(64)
12Total per year (kWh/year)												799	(64)
Electric shower(s)	47.5461	42.3640	46.2598	44.1452	44.9736	42.9004	44.3304	44.9736	44.1452	46.2598	45.3900	47.5461	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							540.8340	(64a)
Heat gains from water heating, kWh/month	32.6700	28.7653	30.5772	27.3005	26.6498	24.2397	24.2612	25.2213	25.4525	28.0616	29.3702	32.4049	(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	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	93.0390	103.0075	93.0390	96.1403	93.0390	96.1403	93.0390	93.0390	96.1403	93.0390	96.1403	93.0390	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	183.3037	185.2058	180.4125	170.2082	157.3271	145.2206	137.1328	135.2307	140.0239	150.2283	163.1094	175.2158	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	(71)
Water heating gains (Table 5)	43.9112	42.8055	41.0983	37.9174	35.8196	33.6663	32.6091	33.8996	35.3508	37.7172	40.7919	43.5550	(72)
Total internal gains	374.7012	385.4660	368.9971	358.7132	340.6330	329.4745	317.2282	316.6166	325.9623	335.4318	354.4889	366.2571	(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	4.5900	10.6334	0.7200	0.7000	0.7700	17.0470	(74)
East	6.3100	19.6403	0.7200	0.7000	0.7700	43.2853	(76)
South	1.6800	26.0000	0.7200	0.7000	1.0000	19.8132	(82)

Solar gains	80.1456	158.4035	267.9622	406.6022	515.3401	535.7862	506.6562	423.2795	316.3770	189.5490	100.1490	65.8100	(83)
Total gains	454.8467	543.8695	636.9593	765.3154	855.9731	865.2608	823.8843	739.8961	642.3393	524.9807	454.6378	432.0671	(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	39.6391	39.6862	39.7324	39.9509	39.9921	40.1848	40.1848	40.2207	40.1103	39.9921	39.9089	39.8223	
alpha	3.6426	3.6457	3.6488	3.6634	3.6661	3.6790	3.6790	3.6814	3.6740	3.6661	3.6606	3.6548	
util living area	0.9850	0.9710	0.9389	0.8511	0.7044	0.5277	0.3948	0.4534	0.6984	0.9118	0.9735	0.9874	(86)
MIT	19.1637	19.4450	19.8727	20.4064	20.7720	20.9405	20.9842	20.9740	20.8368	20.3115	19.6389	19.1102	(87)
Th 2	19.9252	19.9263	19.9274	19.9326	19.9336	19.9382	19.9382	19.9390	19.9364	19.9336	19.9316	19.9296	(88)
util rest of house	0.9815	0.9645	0.9252	0.8198	0.6493	0.4506	0.3033	0.3555	0.6220	0.8854	0.9664	0.9845	(89)
MIT 2	18.2673	18.5450	18.9620	19.4655	19.7803	19.9085	19.9332	19.9300	19.8429	19.3938	18.7434	18.2175	(90)
Living area fraction									fLA = Living area / (4) =			0.4749	(91)
MIT	18.6930	18.9724	19.3945	19.9123	20.2513	20.3986	20.4323	20.4258	20.3149	19.8296	19.1687	18.6414	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6930	18.9724	19.3945	19.9123	20.2513	20.3986	20.4323	20.4258	20.3149	19.8296	19.1687	18.6414	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9762	0.9571	0.9171	0.8191	0.6666	0.4849	0.3465	0.4014	0.6509	0.8824	0.9599	0.9798	(94)
Useful gains	444.0391	520.5554	584.1487	626.9002	570.6022	419.5859	285.4537	296.9679	418.0884	463.2226	436.4235	423.3522	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1102.2030	1076.3710	985.1298	836.7319	649.0679	438.0221	289.4880	303.8360	470.3384	700.5560	917.9591	1100.8216	(97)
Space heating kWh	489.6740	373.5081	298.3299	151.0788	58.3785	0.0000	0.0000	0.0000	0.0000	176.5760	346.7056	504.0372	(98a)
Space heating requirement - total per year (kWh/year)												2398.2882	
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	489.6740	373.5081	298.3299	151.0788	58.3785	0.0000	0.0000	0.0000	0.0000	176.5760	346.7056	504.0372	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2398.2882	
Space heating per m2											(98c) / (4) =	37.3798	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	710.0675	558.9893	573.5849	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8838	0.9275	0.8988	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	627.5887	518.4875	515.5171	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	950.6713	905.5654	813.3182	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	232.6195	287.9860	221.5640	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	58.1549	71.9965	55.3910	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												185.5424	(107)
Energy for space heating												37.3798	(99)
Energy for space cooling												2.8919	(108)
Total												40.2717	(109)
Fabric Energy Efficiency (DFEE)												40.3	(109)

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

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		64.1600	(1b)	x 2.4000	(2b) =	153.9840	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.1600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		153.9840	(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	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) = 0.1299 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.3799 (18)
Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3229 (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	0.4117	0.4036	0.3956	0.3552	0.3471	0.3068	0.3068	0.2987	0.3229	0.3471	0.3633	0.3794	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5847	0.5815	0.5782	0.5631	0.5602	0.5470	0.5470	0.5446	0.5521	0.5602	0.5660	0.5720	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			10.9000	1.1450	12.4809			(27)
rooflight			1.6800	2.0221	3.3971			(27a)
External Wall 1	40.3200	10.9000	29.4200	0.1800	5.2956			(29a)
sheltered	14.1600	2.1000	12.0600	0.1800	2.1708			(29a)
External Roof 1	64.1600	1.6800	62.4800	0.1100	6.8728			(30)
Total net area of external elements Aum(A, m2)			118.6400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.3172			(33)
Party Wall 1			25.7700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 170.3223 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	6.9700	0.0500	0.3485
E3	Sill	5.9700	0.0500	0.2985
E4	Jamb	25.6400	0.0500	1.2820
R11	Upstands or kerbs of rooflights	7.6000	0.0800	0.6080
E7	Party floor between dwellings (in blocks of flats)	16.9000	0.0700	1.1830
E7	Party floor between dwellings (in blocks of flats)	5.8000	0.0700	0.4060
E15	Flat roof with parapet	16.9000	0.5600	9.4640
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	10.9000	0.0000	0.0000
P4	Party wall - Roof (insulation at ceiling level)	10.9000	0.1200	1.3080
P4	Party wall - Roof (insulation at ceiling level)	5.8000	0.1200	0.6960
E18	Party wall between dwellings	2.4000	0.0600	0.1440
E18	Party wall between dwellings	2.4000	0.0600	0.1440
E16	Corner (normal)	7.2000	0.0900	0.6480
E17	Corner (inverted - internal area greater than external area)	2.4000	-0.0900	-0.2160

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.3140 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 48.6312 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.7138	29.5466	29.3827	28.6128	28.4687	27.7982	27.7982	27.6740	28.0565	28.4687	28.7601	29.0648	(38)
Heat transfer coeff	78.3450	78.1778	78.0138	77.2439	77.0999	76.4293	76.4293	76.3052	76.6876	77.0999	77.3913	77.6960	(39)

Average = Sum(39)m / 12 = 77.2433

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2211	1.2185	1.2159	1.2039	1.2017	1.1912	1.1912	1.1893	1.1953	1.2017	1.2062	1.2110	(40)
HLP (average)												1.2039	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0965 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

25.6546	25.2736	24.7371	23.7478	23.0070	22.1856	21.7420	22.2747	22.8549	23.7338	24.7434	25.5679	(42b)

Hot water usage for other uses

36.1001	34.7874	33.4746	32.1619	30.8492	29.5365	29.5365	30.8492	32.1619	33.4746	34.7874	36.1001	(42c)

Average daily hot water use (litres/day) 56.6041 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	61.7547	60.0610	58.2117	55.9097	53.8562	51.7221	51.2784	53.1239	55.0168	57.2084	59.5308	61.6680	(44)
Energy conte	97.8044	85.5260	89.4692	76.5376	72.5008	63.5983	62.0168	65.7785	67.8412	77.6313	84.8125	96.5572	(45)

Energy content (annual) Total = Sum(45)m = 940.0737

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

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 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

83.1337	72.6971	76.0488	65.0569	61.6257	54.0586	52.7143	55.9117	57.6650	65.9866	72.0906	82.0736	(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

83.1337	72.6971	76.0488	65.0569	61.6257	54.0586	52.7143	55.9117	57.6650	65.9866	72.0906	82.0736	(64)

Total per year (kWh/year) = Sum(64)m = 799.0627 (64)

12Total per year (kWh/year) 799 (64)

Electric shower(s)

	47.5461	42.3640	46.2598	44.1452	44.9736	42.9004	44.3304	44.9736	44.1452	46.2598	45.3900	47.5461 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 540.8340 (64a)

Heat gains from water heating, kWh/month

	32.6700	28.7653	30.5772	27.3005	26.6498	24.2397	24.2612	25.2213	25.4525	28.0616	29.3702	32.4049 (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	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	(66)

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

	93.0390	103.0075	93.0390	96.1403	93.0390	96.1403	93.0390	93.0390	96.1403	93.0390	96.1403	93.0390	(67)

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

	183.3037	185.2058	180.4125	170.2082	157.3271	145.2206	137.1328	135.2307	140.0239	150.2283	163.1094	175.2158	(68)

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

	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

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

	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	(71)

Water heating gains (Table 5)

	43.9112	42.8055	41.0983	37.9174	35.8196	33.6663	32.6091	33.8996	35.3508	37.7172	40.7919	43.5550	(72)

Total internal gains

	374.7012	385.4660	368.9971	358.7132	340.6330	329.4745	317.2282	316.6166	325.9623	335.4318	354.4889	366.2571	(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	4.5900	10.6334	0.6300	0.7000	0.7700	14.9161	(74)
East	6.3100	19.6403	0.6300	0.7000	0.7700	37.8746	(76)
South	1.6800	26.0000	0.6300	0.7000	1.0000	17.3366	(82)

Solar gains	70.1274	138.6031	234.4669	355.7769	450.9226	468.8129	443.3241	370.3696	276.8299	165.8554	87.6303	57.5837	(83)
Total gains	444.8286	524.0691	603.4640	714.4901	791.5556	798.2875	760.5523	686.9862	602.7922	501.2871	442.1192	423.8408	(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	38.7456	38.8285	38.9100	39.2979	39.3713	39.7167	39.7167	39.7813	39.5829	39.3713	39.2230	39.0692	
alpha	3.5830	3.5886	3.5940	3.6199	3.6248	3.6478	3.6478	3.6521	3.6389	3.6248	3.6149	3.6046	
util living area	0.9861	0.9744	0.9484	0.8747	0.7435	0.5685	0.4293	0.4884	0.7307	0.9229	0.9759	0.9882	(86)
MIT	19.0905	19.3567	19.7714	20.3172	20.7165	20.9218	20.9784	20.9658	20.8041	20.2518	19.5805	19.0491	(87)
Th 2	19.9032	19.9052	19.9073	19.9169	19.9187	19.9270	19.9270	19.9286	19.9238	19.9187	19.9150	19.9112	(88)
util rest of house	0.9828	0.9685	0.9363	0.8463	0.6896	0.4876	0.3302	0.3840	0.6551	0.8989	0.9694	0.9855	(89)
MIT 2	18.1792	18.4432	18.8501	19.3738	19.7250	19.8875	19.9201	19.9166	19.8095	19.3278	18.6741	18.1439	(90)
Living area fraction									fLA = Living area / (4) =			0.4749	(91)
MIT	18.6120	18.8770	19.2876	19.8218	20.1958	20.3787	20.4227	20.4149	20.2818	19.7666	19.1046	18.5738	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6120	18.8770	19.2876	19.8218	20.1958	20.3787	20.4227	20.4149	20.2818	19.7666	19.1046	18.5738	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9777	0.9614	0.9280	0.8435	0.7043	0.5228	0.3768	0.4327	0.6822	0.8948	0.9630	0.9809	(94)
Useful gains	434.9116	503.8508	559.9954	602.6382	557.5253	417.3349	286.6116	297.2521	411.2034	448.5610	425.7691	415.7448	(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	1121.2703	1092.6924	997.6119	843.6462	655.0289	441.6604	292.1651	306.3548	474.0700	706.7453	929.0479	1116.7848	(97)
Space heating kWh	510.6509	395.7016	325.5867	173.5258	72.5426	0.0000	0.0000	0.0000	0.0000	192.0892	362.3607	521.5738	(98a)

Space heating requirement - total per year (kWh/year) 2554.0313

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	510.6509	395.7016	325.5867	173.5258	72.5426	0.0000	0.0000	0.0000	0.0000	192.0892	362.3607	521.5738	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 2554.0313

Space heating per m2 (98c) / (4) = 39.8072 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	718.4359	565.5772	579.9193	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8549	0.9067	0.8745	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	614.2172	512.8365	507.1194	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	875.6073	834.5805	754.0003	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	188.2009	239.3775	183.6794	0.0000	0.0000	0.0000	0.0000	(104)

Cooled fraction fC = cooled area / (4) = 1.0000 (105)

Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)

Space cooling kWh

0.0000	0.0000	0.0000	0.0000	0.0000	47.0502	59.8444	45.9199	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement											152.8144 (107)
Energy for space heating											39.8072 (99)
Energy for space cooling											2.3818 (108)
Total											42.1890 (109)
Fabric Energy Efficiency (TFEE)											42.2 (109)

Full SAP Calculation Printout

Property Reference	Flat 2 Block B	**Issued on Date**	13/03/2024
Assessment Reference	Design stage for ES condition	**Prop Type Ref**	
Property	Flat 7 Block C, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	85 B	**DER**	4.05	**TER**	13.58
Environmental	97 A	**% DER < TER**			70.18
CO_2 Emissions (t/year)	0.24	**DFEE**	40.27	**TFEE**	42.19
Compliance Check	See BREL	**% DFEE < TFEE**			4.54
% DPER < TPER	39.93	**DPER**	42.78	**TPER**	71.21

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.1600	(1b)	x 2.4000	(2b) =	153.9840	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.1600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		153.9840	(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		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(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) =		81.0000 (23c)

Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448	(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	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			10.9000	1.1450	12.4809			(27)
rooflight			1.6800	1.2357	2.0760			(27a)
External Wall 1	40.3200	10.9000	29.4200	0.1300	3.8246	70.0000	2059.4000	(29a)
sheltered	14.1600	2.1000	12.0600	0.1300	1.5678	70.0000	844.2000	(29a)
External Roof 1	64.1600	1.6800	62.4800	0.1100	6.8728	9.0000	562.3200	(30)
Total net area of external elements Aum(A, m2)			118.6400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.7622			(33)
Party Wall 1			25.7700	0.0000	0.0000	180.0000	4638.6000	(32)
Party Floor 1			64.1600			30.0000	1924.8000	(32d)
Internal Wall 1			99.8400			9.0000	898.5600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10927.8800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		170.3223 (35)
List of Thermal Bridges		

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	6.9700	0.0600	0.4182	
E3 Sill	5.9700	0.0400	0.2388	
E4 Jamb	25.6400	0.0200	0.5128	
R11 Upstands or kerbs of rooflights	7.6000	0.2400	1.8240	
E7 Party floor between dwellings (in blocks of flats)	16.9000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	5.8000	0.2800	1.6240	
E15 Flat roof with parapet	16.9000	0.3000	5.0700	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.9000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	10.9000	0.4800	5.2320	
P4 Party wall - Roof (insulation at ceiling level)	5.8000	0.4800	2.7840	
E18 Party wall between dwellings	2.4000	0.2400	0.5760	
E18 Party wall between dwellings	2.4000	0.2400	0.5760	
E16 Corner (normal)	7.2000	0.0500	0.3600	
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0600	-0.1440	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			19.0718	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	48.8340	(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	13.0880	12.9260	12.7640	11.9542	11.7922	10.9823	10.9823	10.8204	11.3063	11.7922	12.1161	12.4401	(38)
Heat transfer coeff	61.9219	61.7600	61.5980	60.7881	60.6262	59.8163	59.8163	59.6543	60.1402	60.6262	60.9501	61.2740	(39)
Average = Sum(39)m / 12 =												60.7476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9651	0.9626	0.9601	0.9474	0.9449	0.9323	0.9323	0.9298	0.9373	0.9449	0.9500	0.9550	(40)
HLP (average)												0.9468	
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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Assumed occupancy												2.0965	(42)
Hot water usage for mixer showers	89.0562	87.7178	85.7676	82.0362	79.2825	76.2116	74.4661	76.4016	78.5232	81.8204	85.6320	88.7149	(42a)
Hot water usage for baths	25.6546	25.2736	24.7371	23.7478	23.0070	22.1856	21.7420	22.2747	22.8549	23.7338	24.7434	25.5679	(42b)
Hot water usage for other uses	36.1001	34.7874	33.4746	32.1619	30.8492	29.5365	29.5365	30.8492	32.1619	33.4746	34.7874	36.1001	(42c)
Average daily hot water use (litres/day)												138.7109	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.8109	147.7788	143.9793	137.9459	133.1387	127.9337	125.7445	129.5255	133.5400	139.0288	145.1628	150.3829	(44)
Energy conte	238.8475	210.4350	221.2908	188.8410	179.2303	157.3094	152.0771	160.3797	164.6682	188.6608	206.8110	235.4633	(45)
Energy content (annual)										Total = Sum(45)m =		2304.0141	
Distribution loss (46)m = 0.15 x (45)m	35.8271	31.5653	33.1936	28.3262	26.8845	23.5964	22.8116	24.0569	24.7002	28.2991	31.0216	35.3195	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.5400	(55)
Total storage loss	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(56)
If cylinder contains dedicated solar storage	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(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	278.8499	246.5662	261.2932	227.5530	219.2327	196.0214	192.0795	200.3821	203.3802	228.6632	245.5230	275.4657	(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	278.8499	246.5662	261.2932	227.5530	219.2327	196.0214	192.0795	200.3821	203.3802	228.6632	245.5230	275.4657	(64)
										Total per year (kWh/year) = Sum(64)m =		2775.0101	(64)
12Total per year (kWh/year)												2775	(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	111.4187	98.8746	105.5811	93.7592	91.5960	83.2750	82.5676	85.3282	85.7218	94.7316	99.7342	110.2935	(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	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	93.0390	103.0075	93.0390	96.1403	93.0390	96.1403	93.0390	93.0390	96.1403	93.0390	96.1403	93.0390	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	183.3037	185.2058	180.4125	170.2082	157.3271	145.2206	137.1328	135.2307	140.0239	150.2283	163.1094	175.2158	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	(71)
Water heating gains (Table 5)	149.7564	147.1348	141.9101	130.2212	123.1129	115.6597	110.9779	114.6884	119.0580	127.3275	138.5198	148.2439	(72)
Total internal gains	480.5463	489.7954	469.8089	451.0169	427.9263	411.4679	395.5970	397.4053	409.6695	425.0420	452.2168	470.9460	(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				4.5900	10.6334	0.7200	0.7000	0.7700	17.0470	(74)			
East				6.3100	19.6403	0.7200	0.7000	0.7700	43.2853	(76)			
South				1.6800	26.0000	0.7200	0.7000	1.0000	19.8132	(82)			
Solar gains	80.1456	158.4035	267.9622	406.6022	515.3401	535.7862	506.6562	423.2795	316.3770	189.5490	100.1490	65.8100	(83)
Total gains	560.6919	648.1989	737.7711	857.6191	943.2663	947.2541	902.2532	820.6849	726.0466	614.5910	552.3657	536.7560	(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	49.0218	49.1503	49.2796	49.9361	50.0695	50.7474	50.7474	50.8852	50.4741	50.0695	49.8034	49.5401	
alpha	4.2681	4.2767	4.2853	4.3291	4.3380	4.3832	4.3832	4.3923	4.3649	4.3380	4.3202	4.3027	
util living area	0.9650	0.9376	0.8794	0.7453	0.5702	0.3996	0.2908	0.3326	0.5491	0.8229	0.9389	0.9700	(86)
Living	19.8469	20.0953	20.4277	20.7736	20.9389	20.9898	20.9980	20.9965	20.9617	20.7067	20.2285	19.8071	
Non living	19.0790	19.3206	19.6364	19.9543	20.0894	20.1350	20.1395	20.1410	20.1146	19.9080	19.4619	19.0469	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4101	20.0953	20.4277	20.7736	20.9389	20.9898	20.9980	20.9965	20.9617	20.7067	20.2285	19.9739	(87)
Th 2	20.1125	20.1146	20.1167	20.1274	20.1295	20.1401	20.1401	20.1423	20.1359	20.1295	20.1252	20.1210	(88)
util rest of house	0.9582	0.9262	0.8589	0.7099	0.5237	0.3476	0.2344	0.2714	0.4875	0.7867	0.9257	0.9641	(89)
MIT 2	19.5838	19.3206	19.6364	19.9543	20.0894	20.1350	20.1395	20.1410	20.1146	19.9080	19.4619	19.1971	(90)
Living area fraction										fLA = Living area / (4) =		0.4749	(91)
MIT	19.9762	19.6885	20.0122	20.3434	20.4928	20.5410	20.5472	20.5473	20.5169	20.2873	19.8259	19.5660	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9762	19.6885	20.0122	20.3434	20.4928	20.5410	20.5472	20.5473	20.5169	20.2873	19.8259	19.5660	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9570	0.9199	0.8562	0.7190	0.5434	0.3719	0.2611	0.3004	0.5152	0.7938	0.9205	0.9596	(94)
Useful gains	536.5999	596.2813	631.7052	616.6602	512.6041	352.3294	235.6172	246.5100	374.0553	487.8357	508.4729	515.0948	(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	970.7033	913.3384	832.3248	695.6222	533.0753	355.3658	236.1066	247.4030	385.9126	587.3026	775.6473	941.5396	(97)
Space heating kWh	322.9730	213.0624	149.2609	56.8526	15.2306	0.0000	0.0000	0.0000	0.0000	74.0034	192.3656	317.2750	(98a)
Space heating requirement - total per year (kWh/year)												1341.0235	
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	322.9730	213.0624	149.2609	56.8526	15.2306	0.0000	0.0000	0.0000	0.0000	74.0034	192.3656	317.2750	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1341.0235	
Space heating per m2											(98c) / (4) =	20.9012	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												282.4346	(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	322.9730	213.0624	149.2609	56.8526	15.2306	0.0000	0.0000	0.0000	0.0000	74.0034	192.3656	317.2750	(98)
Space heating efficiency (main heating system 1)	282.4346	282.4346	282.4346	282.4346	282.4346	0.0000	0.0000	0.0000	0.0000	282.4346	282.4346	282.4346	(210)
Space heating fuel (main heating system)	114.3532	75.4378	52.8480	20.1295	5.3926	0.0000	0.0000	0.0000	0.0000	26.2019	68.1098	112.3357	(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	278.8499	246.5662	261.2932	227.5530	219.2327	196.0214	192.0795	200.3821	203.3802	228.6632	245.5230	275.4657	(64)
Efficiency of water heater												279.9227	(216)
(217)m	279.9227	279.9227	279.9227	279.9227	279.9227	279.9227	279.9227	279.9227	279.9227	279.9227	279.9227	279.9227	(217)
Fuel for water heating, kWh/month	99.6168	88.0837	93.3448	81.2914	78.3190	70.0270	68.6188	71.5848	72.6558	81.6880	87.7110	98.4078	(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	9.6529	8.7188	9.6529	9.3416	9.6529	9.3416	9.6529	9.6529	9.3416	9.6529	9.3416	9.6529	(231)
Lighting	25.3205	20.3131	18.2897	13.3998	10.3504	8.4563	9.4420	12.2730	15.9414	20.9160	23.6246	26.0242	(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	474.8085	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.9227	
Water heating fuel used	991.3487	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)		
mechanical ventilation fans (SFP = 0.6050)	113.6556	(230a)
Total electricity for the above, kWh/year	113.6556	(231)
Electricity for lighting (calculated in Appendix L)	204.3510	(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	1784.1637	(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	474.8085	0.1570	74.5445	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	991.3487	0.1411	139.8713	(264)
Space and water heating			214.4157	(265)
Pumps, fans and electric keep-hot	113.6556	0.1387	15.7654	(267)
Energy for lighting	204.3510	0.1443	29.4942	(268)
Total CO2, kg/year			259.6753	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.0500	(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	474.8085	1.5812	750.7580	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	991.3487	1.5217	1508.5515	(278)
Space and water heating			2259.3095	(279)
Pumps, fans and electric keep-hot	113.6556	1.5128	171.9382	(281)
Energy for lighting	204.3510	1.5338	313.4404	(282)
Total Primary energy kWh/year			2744.6881	(286)
Dwelling Primary energy Rate (DPER)			42.7800	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.1600	(1b)	x 2.4000	(2b) =	153.9840	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.1600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		153.9840	(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) =	0.1299	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3799	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3229	(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													

	0.4117	0.4036	0.3956	0.3552	0.3471	0.3068	0.3068	0.2987	0.3229	0.3471	0.3633	0.3794	(22b)
Effective ac	0.5847	0.5815	0.5782	0.5631	0.5602	0.5470	0.5470	0.5446	0.5521	0.5602	0.5660	0.5720	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			10.9000	1.1450	12.4809			(27)
rooflight			1.6800	2.0221	3.3971			(27a)
External Wall 1	40.3200	10.9000	29.4200	0.1800	5.2956			(29a)
sheltered	14.1600	2.1000	12.0600	0.1800	2.1708			(29a)
External Roof 1	64.1600	1.6800	62.4800	0.1100	6.8728			(30)
Total net area of external elements Aum(A, m2)			118.6400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.3172			(33)
Party Wall 1			25.7700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 170.3223 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.9700	0.0500	0.3485
E3 Sill	5.9700	0.0500	0.2985
E4 Jamb	25.6400	0.0500	1.2820
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080
E7 Party floor between dwellings (in blocks of flats)	16.9000	0.0700	1.1830
E7 Party floor between dwellings (in blocks of flats)	5.8000	0.0700	0.4060
E15 Flat roof with parapet	16.9000	0.5600	9.4640
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.9000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	10.9000	0.1200	1.3080
P4 Party wall - Roof (insulation at ceiling level)	5.8000	0.1200	0.6960
E18 Party wall between dwellings	2.4000	0.0600	0.1440
E18 Party wall between dwellings	2.4000	0.0600	0.1440
E16 Corner (normal)	7.2000	0.0900	0.6480
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0900	-0.2160

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.3140 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 48.6312 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.7138	29.5466	29.3827	28.6128	28.4687	27.7982	27.7982	27.6740	28.0565	28.4687	28.7601	29.0648	(38)
Heat transfer coeff	78.3450	78.1778	78.0138	77.2439	77.0999	76.4293	76.4293	76.3052	76.6876	77.0999	77.3913	77.6960	(39)
Average = Sum(39)m / 12 =												77.2433	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2211	1.2185	1.2159	1.2039	1.2017	1.1912	1.1912	1.1893	1.1953	1.2017	1.2062	1.2110	(40)
HLP (average)												1.2039	
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 2.0965 (42)

Hot water usage for mixer showers

59.3708	58.4785	57.1784	54.6908	52.8550	50.8077	49.6441	50.9344	52.3488	54.5469	57.0880	59.1433	(42a)

Hot water usage for baths

25.6546	25.2736	24.7371	23.7478	23.0070	22.1856	21.7420	22.2747	22.8549	23.7338	24.7434	25.5679	(42b)

Hot water usage for other uses

36.1001	34.7874	33.4746	32.1619	30.8492	29.5365	29.5365	30.8492	32.1619	33.4746	34.7874	36.1001	(42c)

Average daily hot water use (litres/day) 111.3420 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	121.1255	118.5395	115.3901	110.6005	106.7112	102.5298	100.9225	104.0583	107.3656	111.7554	116.6188	120.8113	(44)
Energy conte	191.8332	168.7987	177.3503	151.4065	143.6538	126.0724	122.0570	128.8459	132.3925	151.6510	166.1448	189.1613	(45)
Energy content (annual)										Total = Sum(45)m =		1849.3673	

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

28.7750	25.3198	26.6025	22.7110	21.5481	18.9109	18.3086	19.3269	19.8589	22.7476	24.9217	28.3742	(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

238.4281	210.8844	223.9452	196.4984	190.2487	171.1642	168.6519	175.4408	177.4843	198.2459	211.2367	235.7562	(62)
WWHRS -27.1418	-24.0045	-25.1361	-20.8137	-19.3976	-16.5987	-15.5586	-16.5450	-17.1736	-20.2458	-22.9360	-26.6392	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
211.2862	186.8799	198.8091	175.6847	170.8511	154.5656	153.0933	158.8958	160.3107	178.0001	188.3006	209.1170	(64)
									Total per year (kWh/year) = Sum(64)m =		2145.7941	(64)
12Total per year (kWh/year)											2146	(64)	

Electric shower(s)

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

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

Heat gains from water heating, kWh/month

101.0604	89.7941	96.2449	86.4161	85.0408	77.9925	77.8599	80.1172	80.0940	87.6999	91.3166	100.1720	(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	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	104.8243	(66)

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

	93.0390	103.0075	93.0390	96.1403	93.0390	96.1403	93.0390	93.0390	96.1403	93.0390	96.1403	93.0390	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	183.3037	185.2058	180.4125	170.2082	157.3271	145.2206	137.1328	135.2307	140.0239	150.2283	163.1094	175.2158	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	33.4824	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	-83.8594	(71)
Water heating gains (Table 5)													
	135.8339	133.6222	129.3614	120.0224	114.3022	108.3230	104.6504	107.6844	111.2416	117.8762	126.8286	134.6398	(72)
Total internal gains													
	469.6239	479.2828	460.2602	443.8182	422.1155	404.1312	389.2695	390.4014	401.8532	418.5907	443.5256	460.3420	(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	4.5900	10.6334	0.6300	0.7000	0.7700	14.9161	(74)
East	6.3100	19.6403	0.6300	0.7000	0.7700	37.8746	(76)
South	1.6800	26.0000	0.6300	0.7000	1.0000	17.3366	(82)

Solar gains	70.1274	138.6031	234.4669	355.7769	450.9226	468.8129	443.3241	370.3696	276.8299	165.8554	87.6303	57.5837	(83)
Total gains	539.7513	617.8859	694.7271	799.5951	873.0381	872.9441	832.5936	760.7709	678.6831	584.4461	531.1560	517.9257	(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	38.7456	38.8285	38.9100	39.2979	39.3713	39.7167	39.7167	39.7813	39.5829	39.3713	39.2230	39.0692	
alpha	3.5830	3.5886	3.5940	3.6199	3.6248	3.6478	3.6478	3.6521	3.6389	3.6248	3.6149	3.6046	
util living area													
	0.9750	0.9588	0.9251	0.8401	0.7010	0.5284	0.3950	0.4462	0.6783	0.8879	0.9589	0.9781	(86)
MIT	19.2828	19.5364	19.9262	20.4204	20.7683	20.9383	20.9835	20.9745	20.8479	20.3759	19.7520	19.2422	(87)
Th 2	19.9032	19.9052	19.9073	19.9169	19.9187	19.9270	19.9270	19.9286	19.9238	19.9187	19.9150	19.9112	(88)
util rest of house													
	0.9694	0.9499	0.9089	0.8073	0.6452	0.4505	0.3026	0.3487	0.6008	0.8565	0.9485	0.9733	(89)
MIT 2	17.9334	18.2529	18.7381	19.3355	19.7195	19.8877	19.9204	19.9174	19.8135	19.3020	18.5354	17.8875	(90)
Living area fraction									fLA = Living area / (4) =			0.4749	(91)
MIT	18.5743	18.8625	19.3023	19.8507	20.2176	20.3867	20.4253	20.4194	20.3048	19.8120	19.1132	18.5309	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5743	18.8625	19.3023	19.8507	20.2176	20.3867	20.4253	20.4194	20.3048	19.8120	19.1132	18.5309	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9606	0.9392	0.8982	0.8050	0.6615	0.4848	0.3461	0.3943	0.6298	0.8529	0.9387	0.9651	(94)
Useful gains	518.4648	580.3365	624.0124	643.6954	577.5130	423.1949	288.1606	299.9701	427.4467	498.4869	498.6034	499.8413	(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													
	1118.3159	1091.5531	998.7585	845.8790	656.7062	442.2710	292.3628	306.7012	475.8308	710.2437	929.7161	1113.4490	(97)
Space heating kWh													
	446.2892	343.5376	278.8111	145.5722	58.9197	0.0000	0.0000	0.0000	0.0000	157.5470	310.4012	456.5241	(98a)
Space heating requirement - total per year (kWh/year)												2197.6022	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	446.2892	343.5376	278.8111	145.5722	58.9197	0.0000	0.0000	0.0000	0.0000	157.5470	310.4012	456.5241	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2197.6022	
Space heating per m2										(98c) / (4) =		34.2519	(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													
	446.2892	343.5376	278.8111	145.5722	58.9197	0.0000	0.0000	0.0000	0.0000	157.5470	310.4012	456.5241	(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)													
	483.5203	372.1967	302.0706	157.7164	63.8350	0.0000	0.0000	0.0000	0.0000	170.6902	336.2960	494.6090	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	211.2862	186.8799	198.8091	175.6847	170.8511	154.5656	153.0933	158.8958	160.3107	178.0001	188.3006	209.1170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.6946	85.4063	84.8182	83.6413	81.9293	79.8000	79.8000	79.8000	79.8000	83.7872	85.1730	85.7614	(217)
Fuel for water heating, kWh/month													
	246.5572	218.8128	234.3944	210.0454	208.5348	193.6912	191.8463	199.1176	200.8906	212.4431	221.0803	243.8359	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)

Lighting	19.3317	15.5086	13.9638	10.2304	7.9023	6.4562	7.2087	9.3702	12.1709	15.9689	18.0369	19.8690	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-30.2534	-42.7779	-61.6851	-69.6076	-75.3003	-70.4010	-69.5524	-65.5495	-58.5097	-49.0461	-33.3127	-26.1428	(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	-16.7181	-35.2100	-70.0479	-105.2935	-139.2939	-139.9582	-138.2903	-117.0429	-85.7408	-50.3594	-22.3255	-13.2155	(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	2380.9342	(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	2581.2498	(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)	156.0176	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1585.6344	(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	3618.5672	(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	2380.9342	0.2100	499.9962	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2581.2498	0.2100	542.0624	(264)
Space and water heating			1042.0586	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	156.0176	0.1443	22.5182	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-652.1384	0.1345	-87.7170	
PV Unit electricity exported	-933.4959	0.1259	-117.5047	
Total			-205.2217	(269)
Total CO2, kg/year			871.2844	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.5800	(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	2380.9342	1.1300	2690.4556	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2581.2498	1.1300	2916.8122	(278)
Space and water heating			5607.2678	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	156.0176	1.5338	239.3051	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-652.1384	1.4971	-976.3228	
PV Unit electricity exported	-933.4959	0.4621	-431.3224	
Total			-1407.6452	(283)
Total Primary energy kWh/year			4569.0285	(286)
Target Primary Energy Rate (TPER)			71.2100	(287)

Full SAP Calculation Printout

Property Reference	Flat 3 Block A	**Issued on Date**	13/03/2024
Assessment Reference	Design stage for ES condition	**Prop Type Ref**	
Property	Flat 3 Block A, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	87 B	**DER**	0.78	**TER**	14.37
Environmental	100 A	**% DER < TER**			94.57
CO_2 Emissions (t/year)	0.02	**DFEE**	29.19	**TFEE**	31.08
Compliance Check	See BREL	**% DFEE < TFEE**			6.09
% DPER < TPER	75.16	**DPER**	19.00	**TPER**	76.51

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	46.4600	(1b)	x 2.4900	(2b) =	115.6854	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	115.6854	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(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) =	81.0000	(23c)

Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			3.3000	1.1450	3.7786			(27)
exposed upper			2.5600	0.1300	0.3328	20.0000	51.2000	(28b)
over commercial			43.9000	0.1300	5.7070	20.0000	878.0000	(28b)
External Wall 1	12.7000	3.3000	9.4000	0.1300	1.2220	70.0000	658.0000	(29a)
sheltered	16.9300	2.1000	14.8300	0.1300	1.9279	70.0000	1038.1000	(29a)
Total net area of external elements Aum(A, m2)			76.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.9083			(33)
Party Wall 1			20.6600	0.0000	0.0000	180.0000	3718.8000	(32)
Party Wall 2 to existing			24.1500	0.0000	0.0000	180.0000	4347.0000	(32)
Party Ceiling 1			62.8800			20.0000	1257.6000	(32b)
Internal Wall 1			17.9200			9.0000	161.2800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12109.9800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	260.6539	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	2.9400	0.0600	0.1764
E3 Sill	1.9400	0.0400	0.0776
E4 Jamb	11.0000	0.0200	0.2200
E7 Party floor between dwellings (in blocks of flats)	9.7000	0.0000	0.0000
E20 Exposed floor (normal)	4.8000	0.3200	1.5360
E21 Exposed floor (inverted)	4.2000	0.3200	1.3440
E7 Party floor between dwellings (in blocks of flats)	13.6000	0.2000	2.7200
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E16 Corner (normal)	2.4900	0.1800	0.4482
E17 Corner (inverted - internal area greater than external area)	2.4900	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	31.9000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.9126 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.8209 (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	9.2852	9.1742	9.0633	8.5085	8.3976	7.8428	7.8428	7.7319	8.0647	8.3976	8.6195	8.8414	(38)
Heat transfer coeff	34.1061	33.9951	33.8842	33.3294	33.2185	32.6637	32.6637	32.5528	32.8856	33.2185	33.4404	33.6623	(39)

Average = Sum(39)m / 12 = 33.3017

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7341	0.7317	0.7293	0.7174	0.7150	0.7031	0.7031	0.7007	0.7078	0.7150	0.7198	0.7245	(40)
HLP (average)												0.7168	
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 1.5866 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	76.2330	75.0873	73.4179	70.2238	67.8666	65.2379	63.7438	65.4006	67.2167	70.0391	73.3018	75.9409	(42a)
Hot water usage for baths	21.9783	21.6519	21.1923	20.3448	19.7102	19.0065	18.6264	19.0828	19.5798	20.3328	21.1977	21.9040	(42b)
Hot water usage for other uses	30.8787	29.7558	28.6329	27.5101	26.3872	25.2644	25.2644	26.3872	27.5101	28.6329	29.7558	30.8787	(42c)

Average daily hot water use (litres/day) 118.7332 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.0900	126.4951	123.2432	118.0787	113.9640	109.5088	107.6345	110.8706	114.3066	119.0048	124.2554	128.7236	(44)
Energy conte	204.4470	180.1273	189.4201	161.6438	153.4175	134.6538	130.1746	137.2809	140.9514	161.4884	177.0246	201.5501	(45)

Energy content (annual) Total = Sum(45)m = 1972.1795

Distribution loss (46)m = 0.15 x (45)m	30.6670	27.0191	28.4130	24.2466	23.0126	20.1981	19.5262	20.5921	21.1427	24.2233	26.5537	30.2325	(46)

Water storage loss:

Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.0000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.5400 (55)

Total storage loss	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(56)
If cylinder contains dedicated solar storage	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(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	244.4494	216.2585	229.4225	200.3558	193.4199	173.3658	170.1770	177.2833	179.6634	201.4908	215.7366	241.5525	(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	244.4494	216.2585	229.4225	200.3558	193.4199	173.3658	170.1770	177.2833	179.6634	201.4908	215.7366	241.5525	(64)

Total per year (kWh/year) = Sum(64)m = 2443.1755 (64)

12Total per year (kWh/year) 2443 (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	99.9805	88.7973	94.9841	84.7162	83.0132	75.7420	75.2850	77.6478	77.8359	85.6968	89.8303	99.0173	(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	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	85.8594	95.0586	85.8594	88.7214	85.8594	88.7214	85.8594	85.8594	88.7214	85.8594	88.7214	85.8594	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	138.0513	139.4839	135.8739	128.1887	118.4876	109.3699	103.2787	101.8461	105.4561	113.1413	122.8424	131.9601	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)
Water heating gains (Table 5)	134.3824	132.1388	127.6668	117.6613	111.5769	105.1972	101.1895	104.3654	108.1055	115.1839	124.7643	133.0878	(72)
Total internal gains	405.0926	413.4807	396.1995	381.3709	362.7233	350.0879	337.1270	338.8703	349.0824	360.9840	383.1275	397.7067	(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	
South	3.3000	46.7521	0.7200	0.7000	0.7700	53.8863	(78)

Solar gains	53.8863	88.2519	112.4173	127.0559	132.4001	127.4171	124.4943	120.9012	117.4331	95.1880	63.8737	46.5627	(83)
Total gains	458.9789	501.7326	508.6168	508.4268	495.1234	477.5050	461.6213	459.7715	466.5155	456.1719	447.0011	444.2695	(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	98.6300	98.9519	99.2759	100.9283	101.2654	102.9852	102.9852	103.3362	102.2903	101.2654	100.5934	99.9303	
alpha	7.5753	7.5968	7.6184	7.7286	7.7510	7.8657	7.8657	7.8891	7.8194	7.7510	7.7062	7.6620	
util living area													
	0.9551	0.9183	0.8681	0.7617	0.6178	0.4374	0.3113	0.3257	0.4855	0.7340	0.9017	0.9615	(86)
Living	20.6840	20.7914	20.8800	20.9612	20.9926	20.9996	21.0000	21.0000	20.9990	20.9742	20.8508	20.6661	
Non living	20.0400	20.1407	20.2215	20.2986	20.3234	20.3380	20.3381	20.3402	20.3335	20.3111	20.2058	20.0309	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.8383	20.7914	20.8800	20.9612	20.9926	20.9996	21.0000	21.0000	20.9990	20.9742	20.8508	20.7128	(87)
Th 2	20.3108	20.3129	20.3150	20.3255	20.3276	20.3381	20.3381	20.3402	20.3339	20.3276	20.3234	20.3192	(88)
util rest of house													
	0.9448	0.9019	0.8441	0.7271	0.5753	0.3924	0.2645	0.2790	0.4390	0.6934	0.8803	0.9524	(89)
MIT 2	20.1723	20.1407	20.2215	20.2986	20.3234	20.3380	20.3381	20.3402	20.3335	20.3111	20.2058	20.0712	(90)
Living area fraction									fLA = Living area / (4) =			0.8717	(91)
MIT	20.7529	20.7079	20.7955	20.8762	20.9068	20.9147	20.9151	20.9153	20.9136	20.8892	20.7681	20.6305	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.7529	20.7079	20.7955	20.8762	20.9068	20.9147	20.9151	20.9153	20.9136	20.8892	20.7681	20.6305	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9516	0.9117	0.8613	0.7555	0.6120	0.4316	0.3053	0.3197	0.4795	0.7275	0.8947	0.9568	(94)
Useful gains	436.7866	457.4052	438.0593	384.1195	302.9995	206.1026	140.9378	146.9744	223.6931	331.8491	399.9522	425.0801	(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													
	561.1441	537.3915	484.3917	399.1613	305.8351	206.2617	140.9464	146.9867	224.0702	341.7904	457.0652	553.0891	(97)
Space heating kWh													
	92.5220	53.7508	34.4713	10.8301	2.1097	0.0000	0.0000	0.0000	0.0000	7.3964	41.1214	95.2387	(98a)
Space heating requirement - total per year (kWh/year)												337.4404	
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													
	92.5220	53.7508	34.4713	10.8301	2.1097	0.0000	0.0000	0.0000	0.0000	7.3964	41.1214	95.2387	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												337.4404	
Space heating per m2											(98c) / (4) =	7.2630	(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 %)	260.7193	(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													
	92.5220	53.7508	34.4713	10.8301	2.1097	0.0000	0.0000	0.0000	0.0000	7.3964	41.1214	95.2387	(98)
Space heating efficiency (main heating system 1)													
	260.7193	260.7193	260.7193	260.7193	0.0000	0.0000	0.0000	0.0000	260.7193	260.7193	260.7193	260.7193	(210)
Space heating fuel (main heating system)													
	35.4872	20.6164	13.2216	4.1539	0.8092	0.0000	0.0000	0.0000	0.0000	2.8369	15.7723	36.5292	(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													
	244.4494	216.2585	229.4225	200.3558	193.4199	173.3658	170.1770	177.2833	179.6634	201.4908	215.7366	241.5525	(64)
Efficiency of water heater												267.7594	(216)
(217)m	267.7594	267.7594	267.7594	267.7594	267.7594	267.7594	267.7594	267.7594	267.7594	267.7594	267.7594	267.7594	(217)
Fuel for water heating, kWh/month													
	91.2944	80.7660	85.6823	74.8268	72.2364	64.7468	63.5559	66.2099	67.0988	75.2507	80.5710	90.2125	(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	7.2521	6.5503	7.2521	7.0181	7.2521	7.0181	7.2521	7.2521	7.0181	7.2521	7.0181	7.2521	(231)
Lighting	22.6544	18.1742	16.3639	11.9889	9.2605	7.5659	8.4478	10.9807	14.2629	18.7137	21.1371	23.2840	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.4963	-30.3619	-50.9828	-64.0479	-73.5523	-70.1274	-68.8866	-62.7730	-51.3412	-37.1313	-21.4036	-15.3297	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.7998	-15.2158	-38.7258	-71.6001	-105.8648	-110.7366	-107.7271	-83.9378	-52.6556	-24.5434	-8.4390	-4.2941	(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												129.4267	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	267.7594	
Water heating fuel used	912.4517	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)		
mechanical ventilation fans (SFP = 0.6050)	85.3874	(230a)
Total electricity for the above, kWh/year	85.3874	(231)
Electricity for lighting (calculated in Appendix L)	182.8340	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1193.9737	(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	116.1261	(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	129.4267	0.1586	20.5285	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	912.4517	0.1410	128.6792	(264)
Space and water heating			149.2077	(265)
Pumps, fans and electric keep-hot	85.3874	0.1387	11.8443	(267)
Energy for lighting	182.8340	0.1443	26.3886	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-564.4339	0.1323	-74.6774	
PV Unit electricity exported	-629.5398	0.1212	-76.3226	
Total			-150.9999	(269)
Total CO2, kg/year			36.4407	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			0.7800	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	129.4267	1.5871	205.4154	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	912.4517	1.5215	1388.2668	(278)
Space and water heating			1593.6821	(279)
Pumps, fans and electric keep-hot	85.3874	1.5128	129.1740	(281)
Energy for lighting	182.8340	1.5338	280.4370	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-564.4339	1.4889	-840.3605	
PV Unit electricity exported	-629.5398	0.4448	-280.0175	
Total			-1120.3780	(283)
Total Primary energy kWh/year			882.9151	(286)
Dwelling Primary energy Rate (DPER)			19.0000	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	46.4600	(1b)	x 2.4900	(2b) =	115.6854	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 46.4600						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		115.6854	(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) =	0.1729	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4229	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3277 (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	0.4179	0.4097	0.4015	0.3605	0.3523	0.3113	0.3113	0.3032	0.3277	0.3523	0.3687	0.3851	(22b)
Effective ac	0.5873	0.5839	0.5806	0.5650	0.5621	0.5485	0.5485	0.5460	0.5537	0.5621	0.5680	0.5741	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			3.3000	1.1450	3.7786			(27)
exposed upper			2.5600	0.1300	0.3328			(28b)
over commercial			43.9000	0.1300	5.7070			(28b)
External Wall 1	12.7000	3.3000	9.4000	0.1800	1.6920			(29a)
sheltered	16.9300	2.1000	14.8300	0.1800	2.6694			(29a)
Total net area of external elements Aum(A, m2)			76.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.2798			(33)
Party Wall 1			20.6600	0.0000	0.0000			(32)
Party Wall 2 to existing			24.1500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 274.1881 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	2.9400	0.0500	0.1470
E3 Sill	1.9400	0.0500	0.0970
E4 Jamb	11.0000	0.0500	0.5500
E7 Party floor between dwellings (in blocks of flats)	9.7000	0.0700	0.6790
E20 Exposed floor (normal)	4.8000	0.3200	1.5360
E21 Exposed floor (inverted)	4.2000	0.3200	1.3440
E7 Party floor between dwellings (in blocks of flats)	13.6000	0.0700	0.9520
E18 Party wall between dwellings	4.9800	0.0600	0.2988
E18 Party wall between dwellings	4.9800	0.0600	0.2988
E16 Corner (normal)	2.4900	0.0900	0.2241
E17 Corner (inverted - internal area greater than external area)	2.4900	-0.0900	-0.2241
E7 Party floor between dwellings (in blocks of flats)	31.9000	0.0700	2.2330

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.1356 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 24.4154 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.4210	22.2916	22.1647	21.5689	21.4574	20.9384	20.9384	20.8423	21.1383	21.4574	21.6829	21.9187	(38)
Heat transfer coeff	46.8364	46.7070	46.5802	45.9843	45.8728	45.3539	45.3539	45.2578	45.5538	45.8728	46.0984	46.3341	(39)
Average = Sum(39)m / 12 =												45.9838	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0081	1.0053	1.0026	0.9898	0.9874	0.9762	0.9762	0.9741	0.9805	0.9874	0.9922	0.9973	(40)
HLP (average)												0.9897	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.5866 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
50.8220	50.0582	48.9453	46.8159	45.2444	43.4920	42.4958	43.6004	44.8111	46.6927	48.8679	50.6273	(42a)

Hot water usage for baths

21.9783	21.6519	21.1923	20.3448	19.7102	19.0065	18.6264	19.0828	19.5798	20.3328	21.1977	21.9040	(42b)

Hot water usage for other uses

30.8787	29.7558	28.6329	27.5101	26.3872	25.2644	25.2644	26.3872	27.5101	28.6329	29.7558	30.8787	(42c)

Average daily hot water use (litres/day) 95.3051 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.6790	101.4660	98.7705	94.6707	91.3418	87.7628	86.3866	89.0704	91.9010	95.6584	99.8214	103.4100	(44)
Energy conte	164.2022	144.4862	151.8066	129.5995	122.9636	107.9146	104.4771	110.2878	113.3231	129.8076	142.2139	161.9150	(45)
Energy content (annual)											Total = Sum(45)m =	1582.9972	
Distribution loss (46)m = 0.15 x (45)m	24.6303	21.6729	22.7710	19.4399	18.4445	16.1872	15.6716	16.5432	16.9985	19.4711	21.3321	24.2873	(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

210.7971	186.5719	198.4015	174.6913	169.5585	153.0064	151.0720	156.8827	158.4150	176.4025	187.3058	208.5099	(62)
WWHRS -23.2337	-20.5481	-21.5168	-17.8167	-16.6045	-14.2086	-13.3183	-14.1627	-14.7008	-17.3306	-19.6335	-22.8034	(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	187.5634	166.0238	176.8848	156.8746	152.9540	138.7978	137.7537	142.7200	143.7142	159.0719	167.6723	185.7065	(64)
										Total per year (kWh/year) = Sum(64)m =		1915.7368	(64)
12Total per year (kWh/year)												1916	(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

91.8731	81.7102	87.7516	79.1653	78.1613	71.9551	72.0146	73.9466	73.7534	80.4370	83.3596	91.1127	(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	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	85.8594	95.0586	85.8594	88.7214	85.8594	88.7214	85.8594	85.8594	88.7214	85.8594	88.7214	85.8594	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	138.0513	139.4839	135.8739	128.1887	118.4876	109.3699	103.2787	101.8461	105.4561	113.1413	122.8424	131.9601	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	(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)													
	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)
Water heating gains (Table 5)													
	123.4854	121.5926	117.9457	109.9518	105.0555	99.9376	96.7938	99.3906	102.4353	108.1142	115.7772	122.4633	(72)
Total internal gains													
	397.1955	405.9345	389.4784	376.6613	359.2019	344.8283	332.7313	333.8956	343.4122	356.9143	377.1404	390.0822	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	3.3000	46.7521	0.6300	0.7000	0.7700	47.1505	(78)

Solar gains	47.1505	77.2204	98.3651	111.1739	115.8501	111.4900	108.9325	105.7885	102.7540	83.2895	55.8895	40.7424	(83)
Total gains	444.3461	483.1549	487.8435	487.8353	475.0521	456.3182	441.6637	439.6841	446.1662	440.2037	433.0299	430.8246	(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	75.5512	75.7606	75.9669	76.9512	77.1383	78.0209	78.0209	78.1866	77.6785	77.1383	76.7609	76.3703	
alpha	6.0367	6.0507	6.0645	6.1301	6.1426	6.2014	6.2014	6.2124	6.1786	6.1426	6.1174	6.0914	
util living area													
	0.9855	0.9743	0.9571	0.9096	0.8098	0.6215	0.4500	0.4711	0.6785	0.8921	0.9686	0.9877	(86)
MIT	20.2440	20.3820	20.5417	20.7517	20.9076	20.9853	20.9982	20.9977	20.9744	20.8140	20.5126	20.2235	(87)
Th 2	20.4959	20.4973	20.4987	20.5051	20.5063	20.5119	20.5119	20.5129	20.5098	20.5063	20.5039	20.5014	(88)
util rest of house													
	0.9832	0.9703	0.9502	0.8952	0.7818	0.5784	0.4009	0.4222	0.6371	0.8733	0.9631	0.9857	(89)
MIT 2	19.7895	19.9267	20.0844	20.2916	20.4345	20.5027	20.5111	20.5118	20.4927	20.3520	20.0616	19.7738	(90)
Living area fraction									fLA = Living area / (4) =			0.8717	(91)
MIT	20.1857	20.3236	20.4830	20.6927	20.8469	20.9234	20.9357	20.9353	20.9126	20.7548	20.4547	20.1658	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1857	20.3236	20.4830	20.6927	20.8469	20.9234	20.9357	20.9353	20.9126	20.7548	20.4547	20.1658	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9816	0.9688	0.9500	0.9009	0.8015	0.6149	0.4436	0.4646	0.6713	0.8831	0.9625	0.9841	(94)
Useful gains	436.1603	468.0611	463.4583	439.4967	380.7315	280.5925	195.9188	204.2916	299.5122	388.7474	416.7749	423.9953	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	744.0285	720.3916	651.3302	542.2793	419.5959	286.7912	196.6430	205.2590	310.3396	465.8284	615.6301	739.7635	(97)
Space heating kWh													
	229.0539	169.5661	139.7766	74.0034	28.9151	0.0000	0.0000	0.0000	0.0000	57.3483	143.1757	234.9315	(98a)
Space heating requirement - total per year (kWh/year)												1076.7707	
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													
	229.0539	169.5661	139.7766	74.0034	28.9151	0.0000	0.0000	0.0000	0.0000	57.3483	143.1757	234.9315	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1076.7707	
Space heating per m2										(98c) / (4) =		23.1763	(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													
	229.0539	169.5661	139.7766	74.0034	28.9151	0.0000	0.0000	0.0000	0.0000	57.3483	143.1757	234.9315	(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)													
	248.1625	183.7119	151.4373	80.1770	31.3273	0.0000	0.0000	0.0000	0.0000	62.1325	155.1199	254.5303	(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													
	187.5634	166.0238	176.8848	156.8746	152.9540	138.7978	137.7537	142.7200	143.7142	159.0719	167.6723	185.7065	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.5090	84.1072	83.5372	82.4794	81.1069	79.8000	79.8000	79.8000	79.8000	82.0023	83.7077	84.5882	(217)
Fuel for water heating, kWh/month													

	221.9447	197.3956	211.7436	190.1984	188.5831	173.9321	172.6236	178.8471	180.0929	193.9847	200.3070	219.5418 (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	17.8399	14.3118	12.8862	9.4410	7.2925	5.9580	6.6525	8.6471	11.2317	14.7367	16.6450	18.3357 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-16.0908	-23.5607	-35.1586	-41.0999	-45.7067	-43.2054	-42.7306	-39.6940	-34.5073	-27.6979	-18.0183	-13.8149 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-6.5847	-14.0881	-28.4357	-43.3338	-57.8889	-58.3458	-57.6058	-48.4527	-35.1298	-20.2903	-8.8411	-5.1854 (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	1166.5988 (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	2329.1947 (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)	143.9781 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-765.4673 (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	2960.3043 (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	1166.5988	0.2100	244.9857	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2329.1947	0.2100	489.1309	(264)
Space and water heating			734.1166	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	143.9781	0.1443	20.7805	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-381.2851	0.1338	-51.0052	
PV Unit electricity exported	-384.1822	0.1255	-48.2118	
Total			-99.2171	(269)
Total CO2, kg/year			667.6093	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.3700	(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	1166.5988	1.1300	1318.2566	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2329.1947	1.1300	2631.9900	(278)
Space and water heating			3950.2466	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	143.9781	1.5338	220.8384	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-381.2851	1.4944	-569.7741	
PV Unit electricity exported	-384.1822	0.4606	-176.9639	
Total			-746.7380	(283)
Total Primary energy kWh/year			3554.4479	(286)
Target Primary Energy Rate (TPER)			76.5100	(287)

Full SAP Calculation Printout

Property Reference	Flat 3 Block A	**Issued on Date**	13/03/2024
Assessment Reference	Design stage for ES condition	**Prop Type Ref**	
Property	Flat 3 Block A, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	87 B	**DER**	0.78	**TER**	14.37
Environmental	100 A	**% DER < TER**			94.57
CO_2 Emissions (t/year)	0.02	**DFEE**	29.19	**TFEE**	31.08
Compliance Check	See BREL	**% DFEE < TFEE**			6.09
% DPER < TPER	75.16	**DPER**	19.00	**TPER**	76.51

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	46.4600 (1b)	x	2.4900 (2b)	=	115.6854	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	115.6854	(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	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) =	0.1729	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3229	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2502	(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	0.3190	0.3128	0.3065	0.2753	0.2690	0.2377	0.2377	0.2315	0.2502	0.2690	0.2815	0.2940	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

Effective ac	0.5509	0.5489	0.5470	0.5379	0.5362	0.5283	0.5283	0.5268	0.5313	0.5362	0.5396	0.5432	(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	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			3.3000	1.1450	3.7786			(27)
exposed upper			2.5600	0.1300	0.3328	20.0000	51.2000	(28b)
over commercial			43.9000	0.1300	5.7070	20.0000	878.0000	(28b)
External Wall 1	12.7000	3.3000	9.4000	0.1300	1.2220	70.0000	658.0000	(29a)
sheltered	16.9300	2.1000	14.8300	0.1300	1.9279	70.0000	1038.1000	(29a)
Total net area of external elements Aum(A, m2)			76.0900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.9083			(33)
Party Wall 1			20.6600	0.0000	0.0000	180.0000	3718.8000	(32)
Party Wall 2 to existing			24.1500	0.0000	0.0000	180.0000	4347.0000	(32)
Party Ceiling 1			62.8800			30.0000	1886.4000	(32b)
Internal Wall 1			17.9200			9.0000	161.2800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12738.7800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	274.1881 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	2.9400	0.0600	0.1764

E3 Sill	1.9400	0.0400	0.0776	
E4 Jamb	11.0000	0.0200	0.2200	
E7 Party floor between dwellings (in blocks of flats)	9.7000	0.0000	0.0000	
E20 Exposed floor (normal)	4.8000	0.3200	1.5360	
E21 Exposed floor (inverted)	4.2000	0.3200	1.3440	
E7 Party floor between dwellings (in blocks of flats)	13.6000	0.2000	2.7200	
E18 Party wall between dwellings	4.9800	0.2400	1.1952	
E18 Party wall between dwellings	4.9800	0.2400	1.1952	
E16 Corner (normal)	2.4900	0.1800	0.4482	
E17 Corner (inverted - internal area greater than external area)	2.4900	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	31.9000	0.0000	0.0000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.9126 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.8209 (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	21.0311	20.9557	20.8817	20.5343	20.4693	20.1668	20.1668	20.1108	20.2833	20.4693	20.6008	20.7383	(38)
Heat transfer coeff	45.8520	45.7766	45.7026	45.3553	45.2903	44.9877	44.9877	44.9317	45.1043	45.2903	45.4217	45.5592	(39)

Average = Sum(39)m / 12 = 45.3549

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9869	0.9853	0.9837	0.9762	0.9748	0.9683	0.9683	0.9671	0.9708	0.9748	0.9777	0.9806	(40)
HLP (average)												0.9762	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.5866 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.9783	21.6519	21.1923	20.3448	19.7102	19.0065	18.6264	19.0828	19.5798	20.3328	21.1977	21.9040	(42b)

Hot water usage for other uses

30.8787	29.7558	28.6329	27.5101	26.3872	25.2644	25.2644	26.3872	27.5101	28.6329	29.7558	30.8787	(42c)

Average daily hot water use (litres/day) 48.4489 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	52.8570	51.4077	49.8252	47.8548	46.0974	44.2708	43.8907	45.4700	47.0899	48.9657	50.9535	52.7827	(44)
Energy conte	83.7126	73.2039	76.5795	65.5109	62.0559	54.4362	53.0820	56.3014	58.0665	66.4460	72.5926	82.6450	(45)

Energy content (annual) Total = Sum(45)m = 804.6325

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

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 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

71.1557	62.2233	65.0926	55.6843	52.7475	46.2707	45.1197	47.8562	49.3565	56.4791	61.7037	70.2482	(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

71.1557	62.2233	65.0926	55.6843	52.7475	46.2707	45.1197	47.8562	49.3565	56.4791	61.7037	70.2482	(64)

Total per year (kWh/year) = Sum(64)m = 683.9376 (64)

12Total per year (kWh/year) 684 (64)

Electric shower(s)

40.6999	36.2640	39.5989	37.7887	38.4978	36.7232	37.9473	38.4978	37.7887	39.5989	38.8543	40.6999	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 462.9595 (64a)

Heat gains from water heating, kWh/month

27.9639	24.6218	26.1729	23.3682	22.8113	20.7485	20.7668	21.5885	21.7863	24.0195	25.1395	27.7370	(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	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	85.8594	95.0586	85.8594	88.7214	85.8594	88.7214	85.8594	85.8594	88.7214	85.8594	88.7214	85.8594	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	138.0513	139.4839	135.8739	128.1887	118.4876	109.3699	103.2787	101.8461	105.4561	113.1413	122.8424	131.9601	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)
Water heating gains (Table 5)	37.5859	36.6396	35.1786	32.4559	30.6604	28.8173	27.9123	29.0168	30.2588	32.2843	34.9160	37.2810	(72)
Total internal gains	308.2960	317.9815	303.7113	296.1654	281.8068	273.7080	263.8498	263.5218	271.2357	278.0843	293.2792	301.8999	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	3.3000	46.7521	0.7200	0.7000	0.7700	53.8863	(78)

Solar gains	53.8863	88.2519	112.4173	127.0559	132.4001	127.4171	124.4943	120.9012	117.4331	95.1880	63.8737	46.5627	(83)
Total gains	362.1823	406.2334	416.1286	423.2213	414.2069	401.1251	388.3441	384.4229	388.6688	373.2723	357.1528	348.4626	(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	77.1732	77.3004	77.4255	78.0185	78.1305	78.6559	78.6559	78.7540	78.4527	78.1305	77.9043	77.6693	
alpha	6.1449	6.1534	6.1617	6.2012	6.2087	6.2437	6.2437	6.2503	6.2302	6.2087	6.1936	6.1780	
util living area	0.9947	0.9883	0.9781	0.9460	0.8684	0.6897	0.5060	0.5325	0.7507	0.9398	0.9870	0.9958	(86)
MIT	20.1063	20.2603	20.4361	20.6722	20.8641	20.9751	20.9968	20.9956	20.9571	20.7344	20.3844	20.0767	(87)
Th 2	20.0943	20.0956	20.0969	20.1032	20.1044	20.1098	20.1098	20.1108	20.1077	20.1044	20.1020	20.0995	(88)
util rest of house	0.9929	0.9845	0.9704	0.9265	0.8224	0.6059	0.4057	0.4324	0.6731	0.9146	0.9820	0.9943	(89)
MIT 2	19.2906	19.4437	19.6170	19.8470	20.0160	20.0991	20.1091	20.1097	20.0870	19.9077	19.5725	19.2657	(90)
Living area fraction										fLA = Living area / (4) =		0.8717	(91)
MIT	20.0016	20.1555	20.3310	20.5664	20.7553	20.8627	20.8829	20.8819	20.8454	20.6284	20.2802	19.9727	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0016	20.1555	20.3310	20.5664	20.7553	20.8627	20.8829	20.8819	20.8454	20.6284	20.2802	19.9727	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9927	0.9848	0.9726	0.9374	0.8570	0.6774	0.4930	0.5194	0.7382	0.9304	0.9831	0.9941	(94)
Useful gains	359.5219	400.0461	404.7418	396.7073	354.9631	271.7323	191.4497	199.6798	286.9281	347.2868	351.1289	346.3994	(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	719.9516	698.3459	632.1143	529.1314	410.1185	281.7450	192.6781	201.3811	304.2485	454.1877	598.6695	718.5915	(97)
Space heating kWh	268.1597	200.4575	169.1651	95.3453	41.0357	0.0000	0.0000	0.0000	0.0000	79.5343	178.2292	276.9109	(98a)
Space heating requirement - total per year (kWh/year)												1308.8377	
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	268.1597	200.4575	169.1651	95.3453	41.0357	0.0000	0.0000	0.0000	0.0000	79.5343	178.2292	276.9109	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1308.8377	
Space heating per m2											(98c) / (4) =	28.1713	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	422.8846	332.9091	341.4809	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8654	0.9365	0.9279	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	365.9762	311.7534	316.8733	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	426.3363	413.5287	410.7293	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	43.4593	75.7208	69.8288	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	10.8648	18.9302	17.4572	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												47.2522	(107)
Energy for space heating												28.1713	(99)
Energy for space cooling												1.0171	(108)
Total												29.1883	(109)
Fabric Energy Efficiency (DFEE)												29.2	(109)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		46.4600 (1b)	x	2.4900 (2b)	=	115.6854	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	115.6854	(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) =	0.1729	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4229	(18)
Number of sides sheltered	3	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3277	(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	0.4179	0.4097	0.4015	0.3605	0.3523	0.3113	0.3113	0.3032	0.3277	0.3523	0.3687	0.3851	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5873	0.5839	0.5806	0.5650	0.5621	0.5485	0.5485	0.5460	0.5537	0.5621	0.5680	0.5741	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			3.3000	1.1450	3.7786			(27)
exposed upper			2.5600	0.1300	0.3328			(28b)
over commercial			43.9000	0.1300	5.7070			(28b)
External Wall 1	12.7000	3.3000	9.4000	0.1800	1.6920			(29a)
sheltered	16.9300	2.1000	14.8300	0.1800	2.6694			(29a)
Total net area of external elements Aum(A, m2)			76.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.2798			(33)
Party Wall 1			20.6600	0.0000	0.0000			(32)
Party Wall 2 to existing			24.1500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	274.1881	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	2.9400	0.0500	0.1470
E3 Sill	1.9400	0.0500	0.0970
E4 Jamb	11.0000	0.0500	0.5500
E7 Party floor between dwellings (in blocks of flats)	9.7000	0.0700	0.6790
E20 Exposed floor (normal)	4.8000	0.3200	1.5360
E21 Exposed floor (inverted)	4.2000	0.3200	1.3440
E7 Party floor between dwellings (in blocks of flats)	13.6000	0.0700	0.9520
E18 Party wall between dwellings	4.9800	0.0600	0.2988
E18 Party wall between dwellings	4.9800	0.0600	0.2988
E16 Corner (normal)	2.4900	0.0900	0.2241
E17 Corner (inverted - internal area greater than external area)	2.4900	-0.0900	-0.2241
E7 Party floor between dwellings (in blocks of flats)	31.9000	0.0700	2.2330

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.1356	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	24.4154	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.4210	22.2916	22.1647	21.5689	21.4574	20.9384	20.9384	20.8423	21.1383	21.4574	21.6829	21.9187	(38)
Heat transfer coeff	46.8364	46.7070	46.5802	45.9843	45.8728	45.3539	45.3539	45.2578	45.5538	45.8728	46.0984	46.3341	(39)
Average = Sum(39)m / 12 =												45.9838	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0081	1.0053	1.0026	0.9898	0.9874	0.9762	0.9762	0.9741	0.9805	0.9874	0.9922	0.9973	(40)
HLP (average)												0.9897	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.5866	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.9783	21.6519	21.1923	20.3448	19.7102	19.0065	18.6264	19.0828	19.5798	20.3328	21.1977	21.9040	(42b)

Hot water usage for other uses

30.8787	29.7558	28.6329	27.5101	26.3872	25.2644	25.2644	26.3872	27.5101	28.6329	29.7558	30.8787	(42c)

Average daily hot water use (litres/day)	48.4489	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	52.8570	51.4077	49.8252	47.8548	46.0974	44.2708	43.8907	45.4700	47.0899	48.9657	50.9535	52.7827	(44)
Energy conte	83.7126	73.2039	76.5795	65.5109	62.0559	54.4362	53.0820	56.3014	58.0665	66.4460	72.5926	82.6450	(45)

Energy content (annual) Total = Sum(45)m =	804.6325	

Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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	71.1557	62.2233	65.0926	55.6843	52.7475	46.2707	45.1197	47.8562	49.3565	56.4791	61.7037	70.2482	(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	71.1557	62.2233	65.0926	55.6843	52.7475	46.2707	45.1197	47.8562	49.3565	56.4791	61.7037	70.2482	(64)

Total per year (kWh/year) = Sum(64)m =	683.9376	(64)
12Total per year (kWh/year)	684	(64)

Electric shower(s)

	40.6999	36.2640	39.5989	37.7887	38.4978	36.7232	37.9473	38.4978	37.7887	39.5989	38.8543	40.6999	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	462.9595	(64a)

Heat gains from water heating, kWh/month

	27.9639	24.6218	26.1729	23.3682	22.8113	20.7485	20.7668	21.5885	21.7863	24.0195	25.1395	27.7370 (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	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	(66)

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

	85.8594	95.0586	85.8594	88.7214	85.8594	88.7214	85.8594	85.8594	88.7214	85.8594	88.7214	85.8594	(67)

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

	138.0513	139.4839	135.8739	128.1887	118.4876	109.3699	103.2787	101.8461	105.4561	113.1413	122.8424	131.9601	(68)

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

	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

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

	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)

Water heating gains (Table 5)

	37.5859	36.6396	35.1786	32.4559	30.6604	28.8173	27.9123	29.0168	30.2588	32.2843	34.9160	37.2810	(72)

Total internal gains

	308.2960	317.9815	303.7113	296.1654	281.8068	273.7080	263.8498	263.5218	271.2357	278.0843	293.2792	301.8999	(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	
South	3.3000	46.7521	0.6300	0.7000	0.7700	47.1505	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	47.1505	77.2204	98.3651	111.1739	115.8501	111.4900	108.9325	105.7885	102.7540	83.2895	55.8895	40.7424	(83)
Total gains	355.4466	395.2019	402.0764	407.3393	397.6569	385.1980	372.7823	369.3103	373.9896	361.3738	349.1686	342.6423	(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	75.5512	75.7606	75.9669	76.9512	77.1383	78.0209	78.0209	78.1866	77.6785	77.1383	76.7609	76.3703	
alpha	6.0367	6.0507	6.0645	6.1301	6.1426	6.2014	6.2014	6.2124	6.1786	6.1426	6.1174	6.0914	
util living area	0.9953	0.9902	0.9821	0.9556	0.8883	0.7166	0.5301	0.5566	0.7762	0.9489	0.9888	0.9962	(86)
MIT	20.0592	20.2076	20.3834	20.6317	20.8383	20.9686	20.9957	20.9942	20.9470	20.7043	20.3492	20.0384	(87)
Th 2	20.0766	20.0789	20.0812	20.0919	20.0939	20.1032	20.1032	20.1050	20.0996	20.0939	20.0898	20.0856	(88)
util rest of house	0.9937	0.9869	0.9757	0.9387	0.8458	0.6318	0.4250	0.4522	0.6991	0.9265	0.9843	0.9949	(89)
MIT 2	19.2295	19.3782	19.5529	19.8005	19.9865	20.0895	20.1022	20.1035	20.0735	19.8720	19.5280	19.2162	(90)
Living area fraction									fLA = Living area / (4) =			0.8717	(91)
MIT	19.9528	20.1012	20.2768	20.5251	20.7290	20.8558	20.8811	20.8799	20.8349	20.5975	20.2439	19.9329	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9528	20.1012	20.2768	20.5251	20.7290	20.8558	20.8811	20.8799	20.8349	20.5975	20.2439	19.9329	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9934	0.9870	0.9772	0.9475	0.8769	0.7038	0.5164	0.5430	0.7632	0.9400	0.9852	0.9946	(94)
Useful gains	353.1162	390.0605	392.9253	385.9396	348.6982	271.1066	192.5199	200.5182	285.4274	339.6936	343.9871	340.8058	(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	733.1210	710.0029	641.7268	534.5718	414.1872	283.7251	194.1636	202.7520	306.8004	458.6158	605.9104	728.9696	(97)
Space heating kWh	282.7236	215.0013	185.1083	107.0152	48.7238	0.0000	0.0000	0.0000	0.0000	88.4781	188.5848	288.7939	(98a)
Space heating requirement - total per year (kWh/year)												1404.4290	
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	282.7236	215.0013	185.1083	107.0152	48.7238	0.0000	0.0000	0.0000	0.0000	88.4781	188.5848	288.7939	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1404.4290	
Space heating per m2											(98c) / (4) =	30.2288	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	426.3263	335.6186	343.9590	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8412	0.9210	0.9118	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	358.6268	309.1033	313.6145	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	407.7202	395.3396	393.0651	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	35.3473	64.1598	59.1113	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	8.8368	16.0399	14.7778	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												39.6546	(107)
Energy for space heating												30.2288	(99)
Energy for space cooling												0.8535	(108)
Total												31.0823	(109)
Fabric Energy Efficiency (TFEE)												31.1	(109)

Full SAP Calculation Printout

Property Reference	Flat 3 Block A	**Issued on Date**	13/03/2024
Assessment Reference	Design stage for ES condition	**Prop Type Ref**	
Property	Flat 3 Block A, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	87 B	**DER**	0.78	**TER**	14.37
Environmental	100 A	**% DER < TER**			94.57
CO_2 Emissions (t/year)	0.02	**DFEE**	29.19	**TFEE**	31.08
Compliance Check	See BREL	**% DFEE < TFEE**			6.09
% DPER < TPER	75.16	**DPER**	19.00	**TPER**	76.51

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	46.4600	(1b)	x 2.4900	(2b) =	115.6854	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	115.6854	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(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) =	81.0000	(23c)

Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			3.3000	1.1450	3.7786			(27)
exposed upper			2.5600	0.1300	0.3328	20.0000	51.2000	(28b)
over commercial			43.9000	0.1300	5.7070	20.0000	878.0000	(28b)
External Wall 1	12.7000	3.3000	9.4000	0.1300	1.2220	70.0000	658.0000	(29a)
sheltered	16.9300	2.1000	14.8300	0.1300	1.9279	70.0000	1038.1000	(29a)
Total net area of external elements Aum(A, m2)			76.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.9083			(33)
Party Wall 1			20.6600	0.0000	0.0000	180.0000	3718.8000	(32)
Party Wall 2 to existing			24.1500	0.0000	0.0000	180.0000	4347.0000	(32)
Party Ceiling 1			62.8800			20.0000	1257.6000	(32b)
Internal Wall 1			17.9200			9.0000	161.2800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12109.9800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	260.6539	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	2.9400	0.0600	0.1764
E3 Sill	1.9400	0.0400	0.0776
E4 Jamb	11.0000	0.0200	0.2200
E7 Party floor between dwellings (in blocks of flats)	9.7000	0.0000	0.0000
E20 Exposed floor (normal)	4.8000	0.3200	1.5360
E21 Exposed floor (inverted)	4.2000	0.3200	1.3440
E7 Party floor between dwellings (in blocks of flats)	13.6000	0.2000	2.7200
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E16 Corner (normal)	2.4900	0.1800	0.4482
E17 Corner (inverted - internal area greater than external area)	2.4900	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	31.9000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.9126 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.8209 (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	9.2852	9.1742	9.0633	8.5085	8.3976	7.8428	7.8428	7.7319	8.0647	8.3976	8.6195	8.8414	(38)
Heat transfer coeff	34.1061	33.9951	33.8842	33.3294	33.2185	32.6637	32.6637	32.5528	32.8856	33.2185	33.4404	33.6623	(39)

Average = Sum(39)m / 12 = 33.3017

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7341	0.7317	0.7293	0.7174	0.7150	0.7031	0.7031	0.7007	0.7078	0.7150	0.7198	0.7245	(40)
HLP (average)												0.7168	
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 1.5866 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	76.2330	75.0873	73.4179	70.2238	67.8666	65.2379	63.7438	65.4006	67.2167	70.0391	73.3018	75.9409	(42a)
Hot water usage for baths	21.9783	21.6519	21.1923	20.3448	19.7102	19.0065	18.6264	19.0828	19.5798	20.3328	21.1977	21.9040	(42b)
Hot water usage for other uses	30.8787	29.7558	28.6329	27.5101	26.3872	25.2644	25.2644	26.3872	27.5101	28.6329	29.7558	30.8787	(42c)

Average daily hot water use (litres/day) 118.7332 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.0900	126.4951	123.2432	118.0787	113.9640	109.5088	107.6345	110.8706	114.3066	119.0048	124.2554	128.7236	(44)
Energy conte	204.4470	180.1273	189.4201	161.6438	153.4175	134.6538	130.1746	137.2809	140.9514	161.4884	177.0246	201.5501	(45)

Energy content (annual) Total = Sum(45)m = 1972.1795

Distribution loss (46)m = 0.15 x (45)m	30.6670	27.0191	28.4130	24.2466	23.0126	20.1981	19.5262	20.5921	21.1427	24.2233	26.5537	30.2325	(46)

Water storage loss:

Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.0000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.5400 (55)

Total storage loss	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(56)
If cylinder contains dedicated solar storage	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(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	244.4494	216.2585	229.4225	200.3558	193.4199	173.3658	170.1770	177.2833	179.6634	201.4908	215.7366	241.5525	(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	244.4494	216.2585	229.4225	200.3558	193.4199	173.3658	170.1770	177.2833	179.6634	201.4908	215.7366	241.5525	(64)

Total per year (kWh/year) = Sum(64)m = 2443.1755 (64)

12Total per year (kWh/year) 2443 (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	99.9805	88.7973	94.9841	84.7162	83.0132	75.7420	75.2850	77.6478	77.8359	85.6968	89.8303	99.0173	(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	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	85.8594	95.0586	85.8594	88.7214	85.8594	88.7214	85.8594	85.8594	88.7214	85.8594	88.7214	85.8594	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	138.0513	139.4839	135.8739	128.1887	118.4876	109.3699	103.2787	101.8461	105.4561	113.1413	122.8424	131.9601	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)
Water heating gains (Table 5)	134.3824	132.1388	127.6668	117.6613	111.5769	105.1972	101.1895	104.3654	108.1055	115.1839	124.7643	133.0878	(72)
Total internal gains	405.0926	413.4807	396.1995	381.3709	362.7233	350.0879	337.1270	338.8703	349.0824	360.9840	383.1275	397.7067	(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	
South	3.3000	46.7521	0.7200	0.7000	0.7700	53.8863	(78)

Solar gains	53.8863	88.2519	112.4173	127.0559	132.4001	127.4171	124.4943	120.9012	117.4331	95.1880	63.8737	46.5627	(83)
Total gains	458.9789	501.7326	508.6168	508.4268	495.1234	477.5050	461.6213	459.7715	466.5155	456.1719	447.0011	444.2695	(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	98.6300	98.9519	99.2759	100.9283	101.2654	102.9852	102.9852	103.3362	102.2903	101.2654	100.5934	99.9303	
alpha	7.5753	7.5968	7.6184	7.7286	7.7510	7.8657	7.8657	7.8891	7.8194	7.7510	7.7062	7.6620	
util living area													
	0.9551	0.9183	0.8681	0.7617	0.6178	0.4374	0.3113	0.3257	0.4855	0.7340	0.9017	0.9615	(86)
Living	20.6840	20.7914	20.8800	20.9612	20.9926	20.9996	21.0000	21.0000	20.9990	20.9742	20.8508	20.6661	
Non living	20.0400	20.1407	20.2215	20.2986	20.3234	20.3380	20.3381	20.3402	20.3335	20.3111	20.2058	20.0309	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.8383	20.7914	20.8800	20.9612	20.9926	20.9996	21.0000	21.0000	20.9990	20.9742	20.8508	20.7128	(87)
Th 2	20.3108	20.3129	20.3150	20.3255	20.3276	20.3381	20.3381	20.3402	20.3339	20.3276	20.3234	20.3192	(88)
util rest of house													
	0.9448	0.9019	0.8441	0.7271	0.5753	0.3924	0.2645	0.2790	0.4390	0.6934	0.8803	0.9524	(89)
MIT 2	20.1723	20.1407	20.2215	20.2986	20.3234	20.3380	20.3381	20.3402	20.3335	20.3111	20.2058	20.0712	(90)
Living area fraction									fLA = Living area / (4) =			0.8717	(91)
MIT	20.7529	20.7079	20.7955	20.8762	20.9068	20.9147	20.9151	20.9153	20.9136	20.8892	20.7681	20.6305	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.7529	20.7079	20.7955	20.8762	20.9068	20.9147	20.9151	20.9153	20.9136	20.8892	20.7681	20.6305	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9516	0.9117	0.8613	0.7555	0.6120	0.4316	0.3053	0.3197	0.4795	0.7275	0.8947	0.9568	(94)
Useful gains	436.7866	457.4052	438.0593	384.1195	302.9995	206.1026	140.9378	146.9744	223.6931	331.8491	399.9522	425.0801	(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													
	561.1441	537.3915	484.3917	399.1613	305.8351	206.2617	140.9464	146.9867	224.0702	341.7904	457.0652	553.0891	(97)
Space heating kWh													
	92.5220	53.7508	34.4713	10.8301	2.1097	0.0000	0.0000	0.0000	0.0000	7.3964	41.1214	95.2387	(98a)
Space heating requirement - total per year (kWh/year)												337.4404	
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													
	92.5220	53.7508	34.4713	10.8301	2.1097	0.0000	0.0000	0.0000	0.0000	7.3964	41.1214	95.2387	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												337.4404	
Space heating per m2											(98c) / (4) =	7.2630	(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 %)	260.7193	(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													
	92.5220	53.7508	34.4713	10.8301	2.1097	0.0000	0.0000	0.0000	0.0000	7.3964	41.1214	95.2387	(98)
Space heating efficiency (main heating system 1)													
	260.7193	260.7193	260.7193	260.7193	0.0000	0.0000	0.0000	0.0000	260.7193	260.7193	260.7193	260.7193	(210)
Space heating fuel (main heating system)													
	35.4872	20.6164	13.2216	4.1539	0.8092	0.0000	0.0000	0.0000	0.0000	2.8369	15.7723	36.5292	(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													
	244.4494	216.2585	229.4225	200.3558	193.4199	173.3658	170.1770	177.2833	179.6634	201.4908	215.7366	241.5525	(64)
Efficiency of water heater												267.7594	(216)
(217)m	267.7594	267.7594	267.7594	267.7594	267.7594	267.7594	267.7594	267.7594	267.7594	267.7594	267.7594	267.7594	(217)
Fuel for water heating, kWh/month													
	91.2944	80.7660	85.6823	74.8268	72.2364	64.7468	63.5559	66.2099	67.0988	75.2507	80.5710	90.2125	(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	7.2521	6.5503	7.2521	7.0181	7.2521	7.0181	7.2521	7.2521	7.0181	7.2521	7.0181	7.2521	(231)
Lighting	22.6544	18.1742	16.3639	11.9889	9.2605	7.5659	8.4478	10.9807	14.2629	18.7137	21.1371	23.2840	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.4963	-30.3619	-50.9828	-64.0479	-73.5523	-70.1274	-68.8866	-62.7730	-51.3412	-37.1313	-21.4036	-15.3297	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.7998	-15.2158	-38.7258	-71.6001	-105.8648	-110.7366	-107.7271	-83.9378	-52.6556	-24.5434	-8.4390	-4.2941	(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												129.4267	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	267.7594	
Water heating fuel used	912.4517	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)		
mechanical ventilation fans (SFP = 0.6050)	85.3874	(230a)
Total electricity for the above, kWh/year	85.3874	(231)
Electricity for lighting (calculated in Appendix L)	182.8340	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1193.9737	(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	116.1261	(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	129.4267	0.1586	20.5285	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	912.4517	0.1410	128.6792	(264)
Space and water heating			149.2077	(265)
Pumps, fans and electric keep-hot	85.3874	0.1387	11.8443	(267)
Energy for lighting	182.8340	0.1443	26.3886	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-564.4339	0.1323	-74.6774	
PV Unit electricity exported	-629.5398	0.1212	-76.3226	
Total			-150.9999	(269)
Total CO2, kg/year			36.4407	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			0.7800	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	129.4267	1.5871	205.4154	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	912.4517	1.5215	1388.2668	(278)
Space and water heating			1593.6821	(279)
Pumps, fans and electric keep-hot	85.3874	1.5128	129.1740	(281)
Energy for lighting	182.8340	1.5338	280.4370	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-564.4339	1.4889	-840.3605	
PV Unit electricity exported	-629.5398	0.4448	-280.0175	
Total			-1120.3780	(283)
Total Primary energy kWh/year			882.9151	(286)
Dwelling Primary energy Rate (DPER)			19.0000	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	46.4600	(1b)	x 2.4900	(2b) =	115.6854	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 46.4600						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		115.6854	(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) =	0.1729	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4229	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3277 (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	0.4179	0.4097	0.4015	0.3605	0.3523	0.3113	0.3113	0.3032	0.3277	0.3523	0.3687	0.3851	(22b)
Effective ac	0.5873	0.5839	0.5806	0.5650	0.5621	0.5485	0.5485	0.5460	0.5537	0.5621	0.5680	0.5741	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			3.3000	1.1450	3.7786			(27)
exposed upper			2.5600	0.1300	0.3328			(28b)
over commercial			43.9000	0.1300	5.7070			(28b)
External Wall 1	12.7000	3.3000	9.4000	0.1800	1.6920			(29a)
sheltered	16.9300	2.1000	14.8300	0.1800	2.6694			(29a)
Total net area of external elements Aum(A, m2)			76.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.2798			(33)
Party Wall 1			20.6600	0.0000	0.0000			(32)
Party Wall 2 to existing			24.1500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 274.1881 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	2.9400	0.0500	0.1470
E3 Sill	1.9400	0.0500	0.0970
E4 Jamb	11.0000	0.0500	0.5500
E7 Party floor between dwellings (in blocks of flats)	9.7000	0.0700	0.6790
E20 Exposed floor (normal)	4.8000	0.3200	1.5360
E21 Exposed floor (inverted)	4.2000	0.3200	1.3440
E7 Party floor between dwellings (in blocks of flats)	13.6000	0.0700	0.9520
E18 Party wall between dwellings	4.9800	0.0600	0.2988
E18 Party wall between dwellings	4.9800	0.0600	0.2988
E16 Corner (normal)	2.4900	0.0900	0.2241
E17 Corner (inverted - internal area greater than external area)	2.4900	-0.0900	-0.2241
E7 Party floor between dwellings (in blocks of flats)	31.9000	0.0700	2.2330

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.1356 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 24.4154 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.4210	22.2916	22.1647	21.5689	21.4574	20.9384	20.9384	20.8423	21.1383	21.4574	21.6829	21.9187	(38)
Heat transfer coeff	46.8364	46.7070	46.5802	45.9843	45.8728	45.3539	45.3539	45.2578	45.5538	45.8728	46.0984	46.3341	(39)
Average = Sum(39)m / 12 =												45.9838	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0081	1.0053	1.0026	0.9898	0.9874	0.9762	0.9762	0.9741	0.9805	0.9874	0.9922	0.9973	(40)
HLP (average)												0.9897	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.5866 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
50.8220	50.0582	48.9453	46.8159	45.2444	43.4920	42.4958	43.6004	44.8111	46.6927	48.8679	50.6273	(42a)

Hot water usage for baths

21.9783	21.6519	21.1923	20.3448	19.7102	19.0065	18.6264	19.0828	19.5798	20.3328	21.1977	21.9040	(42b)

Hot water usage for other uses

30.8787	29.7558	28.6329	27.5101	26.3872	25.2644	25.2644	26.3872	27.5101	28.6329	29.7558	30.8787	(42c)

Average daily hot water use (litres/day) 95.3051 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.6790	101.4660	98.7705	94.6707	91.3418	87.7628	86.3866	89.0704	91.9010	95.6584	99.8214	103.4100	(44)
Energy conte	164.2022	144.4862	151.8066	129.5995	122.9636	107.9146	104.4771	110.2878	113.3231	129.8076	142.2139	161.9150	(45)
Energy content (annual)											Total = Sum(45)m =	1582.9972	
Distribution loss (46)m = 0.15 x (45)m	24.6303	21.6729	22.7710	19.4399	18.4445	16.1872	15.6716	16.5432	16.9985	19.4711	21.3321	24.2873	(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

210.7971	186.5719	198.4015	174.6913	169.5585	153.0064	151.0720	156.8827	158.4150	176.4025	187.3058	208.5099	(62)
WWHRS -23.2337	-20.5481	-21.5168	-17.8167	-16.6045	-14.2086	-13.3183	-14.1627	-14.7008	-17.3306	-19.6335	-22.8034	(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	187.5634	166.0238	176.8848	156.8746	152.9540	138.7978	137.7537	142.7200	143.7142	159.0719	167.6723	185.7065	(64)
										Total per year (kWh/year) = Sum(64)m =		1915.7368	(64)
12Total per year (kWh/year)												1916	(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

91.8731	81.7102	87.7516	79.1653	78.1613	71.9551	72.0146	73.9466	73.7534	80.4370	83.3596	91.1127	(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	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	85.8594	95.0586	85.8594	88.7214	85.8594	88.7214	85.8594	85.8594	88.7214	85.8594	88.7214	85.8594	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	138.0513	139.4839	135.8739	128.1887	118.4876	109.3699	103.2787	101.8461	105.4561	113.1413	122.8424	131.9601	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	(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)													
	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)
Water heating gains (Table 5)													
	123.4854	121.5926	117.9457	109.9518	105.0555	99.9376	96.7938	99.3906	102.4353	108.1142	115.7772	122.4633	(72)
Total internal gains													
	397.1955	405.9345	389.4784	376.6613	359.2019	344.8283	332.7313	333.8956	343.4122	356.9143	377.1404	390.0822	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	3.3000	46.7521	0.6300	0.7000	0.7700	47.1505	(78)

Solar gains	47.1505	77.2204	98.3651	111.1739	115.8501	111.4900	108.9325	105.7885	102.7540	83.2895	55.8895	40.7424	(83)
Total gains	444.3461	483.1549	487.8435	487.8353	475.0521	456.3182	441.6637	439.6841	446.1662	440.2037	433.0299	430.8246	(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	75.5512	75.7606	75.9669	76.9512	77.1383	78.0209	78.0209	78.1866	77.6785	77.1383	76.7609	76.3703	
alpha	6.0367	6.0507	6.0645	6.1301	6.1426	6.2014	6.2014	6.2124	6.1786	6.1426	6.1174	6.0914	
util living area													
	0.9855	0.9743	0.9571	0.9096	0.8098	0.6215	0.4500	0.4711	0.6785	0.8921	0.9686	0.9877	(86)
MIT	20.2440	20.3820	20.5417	20.7517	20.9076	20.9853	20.9982	20.9977	20.9744	20.8140	20.5126	20.2235	(87)
Th 2	20.4959	20.4973	20.4987	20.5051	20.5063	20.5119	20.5119	20.5129	20.5098	20.5063	20.5039	20.5014	(88)
util rest of house													
	0.9832	0.9703	0.9502	0.8952	0.7818	0.5784	0.4009	0.4222	0.6371	0.8733	0.9631	0.9857	(89)
MIT 2	19.7895	19.9267	20.0844	20.2916	20.4345	20.5027	20.5111	20.5118	20.4927	20.3520	20.0616	19.7738	(90)
Living area fraction									fLA = Living area / (4) =			0.8717	(91)
MIT	20.1857	20.3236	20.4830	20.6927	20.8469	20.9234	20.9357	20.9353	20.9126	20.7548	20.4547	20.1658	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1857	20.3236	20.4830	20.6927	20.8469	20.9234	20.9357	20.9353	20.9126	20.7548	20.4547	20.1658	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9816	0.9688	0.9500	0.9009	0.8015	0.6149	0.4436	0.4646	0.6713	0.8831	0.9625	0.9841	(94)
Useful gains	436.1603	468.0611	463.4583	439.4967	380.7315	280.5925	195.9188	204.2916	299.5122	388.7474	416.7749	423.9953	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	744.0285	720.3916	651.3302	542.2793	419.5959	286.7912	196.6430	205.2590	310.3396	465.8284	615.6301	739.7635	(97)
Space heating kWh													
	229.0539	169.5661	139.7766	74.0034	28.9151	0.0000	0.0000	0.0000	0.0000	57.3483	143.1757	234.9315	(98a)
Space heating requirement - total per year (kWh/year)												1076.7707	
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													
	229.0539	169.5661	139.7766	74.0034	28.9151	0.0000	0.0000	0.0000	0.0000	57.3483	143.1757	234.9315	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1076.7707	
Space heating per m2										(98c) / (4) =		23.1763	(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													
	229.0539	169.5661	139.7766	74.0034	28.9151	0.0000	0.0000	0.0000	0.0000	57.3483	143.1757	234.9315	(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)													
	248.1625	183.7119	151.4373	80.1770	31.3273	0.0000	0.0000	0.0000	0.0000	62.1325	155.1199	254.5303	(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													
	187.5634	166.0238	176.8848	156.8746	152.9540	138.7978	137.7537	142.7200	143.7142	159.0719	167.6723	185.7065	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.5090	84.1072	83.5372	82.4794	81.1069	79.8000	79.8000	79.8000	79.8000	82.0023	83.7077	84.5882	(217)
Fuel for water heating, kWh/month													

	221.9447	197.3956	211.7436	190.1984	188.5831	173.9321	172.6236	178.8471	180.0929	193.9847	200.3070	219.5418 (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	17.8399	14.3118	12.8862	9.4410	7.2925	5.9580	6.6525	8.6471	11.2317	14.7367	16.6450	18.3357 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-16.0908	-23.5607	-35.1586	-41.0999	-45.7067	-43.2054	-42.7306	-39.6940	-34.5073	-27.6979	-18.0183	-13.8149 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-6.5847	-14.0881	-28.4357	-43.3338	-57.8889	-58.3458	-57.6058	-48.4527	-35.1298	-20.2903	-8.8411	-5.1854 (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	1166.5988 (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	2329.1947 (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)	143.9781 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-765.4673 (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	2960.3043 (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	1166.5988	0.2100	244.9857	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2329.1947	0.2100	489.1309	(264)
Space and water heating			734.1166	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	143.9781	0.1443	20.7805	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-381.2851	0.1338	-51.0052	
PV Unit electricity exported	-384.1822	0.1255	-48.2118	
Total			-99.2171	(269)
Total CO2, kg/year			667.6093	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.3700	(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	1166.5988	1.1300	1318.2566	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2329.1947	1.1300	2631.9900	(278)
Space and water heating			3950.2466	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	143.9781	1.5338	220.8384	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-381.2851	1.4944	-569.7741	
PV Unit electricity exported	-384.1822	0.4606	-176.9639	
Total			-746.7380	(283)
Total Primary energy kWh/year			3554.4479	(286)
Target Primary Energy Rate (TPER)			76.5100	(287)

Full SAP Calculation Printout

Property Reference	Flat 4 Block A	**Issued on Date**	13/03/2024
Assessment Reference	Design stage for ES condition	**Prop Type Ref**	
Property	Flat 4 Block A, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	86 B	**DER**	0.52	**TER**	13.42
Environmental	100 A	**% DER < TER**			96.13
CO_2 Emissions (t/year)	0	**DFEE**	32.73	**TFEE**	35.12
Compliance Check	See BREL	**% DFEE < TFEE**			6.79
% DPER < TPER	76.99	**DPER**	16.32	**TPER**	70.94

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.8800	(1b)	x 2.5000	(2b) =	157.2000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		157.2000	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(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) =		81.0000 (23c)

Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316	(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	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			7.4900	1.1450	8.5763			(27)
exposed bin store			12.6000	0.1300	1.6380	20.0000	252.0000	(28b)
over commercial			50.2800	0.1300	6.5364	20.0000	1005.6000	(28b)
External Wall 1	55.2500	7.4900	47.7600	0.1300	6.2088	70.0000	3343.2000	(29a)
sheltered	9.7500	2.1000	7.6500	0.1300	0.9945	70.0000	535.5000	(29a)
Total net area of external elements Aum(A, m2)			127.8800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.8940			(33)
Party Wall 1			21.0000	0.0000	0.0000	180.0000	3780.0000	(32)
Party Ceiling 1			62.8800			20.0000	1257.6000	(32b)
Internal Wall 1			108.3400			9.0000	975.0600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11148.9600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		177.3053 (35)
List of Thermal Bridges		

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	5.6500	0.0600	0.3390	
E3 Sill	4.6500	0.0400	0.1860	
E4 Jamb	20.4000	0.0200	0.4080	
E7 Party floor between dwellings (in blocks of flats)	9.8000	0.0000	0.0000	
E20 Exposed floor (normal)	10.0000	0.3200	3.2000	
E21 Exposed floor (inverted)	4.8000	0.3200	1.5360	
E7 Party floor between dwellings (in blocks of flats)	12.6000	0.2000	2.5200	
E16 Corner (normal)	2.4900	0.0500	0.1245	
E18 Party wall between dwellings	4.9800	0.2400	1.1952	
E16 Corner (normal)	2.4900	0.1800	0.4482	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.4000	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.9569	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	36.8509	(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	12.6172	12.4665	12.3157	11.5619	11.4111	10.6573	10.6573	10.5065	10.9588	11.4111	11.7126	12.0142	(38)
Heat transfer coeff	49.4682	49.3174	49.1666	48.4128	48.2620	47.5082	47.5082	47.3574	47.8097	48.2620	48.5636	48.8651	(39)
Average = Sum(39)m / 12 =												48.3751	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7867	0.7843	0.7819	0.7699	0.7675	0.7555	0.7555	0.7531	0.7603	0.7675	0.7723	0.7771	(40)
HLP (average)												0.7693	
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											2.0618	(42)
Hot water usage for mixer showers	88.1834	86.8581	84.9270	81.2322	78.5055	75.4647	73.7363	75.6528	77.7537	81.0185	84.7927	87.8455	(42a)
Hot water usage for baths	25.4044	25.0271	24.4958	23.5162	22.7826	21.9692	21.5299	22.0575	22.6319	23.5023	24.5021	25.3185	(42b)
Hot water usage for other uses	35.7447	34.4449	33.1451	31.8453	30.5455	29.2457	29.2457	30.5455	31.8453	33.1451	34.4449	35.7447	(42c)
Average daily hot water use (litres/day)												137.3512	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.3325	146.3301	142.5679	136.5936	131.8336	126.6796	124.5119	128.2558	132.2309	137.6659	143.7397	148.9087	(44)
Energy conte	236.5061	208.3722	219.1216	186.9899	177.4734	155.7674	150.5864	158.8075	163.0539	186.8114	204.7836	233.1551	(45)
Energy content (annual)										Total = Sum(45)m =		2281.4282	
Distribution loss (46)m = 0.15 x (45)m	35.4759	31.2558	32.8682	28.0485	26.6210	23.3651	22.5880	23.8211	24.4581	28.0217	30.7175	34.9733	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.5400	(55)
Total storage loss	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(56)
If cylinder contains dedicated solar storage	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(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	276.5085	244.5034	259.1240	225.7019	217.4758	194.4794	190.5888	198.8099	201.7659	226.8138	243.4956	273.1575	(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	276.5085	244.5034	259.1240	225.7019	217.4758	194.4794	190.5888	198.8099	201.7659	226.8138	243.4956	273.1575	(64)
										Total per year (kWh/year) = Sum(64)m =		2752.4242	(64)
12Total per year (kWh/year)												2752	(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	110.6402	98.1887	104.8598	93.1437	91.0118	82.7623	82.0719	84.8054	85.1850	94.1167	99.0601	109.5260	(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	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	101.0207	111.8444	101.0207	104.3881	101.0207	104.3881	101.0207	101.0207	104.3881	101.0207	104.3881	101.0207	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.1476	182.0169	177.3062	167.2776	154.6182	142.7202	134.7716	132.9023	137.6130	147.6416	160.3010	172.1990	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)
Water heating gains (Table 5)	148.7100	146.1141	140.9406	129.3663	122.3277	114.9476	110.3117	113.9858	118.3125	126.5009	137.5835	147.2123	(72)
Total internal gains	483.8050	493.9022	473.1943	454.9587	431.8934	415.9826	400.0308	401.8355	414.2404	429.0900	456.1993	474.3587	(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	4.8900	10.6334	0.7200	0.7000	0.7700	18.1612	(74)
South	2.6000	46.7521	0.7200	0.7000	0.7700	42.4559	(78)

Solar gains	60.6171	104.2388	147.5468	194.8347	231.9252	236.9995	225.6295	196.4447	163.4309	116.3107	72.7289	51.8259	(83)
Total gains	544.4220	598.1409	620.7411	649.7933	663.8186	652.9821	625.6603	598.2802	577.6712	545.4007	528.9282	526.1846	(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	62.6046	62.7960	62.9885	63.9693	64.1691	65.1873	65.1873	65.3949	64.7762	64.1691	63.7707	63.3772	
alpha	5.1736	5.1864	5.1992	5.2646	5.2779	5.3458	5.3458	5.3597	5.3184	5.2779	5.2514	5.2251	
util living area	0.9573	0.9313	0.8907	0.7938	0.6458	0.4614	0.3335	0.3631	0.5582	0.8038	0.9231	0.9625	(86)
Living	20.2615	20.4258	20.6121	20.8298	20.9510	20.9933	20.9990	20.9985	20.9819	20.8454	20.5460	20.2365	
Non living	19.6043	19.7635	19.9411	20.1468	20.2484	20.2885	20.2917	20.2936	20.2777	20.1656	19.8897	19.5872	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.6222	20.4258	20.6121	20.8298	20.9510	20.9933	20.9990	20.9985	20.9819	20.8454	20.5460	20.3433	(87)
Th 2	20.2649	20.2670	20.2690	20.2795	20.2816	20.2920	20.2920	20.2941	20.2878	20.2816	20.2774	20.2732	(88)
util rest of house	0.9496	0.9197	0.8727	0.7639	0.6034	0.4119	0.2801	0.3079	0.5049	0.7694	0.9084	0.9556	(89)
MIT 2	19.9269	19.7635	19.9411	20.1468	20.2484	20.2885	20.2917	20.2936	20.2777	20.1656	19.8897	19.6831	(90)
Living area fraction									fLA = Living area / (4) =			0.3639	(91)
MIT	20.1799	20.0045	20.1853	20.3953	20.5040	20.5450	20.5491	20.5501	20.5339	20.4130	20.1285	19.9234	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1799	20.0045	20.1853	20.3953	20.5040	20.5450	20.5491	20.5501	20.5339	20.4130	20.1285	19.9234	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9486	0.9150	0.8705	0.7689	0.6168	0.4297	0.2995	0.3279	0.5236	0.7760	0.9050	0.9518	(94)
Useful gains	516.4422	547.2962	540.3592	499.6403	409.4471	280.6104	187.4030	196.1977	302.4718	423.2402	478.6673	500.8426	(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	785.5511	744.9139	672.8585	556.5209	424.9012	282.4352	187.6131	196.5363	307.6048	473.5943	632.7122	768.3235	(97)
Space heating kWh	200.2171	132.7991	98.5795	40.9540	11.4979	0.0000	0.0000	0.0000	0.0000	37.4635	110.9124	199.0058	(98a)
Space heating requirement - total per year (kWh/year)												831.4292	
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	200.2171	132.7991	98.5795	40.9540	11.4979	0.0000	0.0000	0.0000	0.0000	37.4635	110.9124	199.0058	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												831.4292	
Space heating per m2											(98c) / (4) =	13.2225	(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 %) 276.7307 (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	200.2171	132.7991	98.5795	40.9540	11.4979	0.0000	0.0000	0.0000	0.0000	37.4635	110.9124	199.0058	(98)
Space heating efficiency (main heating system 1)	276.7307	276.7307	276.7307	276.7307	276.7307	0.0000	0.0000	0.0000	0.0000	276.7307	276.7307	276.7307	(210)
Space heating fuel (main heating system)	72.3509	47.9886	35.6229	14.7992	4.1549	0.0000	0.0000	0.0000	0.0000	13.5379	40.0795	71.9132	(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	276.5085	244.5034	259.1240	225.7019	217.4758	194.4794	190.5888	198.8099	201.7659	226.8138	243.4956	273.1575	(64)
Efficiency of water heater												271.3270	(216)
(217)m	271.3270	271.3270	271.3270	271.3270	271.3270	271.3270	271.3270	271.3270	271.3270	271.3270	271.3270	271.3270	(217)
Fuel for water heating, kWh/month	101.9097	90.1139	95.5025	83.1845	80.1527	71.6771	70.2432	73.2732	74.3627	83.5943	89.7425	100.6746	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
(221)m	9.8545	8.9009	9.8545	9.5367	9.8545	9.5367	9.8545	9.8545	9.5367	9.8545	9.5367	9.8545	(231)
Pumps and Fa	26.3258	21.1196	19.0158	13.9318	10.7613	8.7921	9.8168	12.7603	16.5744	21.7465	24.5626	27.0575	(232)
Lighting													
Electricity generated by PVs (Appendix M) (negative quantity)	-24.9765	-40.8646	-68.2006	-84.5639	-95.6622	-90.4228	-88.7979	-81.2534	-66.9723	-49.4169	-28.8163	-20.6990	(233a)
(233a)m													
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
(234a)m													
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
(235a)m													
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
(235c)m													
Electricity generated by PVs (Appendix M) (negative quantity)	-7.9857	-20.9702	-53.5059	-99.4681	-147.7508	-154.9532	-150.8118	-117.7874	-74.1189	-34.2563	-11.6708	-5.9243	(233b)
(233b)m													
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
(234b)m													
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
(235b)m													
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
(235d)m													

Annual totals kWh/year

Space heating fuel - main system 1 300.4471 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 271.3270

Water heating fuel used	1014.4308	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)		
mechanical ventilation fans (SFP = 0.6050)	116.0293	(230a)
Total electricity for the above, kWh/year	116.0293	(231)
Electricity for lighting (calculated in Appendix L)	212.4646	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1619.8497	(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	23.5222	(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	300.4471	0.1571	47.2014	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1014.4308	0.1411	143.1239	(264)
Space and water heating			190.3253	(265)
Pumps, fans and electric keep-hot	116.0293	0.1387	16.0947	(267)
Energy for lighting	212.4646	0.1443	30.6652	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-740.6463	0.1326	-98.1884	
PV Unit electricity exported	-879.2034	0.1211	-106.4654	
Total			-204.6538	(269)
Total CO2, kg/year			32.4314	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			0.5200	(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	300.4471	1.5816	475.1834	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1014.4308	1.5217	1543.6608	(278)
Space and water heating			2018.8443	(279)
Pumps, fans and electric keep-hot	116.0293	1.5128	175.5292	(281)
Energy for lighting	212.4646	1.5338	325.8853	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-740.6463	1.4899	-1103.4587	
PV Unit electricity exported	-879.2034	0.4443	-390.5980	
Total			-1494.0568	(283)
Total Primary energy kWh/year			1026.2019	(286)
Dwelling Primary energy Rate (DPER)			16.3200	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		62.8800 (1b)	x	2.5000 (2b)	=	157.2000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	157.2000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	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) =	0.1272	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3772	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2924	(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													
	0.3727	0.3654	0.3581	0.3216	0.3143	0.2777	0.2777	0.2704	0.2924	0.3143	0.3289	0.3435	(22b)
Effective ac	0.5695	0.5668	0.5641	0.5517	0.5494	0.5386	0.5386	0.5366	0.5427	0.5494	0.5541	0.5590	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			7.4900	1.1450	8.5763			(27)
exposed bin store			12.6000	0.1300	1.6380			(28b)
over commercial			50.2800	0.1300	6.5364			(28b)
External Wall 1	55.2500	7.4900	47.7600	0.1800	8.5968			(29a)
sheltered	9.7500	2.1000	7.6500	0.1800	1.3770			(29a)
Total net area of external elements Aum(A, m2)			127.8800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.8245			(33)
Party Wall 1			21.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 187.3053 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6500	0.0500	0.2825
E3 Sill	4.6500	0.0500	0.2325
E4 Jamb	20.4000	0.0500	1.0200
E7 Party floor between dwellings (in blocks of flats)	9.8000	0.0700	0.6860
E20 Exposed floor (normal)	10.0000	0.3200	3.2000
E21 Exposed floor (inverted)	4.8000	0.3200	1.5360
E7 Party floor between dwellings (in blocks of flats)	12.6000	0.0700	0.8820
E16 Corner (normal)	2.4900	0.0900	0.2241
E18 Party wall between dwellings	4.9800	0.0600	0.2988
E16 Corner (normal)	2.4900	0.0900	0.2241
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.4000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.5860 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 37.4105 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.5418	29.4019	29.2647	28.6204	28.4999	27.9387	27.9387	27.8348	28.1549	28.4999	28.7438	28.9987	(38)
Heat transfer coeff	66.9524	66.8124	66.6753	66.0310	65.9104	65.3493	65.3493	65.2454	65.5654	65.9104	66.1543	66.4092	(39)
Average = Sum(39)m / 12 =												66.0304	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0648	1.0625	1.0604	1.0501	1.0482	1.0393	1.0393	1.0376	1.0427	1.0482	1.0521	1.0561	(40)
HLP (average)												1.0501	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0618 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	58.7889	57.9054	56.6180	54.1548	52.3370	50.3098	49.1576	50.4352	51.8358	54.0124	56.5285	58.5637	(42a)
Hot water usage for baths	25.4044	25.0271	24.4958	23.5162	22.7826	21.9692	21.5299	22.0575	22.6319	23.5023	24.5021	25.3185	(42b)
Hot water usage for other uses	35.7447	34.4449	33.1451	31.8453	30.5455	29.2457	29.2457	30.5455	31.8453	33.1451	34.4449	35.7447	(42c)
Average daily hot water use (litres/day)												110.2505	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	119.9380	117.3774	114.2589	109.5162	105.6651	101.5247	99.9331	103.0382	106.3130	110.6597	115.4755	119.6269	(44)
Energy conte	189.9525	167.1439	175.6117	149.9223	142.2455	124.8365	120.8605	127.5828	131.0946	150.1642	164.5160	187.3068	(45)
Energy content (annual)										Total = Sum(45)m =		1831.2372	
Distribution loss (46)m = 0.15 x (45)m	28.4929	25.0716	26.3418	22.4883	21.3368	18.7255	18.1291	19.1374	19.6642	22.5246	24.6774	28.0960	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	236.5474	209.2296	222.2066	195.0141	188.8404	169.9283	167.4554	174.1777	176.1864	196.7591	209.6078	233.9017	(62)
WWHRS	-26.8758	-23.7692	-24.8897	-20.6097	-19.2075	-16.4360	-15.4061	-16.3829	-17.0053	-20.0474	-22.7113	-26.3781	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	209.6716	185.4604	197.3168	174.4044	169.6329	153.4924	152.0492	157.7948	159.1811	176.7117	186.8966	207.5236	(64)
									Total per year (kWh/year) = Sum(64)m =			2130.1356	(64)
12Total per year (kWh/year)												2130	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	100.4351	89.2439	95.6668	85.9226	84.5726	77.5816	77.4620	79.6972	79.6624	87.2055	90.7750	99.5554	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	101.0207	111.8444	101.0207	104.3881	101.0207	104.3881	101.0207	101.0207	104.3881	101.0207	104.3881	101.0207	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	180.1476	182.0169	177.3062	167.2776	154.6182	142.7202	134.7716	132.9023	137.6130	147.6416	160.3010	172.1990	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)
Water heating gains (Table 5)													
	134.9934	132.8034	128.5844	119.3370	113.6728	107.7522	104.1156	107.1199	110.6422	117.2117	126.0764	133.8111	(72)
Total internal gains													
	473.0884	483.5915	463.8380	447.9293	426.2385	408.7873	393.8347	394.9696	406.5701	422.8008	447.6922	463.9575	(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	4.8900	10.6334	0.6300	0.7000	0.7700	15.8910	(74)
South	2.6000	46.7521	0.6300	0.7000	0.7700	37.1489	(78)

Solar gains	53.0399	91.2089	129.1035	170.4803	202.9346	207.3746	197.4258	171.8891	143.0020	101.7719	63.6378	45.3476	(83)
Total gains	526.1284	574.8004	592.9415	618.4097	629.1730	616.1618	591.2606	566.8587	549.5721	524.5727	511.3300	509.3051	(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	48.8646	48.9669	49.0677	49.5464	49.6371	50.0633	50.0633	50.1430	49.8982	49.6371	49.4541	49.2642	
alpha	4.2576	4.2645	4.2712	4.3031	4.3091	4.3376	4.3376	4.3429	4.3265	4.3091	4.2969	4.2843	
util living area	0.9782	0.9666	0.9481	0.8990	0.8009	0.6323	0.4751	0.5132	0.7260	0.9023	0.9627	0.9808	(86)
MIT	19.6915	19.8717	20.1218	20.4712	20.7626	20.9375	20.9856	20.9799	20.8836	20.5382	20.0707	19.6613	(87)
Th 2	20.0297	20.0315	20.0333	20.0418	20.0434	20.0507	20.0507	20.0521	20.0479	20.0434	20.0402	20.0368	(88)
util rest of house	0.9732	0.9591	0.9359	0.8745	0.7533	0.5542	0.3778	0.4146	0.6539	0.8739	0.9529	0.9764	(89)
MIT 2	18.5242	18.7518	19.0658	19.4977	19.8313	20.0095	20.0447	20.0430	19.9623	19.5853	19.0111	18.4911	(90)
Living area fraction									fLA = Living area / (4) =			0.3639	(91)
MIT	18.9490	19.1593	19.4501	19.8519	20.1702	20.3472	20.3871	20.3839	20.2975	19.9321	19.3966	18.9169	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9490	19.1593	19.4501	19.8519	20.1702	20.3472	20.3871	20.3839	20.2975	19.9321	19.3966	18.9169	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9660	0.9506	0.9270	0.8690	0.7602	0.5796	0.4129	0.4500	0.6741	0.8701	0.9448	0.9697	(94)
Useful gains	508.2495	546.3794	549.6659	537.3933	478.3000	357.1325	244.1589	255.0944	370.4865	456.4239	483.0855	493.8681	(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	980.7823	952.7003	863.4485	723.1679	558.2725	375.5730	247.4825	259.9323	406.3450	615.0798	813.4759	977.3398	(97)
Space heating kWh	351.5644	273.0477	233.4542	133.7577	59.4996	0.0000	0.0000	0.0000	0.0000	118.0399	237.8812	359.7029	(98a)
Space heating requirement - total per year (kWh/year)												1766.9475	
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	351.5644	273.0477	233.4542	133.7577	59.4996	0.0000	0.0000	0.0000	0.0000	118.0399	237.8812	359.7029	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1766.9475	
Space heating per m2											(98c) / (4) =	28.1003	(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	351.5644	273.0477	233.4542	133.7577	59.4996	0.0000	0.0000	0.0000	0.0000	118.0399	237.8812	359.7029	(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)	380.8932	295.8263	252.9298	144.9162	64.4632	0.0000	0.0000	0.0000	0.0000	127.8872	257.7261	389.7106	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	209.6716	185.4604	197.3168	174.4044	169.6329	153.4924	152.0492	157.7948	159.1811	176.7117	186.8966	207.5236	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.2098	84.9258	84.4379	83.4721	81.9570	79.8000	79.8000	79.8000	79.8000	83.1760	84.6018	85.2811	(217)
Fuel for water heating, kWh/month	246.0652	218.3794	233.6828	208.9375	206.9781	192.3463	190.5379	197.7379	199.4751	212.4553	220.9131	243.3405	(219)
Space cooling fuel requirement													

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	20.9901	16.8390	15.1617	11.1081	8.5802	7.0101	7.8272	10.1740	13.2151	17.3389	19.5842	21.5735	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.5109	-31.3628	-46.6025	-54.2280	-60.0693	-56.6639	-55.9959	-52.0977	-45.4534	-36.7079	-24.0242	-18.4802	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.1786	-19.5919	-39.4675	-60.0466	-80.1394	-80.7778	-79.8016	-67.2020	-48.7951	-28.2404	-12.3279	-7.2352	(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	1914.3527	(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	2570.8490	(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)	169.4022	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1036.0005	(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	3704.6033	(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	1914.3527	0.2100	402.0141	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2570.8490	0.2100	539.8783	(264)
Space and water heating			941.8923	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	169.4022	0.1443	24.4500	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-503.1966	0.1339	-67.3659	
PV Unit electricity exported	-532.8039	0.1255	-66.8807	
Total			-134.2467	(269)
Total CO2, kg/year			844.0249	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.4200	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1914.3527	1.1300	2163.2185	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2570.8490	1.1300	2905.0593	(278)
Space and water heating			5068.2779	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	169.4022	1.5338	259.8347	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-503.1966	1.4947	-752.1494	
PV Unit electricity exported	-532.8039	0.4607	-245.4893	
Total			-997.6387	(283)
Total Primary energy kWh/year			4460.5747	(286)
Target Primary Energy Rate (TPER)			70.9400	(287)

Full SAP Calculation Printout

Property Reference	Flat 4 Block A	**Issued on Date**	13/03/2024
Assessment Reference	Design stage for ES condition	**Prop Type Ref**	
Property	Flat 4 Block A, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	86 B	**DER**	0.52	**TER**	13.42
Environmental	100 A	**% DER < TER**			96.13
CO_2 Emissions (t/year)	0	**DFEE**	32.73	**TFEE**	35.12
Compliance Check	See BREL	**% DFEE < TFEE**			6.79
% DPER < TPER	76.99	**DPER**	16.32	**TPER**	70.94

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.8800	(1b)	x 2.5000	(2b) =	157.2000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	157.2000	(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	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) =	0.1272	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2772	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2149	(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	0.2739	0.2686	0.2632	0.2363	0.2310	0.2041	0.2041	0.1987	0.2149	0.2310	0.2417	0.2524	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

Effective ac	0.5375	0.5361	0.5346	0.5279	0.5267	0.5208	0.5208	0.5197	0.5231	0.5267	0.5292	0.5319	(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	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			7.4900	1.1450	8.5763			(27)
exposed bin store			12.6000	0.1300	1.6380	20.0000	252.0000	(28b)
over commercial			50.2800	0.1300	6.5364	20.0000	1005.6000	(28b)
External Wall 1	55.2500	7.4900	47.7600	0.1300	6.2088	70.0000	3343.2000	(29a)
sheltered	9.7500	2.1000	7.6500	0.1300	0.9945	70.0000	535.5000	(29a)
Total net area of external elements Aum(A, m2)			127.8800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.8940			(33)
Party Wall 1			21.0000	0.0000	0.0000	180.0000	3780.0000	(32)
Party Ceiling 1			62.8800			30.0000	1886.4000	(32b)
Internal Wall 1			108.3400			9.0000	975.0600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11777.7600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		187.3053 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6500	0.0600	0.3390
E3 Sill	4.6500	0.0400	0.1860

E4 Jamb	20.4000	0.0200	0.4080	
E7 Party floor between dwellings (in blocks of flats)	9.8000	0.0000	0.0000	
E20 Exposed floor (normal)	10.0000	0.3200	3.2000	
E21 Exposed floor (inverted)	4.8000	0.3200	1.5360	
E7 Party floor between dwellings (in blocks of flats)	12.6000	0.2000	2.5200	
E16 Corner (normal)	2.4900	0.0500	0.1245	
E18 Party wall between dwellings	4.9800	0.2400	1.1952	
E16 Corner (normal)	2.4900	0.1800	0.4482	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.4000	0.0000	0.0000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.9569 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.8509 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.8844	27.8088	27.7347	27.3868	27.3216	27.0186	27.0186	26.9625	27.1353	27.3216	27.4534	27.5910	(38)
Heat transfer coeff	64.7353	64.6597	64.5857	64.2377	64.1726	63.8695	63.8695	63.8134	63.9863	64.1726	64.3043	64.4420	(39)

Average = Sum(39)m / 12 = 64.2374

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0295	1.0283	1.0271	1.0216	1.0206	1.0157	1.0157	1.0148	1.0176	1.0206	1.0227	1.0248	(40)
HLP (average)												1.0216	
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 2.0618 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

25.4044	25.0271	24.4958	23.5162	22.7826	21.9692	21.5299	22.0575	22.6319	23.5023	24.5021	25.3185	(42b)

Hot water usage for other uses

35.7447	34.4449	33.1451	31.8453	30.5455	29.2457	29.2457	30.5455	31.8453	33.1451	34.4449	35.7447	(42c)

Average daily hot water use (litres/day) 56.0491 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	61.1491	59.4720	57.6409	55.3614	53.3281	51.2149	50.7756	52.6030	54.4772	56.6474	58.9470	61.0632	(44)
Energy conte	96.8452	84.6873	88.5919	75.7871	71.7899	62.9747	61.4087	65.1335	67.1759	76.8700	83.9808	95.6102	(45)
Energy content (annual)										Total = Sum(45)m =		930.8551	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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	82.3184	71.9842	75.3031	64.4190	61.0214	53.5285	52.1974	55.3635	57.0995	65.3395	71.3837	81.2687	(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	82.3184	71.9842	75.3031	64.4190	61.0214	53.5285	52.1974	55.3635	57.0995	65.3395	71.3837	81.2687	(64)
									Total per year (kWh/year) = Sum(64)m =			791.2268	(64)
12Total per year (kWh/year)												791	(64)
Electric shower(s)	47.0801	41.9488	45.8065	43.7125	44.5328	42.4800	43.8960	44.5328	43.7125	45.8065	44.9451	47.0801	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			535.5336	(64a)
Heat gains from water heating, kWh/month	32.3496	28.4833	30.2774	27.0329	26.3885	24.0021	24.0233	24.9741	25.2030	27.7865	29.0822	32.0872	(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	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	101.0207	111.8444	101.0207	104.3881	101.0207	104.3881	101.0207	101.0207	104.3881	101.0207	104.3881	101.0207	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.1476	182.0169	177.3062	167.2776	154.6182	142.7202	134.7716	132.9023	137.6130	147.6416	160.3010	172.1990	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)
Water heating gains (Table 5)	43.4807	42.3858	40.6954	37.5457	35.4685	33.3363	32.2894	33.5673	35.0042	37.3474	40.3919	43.1280	(72)
Total internal gains	378.5757	390.1738	372.9490	363.1380	345.0341	334.3713	322.0085	321.4170	330.9320	339.9365	359.0077	370.2744	(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	4.8900	10.6334	0.7200	0.7000	0.7700	18.1612	(74)
South	2.6000	46.7521	0.7200	0.7000	0.7700	42.4559	(78)

Solar gains	60.6171	104.2388	147.5468	194.8347	231.9252	236.9995	225.6295	196.4447	163.4309	116.3107	72.7289	51.8259	(83)
Total gains	439.1928	494.4126	520.4959	557.9727	576.9594	571.3708	547.6380	517.8617	494.3629	456.2472	431.7366	422.1002	(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	50.5381	50.5972	50.6552	50.9296	50.9813	51.2232	51.2232	51.2682	51.1297	50.9813	50.8769	50.7681	
alpha	4.3692	4.3731	4.3770	4.3953	4.3988	4.4149	4.4149	4.4179	4.4086	4.3988	4.3918	4.3845	
util living area	0.9883	0.9794	0.9645	0.9211	0.8283	0.6600	0.4997	0.5459	0.7663	0.9319	0.9784	0.9901	(86)
MIT	19.5855	19.7824	20.0497	20.4232	20.7395	20.9305	20.9838	20.9762	20.8626	20.4693	19.9678	19.5453	(87)
Th 2	20.0588	20.0598	20.0608	20.0654	20.0662	20.0702	20.0702	20.0710	20.0687	20.0662	20.0645	20.0627	(88)
util rest of house	0.9855	0.9745	0.9557	0.9007	0.7843	0.5824	0.4002	0.4448	0.6977	0.9102	0.9724	0.9877	(89)
MIT 2	18.7748	18.9699	19.2331	19.5953	19.8814	20.0338	20.0649	20.0624	19.9876	19.6452	19.1583	18.7380	(90)
Living area fraction										fLA = Living area / (4) =		0.3639	(91)
MIT	19.0698	19.2655	19.5302	19.8965	20.1936	20.3601	20.3992	20.3949	20.3060	19.9451	19.4528	19.0317	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0698	19.2655	19.5302	19.8965	20.1936	20.3601	20.3992	20.3949	20.3060	19.9451	19.4528	19.0317	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9817	0.9693	0.9496	0.8965	0.7909	0.6077	0.4362	0.4811	0.7166	0.9068	0.9674	0.9843	(94)
Useful gains	431.1370	479.2300	494.2736	500.2197	456.3071	347.2280	238.8930	249.1515	354.2597	413.7466	417.6669	415.4715	(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	956.1280	928.8710	841.5656	706.3915	545.0581	367.8918	242.6550	254.9282	397.0962	599.6965	794.3404	955.7852	(97)
Space heating kWh	390.5933	302.1587	258.3852	148.4437	66.0307	0.0000	0.0000	0.0000	0.0000	138.3468	271.2049	401.9934	(98a)
Space heating requirement - total per year (kWh/year)												1977.1567	
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	390.5933	302.1587	258.3852	148.4437	66.0307	0.0000	0.0000	0.0000	0.0000	138.3468	271.2049	401.9934	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1977.1567	
Space heating per m2											(98c) / (4) =	31.4433	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	600.3734	472.6344	484.9818	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8300	0.8967	0.8716	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	498.3096	423.8095	422.7171	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	622.8710	597.3828	564.6221	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	89.6842	129.1386	105.5773	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	22.4211	32.2846	26.3943	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												81.1000	(107)
Energy for space heating												31.4433	(99)
Energy for space cooling												1.2898	(108)
Total												32.7331	(109)
Fabric Energy Efficiency (DFEE)												32.7	(109)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.8800	(1b)	x 2.5000	(2b) =	157.2000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		157.2000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	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) =	0.1272 (8)

Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3772	(18)
Number of sides sheltered	3	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.2924	(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	0.3727	0.3654	0.3581	0.3216	0.3143	0.2777	0.2777	0.2704	0.2924	0.3143	0.3289	0.3435	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)
Effective ac	0.5590	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			7.4900	1.1450	8.5763			(27)
exposed bin store			12.6000	0.1300	1.6380			(28b)
over commercial			50.2800	0.1300	6.5364			(28b)
External Wall 1	55.2500	7.4900	47.7600	0.1800	8.5968			(29a)
sheltered	9.7500	2.1000	7.6500	0.1800	1.3770			(29a)
Total net area of external elements Aum(A, m2)			127.8800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.8245			(33)
Party Wall 1			21.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	187.3053	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6500	0.0500	0.2825
E3 Sill	4.6500	0.0500	0.2325
E4 Jamb	20.4000	0.0500	1.0200
E7 Party floor between dwellings (in blocks of flats)	9.8000	0.0700	0.6860
E20 Exposed floor (normal)	10.0000	0.3200	3.2000
E21 Exposed floor (inverted)	4.8000	0.3200	1.5360
E7 Party floor between dwellings (in blocks of flats)	12.6000	0.0700	0.8820
E16 Corner (normal)	2.4900	0.0900	0.2241
E18 Party wall between dwellings	4.9800	0.0600	0.2988
E16 Corner (normal)	2.4900	0.0900	0.2241
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.4000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.5860	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	37.4105	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.5418	29.4019	29.2647	28.6204	28.4999	27.9387	27.9387	27.8348	28.1549	28.4999	28.7438	28.9987	(38)
Heat transfer coeff	66.9524	66.8124	66.6753	66.0310	65.9104	65.3493	65.3493	65.2454	65.5654	65.9104	66.1543	66.4092	(39)
Average = Sum(39)m / 12 =												66.0304	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0648	1.0625	1.0604	1.0501	1.0482	1.0393	1.0393	1.0376	1.0427	1.0482	1.0521	1.0561	(40)
HLP (average)												1.0501	
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	2.0618	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

25.4044	25.0271	24.4958	23.5162	22.7826	21.9692	21.5299	22.0575	22.6319	23.5023	24.5021	25.3185	(42b)

Hot water usage for other uses

35.7447	34.4449	33.1451	31.8453	30.5455	29.2457	29.2457	30.5455	31.8453	33.1451	34.4449	35.7447	(42c)

Average daily hot water use (litres/day)	56.0491	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	61.1491	59.4720	57.6409	55.3614	53.3281	51.2149	50.7756	52.6030	54.4772	56.6474	58.9470	61.0632	(44)
Energy conte	96.8452	84.6873	88.5919	75.7871	71.7899	62.9747	61.4087	65.1335	67.1759	76.8700	83.9808	95.6102	(45)

Energy content (annual) Total = Sum(45)m =	930.8551	

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

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 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

82.3184	71.9842	75.3031	64.4190	61.0214	53.5285	52.1974	55.3635	57.0995	65.3395	71.3837	81.2687	(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

82.3184	71.9842	75.3031	64.4190	61.0214	53.5285	52.1974	55.3635	57.0995	65.3395	71.3837	81.2687	(64)

Total per year (kWh/year) = Sum(64)m =	791.2268	(64)
12Total per year (kWh/year)	791	(64)

Electric shower(s)

47.0801	41.9488	45.8065	43.7125	44.5328	42.4800	43.8960	44.5328	43.7125	45.8065	44.9451	47.0801	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	535.5336	(64a)

Heat gains from water heating, kWh/month

32.3496	28.4833	30.2774	27.0329	26.3885	24.0021	24.0233	24.9741	25.2030	27.7865	29.0822	32.0872	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	101.0207	111.8444	101.0207	104.3881	101.0207	104.3881	101.0207	101.0207	104.3881	101.0207	104.3881	101.0207	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	180.1476	182.0169	177.3062	167.2776	154.6182	142.7202	134.7716	132.9023	137.6130	147.6416	160.3010	172.1990	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)
Water heating gains (Table 5)													
	43.4807	42.3858	40.6954	37.5457	35.4685	33.3363	32.2894	33.5673	35.0042	37.3474	40.3919	43.1280	(72)
Total internal gains													
	378.5757	390.1738	372.9490	363.1380	345.0341	334.3713	322.0085	321.4170	330.9320	339.9365	359.0077	370.2744	(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	4.8900	10.6334	0.6300	0.7000	0.7700	15.8910	(74)
South	2.6000	46.7521	0.6300	0.7000	0.7700	37.1489	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	53.0399	91.2089	129.1035	170.4803	202.9346	207.3746	197.4258	171.8891	143.0020	101.7719	63.6378	45.3476	(83)
Total gains	431.6156	481.3827	502.0525	533.6184	547.9687	541.7459	519.4343	493.3061	473.9340	441.7084	422.6455	415.6220	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	48.8646	48.9669	49.0677	49.5464	49.6371	50.0633	50.0633	50.1430	49.8982	49.6371	49.4541	49.2642	
alpha	4.2576	4.2645	4.2712	4.3031	4.3091	4.3376	4.3376	4.3429	4.3265	4.3091	4.2969	4.2843	
util living area													
	0.9893	0.9818	0.9698	0.9337	0.8541	0.6955	0.5337	0.5788	0.7929	0.9407	0.9805	0.9908	(86)
MIT	19.5014	19.6917	19.9583	20.3457	20.6845	20.9096	20.9775	20.9681	20.8330	20.4124	19.9015	19.4707	(87)
Th 2	20.0297	20.0315	20.0333	20.0418	20.0434	20.0507	20.0507	20.0521	20.0479	20.0434	20.0402	20.0368	(88)
util rest of house													
	0.9866	0.9774	0.9620	0.9157	0.8131	0.6166	0.4275	0.4722	0.7258	0.9210	0.9750	0.9886	(89)
MIT 2	18.6695	18.8590	19.1231	19.5042	19.8162	20.0024	20.0432	20.0405	19.9476	19.5740	19.0747	18.6445	(90)
Living area fraction									fLA = Living area / (4) =			0.3639	(91)
MIT	18.9722	19.1620	19.4270	19.8104	20.1322	20.3325	20.3832	20.3780	20.2698	19.8791	19.3755	18.9451	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9722	19.1620	19.4270	19.8104	20.1322	20.3325	20.3832	20.3780	20.2698	19.8791	19.3755	18.9451	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9829	0.9723	0.9559	0.9105	0.8173	0.6414	0.4658	0.5103	0.7430	0.9169	0.9701	0.9852	(94)
Useful gains	424.2216	468.0656	479.9305	485.8720	447.8740	347.4991	241.9517	251.7319	352.1195	404.9967	409.9986	409.4705	(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													
	982.3411	952.8806	861.9121	720.4247	555.7668	374.6147	247.2267	259.5467	404.5257	611.5896	812.0787	979.2135	(97)
Space heating kWh													
	415.2409	325.7957	284.1943	168.8779	80.2723	0.0000	0.0000	0.0000	0.0000	153.7051	289.4977	423.8888	(98a)
Space heating requirement - total per year (kWh/year)												2141.4728	
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													
	415.2409	325.7957	284.1943	168.8779	80.2723	0.0000	0.0000	0.0000	0.0000	153.7051	289.4977	423.8888	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2141.4728	
Space heating per m2											(98c) / (4) =	34.0565	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	614.2832	483.5847	495.8648	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7946	0.8696	0.8430	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	488.1324	420.5282	418.0026	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	588.2444	564.4175	535.9208	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	72.0807	107.0536	87.7312	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	18.0202	26.7634	21.9328	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												66.7164	(107)
Energy for space heating												34.0565	(99)
Energy for space cooling												1.0610	(108)
Total												35.1175	(109)
Fabric Energy Efficiency (TFEE)												35.1	(109)

Full SAP Calculation Printout

Property Reference	Flat 4 Block A	**Issued on Date**	13/03/2024
Assessment Reference	Design stage for ES condition	**Prop Type Ref**	
Property	Flat 4 Block A, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	86 B	**DER**	0.52	**TER**	13.42
Environmental	100 A	**% DER < TER**			96.13
CO_2 Emissions (t/year)	0	**DFEE**	32.73	**TFEE**	35.12
Compliance Check	See BREL	**% DFEE < TFEE**			6.79
% DPER < TPER	76.99	**DPER**	16.32	**TPER**	70.94

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.8800	(1b)	x 2.5000	(2b) =	157.2000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		157.2000	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(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) =		81.0000 (23c)

Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316	(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	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			7.4900	1.1450	8.5763			(27)
exposed bin store			12.6000	0.1300	1.6380	20.0000	252.0000	(28b)
over commercial			50.2800	0.1300	6.5364	20.0000	1005.6000	(28b)
External Wall 1	55.2500	7.4900	47.7600	0.1300	6.2088	70.0000	3343.2000	(29a)
sheltered	9.7500	2.1000	7.6500	0.1300	0.9945	70.0000	535.5000	(29a)
Total net area of external elements Aum(A, m2)			127.8800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.8940			(33)
Party Wall 1			21.0000	0.0000	0.0000	180.0000	3780.0000	(32)
Party Ceiling 1			62.8800			20.0000	1257.6000	(32b)
Internal Wall 1			108.3400			9.0000	975.0600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11148.9600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		177.3053 (35)
List of Thermal Bridges		

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	5.6500	0.0600	0.3390	
E3 Sill	4.6500	0.0400	0.1860	
E4 Jamb	20.4000	0.0200	0.4080	
E7 Party floor between dwellings (in blocks of flats)	9.8000	0.0000	0.0000	
E20 Exposed floor (normal)	10.0000	0.3200	3.2000	
E21 Exposed floor (inverted)	4.8000	0.3200	1.5360	
E7 Party floor between dwellings (in blocks of flats)	12.6000	0.2000	2.5200	
E16 Corner (normal)	2.4900	0.0500	0.1245	
E18 Party wall between dwellings	4.9800	0.2400	1.1952	
E16 Corner (normal)	2.4900	0.1800	0.4482	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.4000	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.9569	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	36.8509	(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	12.6172	12.4665	12.3157	11.5619	11.4111	10.6573	10.6573	10.5065	10.9588	11.4111	11.7126	12.0142	(38)
Heat transfer coeff	49.4682	49.3174	49.1666	48.4128	48.2620	47.5082	47.5082	47.3574	47.8097	48.2620	48.5636	48.8651	(39)
Average = Sum(39)m / 12 =												48.3751	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7867	0.7843	0.7819	0.7699	0.7675	0.7555	0.7555	0.7531	0.7603	0.7675	0.7723	0.7771	(40)
HLP (average)												0.7693	
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											2.0618	(42)
Hot water usage for mixer showers	88.1834	86.8581	84.9270	81.2322	78.5055	75.4647	73.7363	75.6528	77.7537	81.0185	84.7927	87.8455	(42a)
Hot water usage for baths	25.4044	25.0271	24.4958	23.5162	22.7826	21.9692	21.5299	22.0575	22.6319	23.5023	24.5021	25.3185	(42b)
Hot water usage for other uses	35.7447	34.4449	33.1451	31.8453	30.5455	29.2457	29.2457	30.5455	31.8453	33.1451	34.4449	35.7447	(42c)
Average daily hot water use (litres/day)												137.3512	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.3325	146.3301	142.5679	136.5936	131.8336	126.6796	124.5119	128.2558	132.2309	137.6659	143.7397	148.9087	(44)
Energy conte	236.5061	208.3722	219.1216	186.9899	177.4734	155.7674	150.5864	158.8075	163.0539	186.8114	204.7836	233.1551	(45)
Energy content (annual)										Total = Sum(45)m =		2281.4282	
Distribution loss (46)m = 0.15 x (45)m	35.4759	31.2558	32.8682	28.0485	26.6210	23.3651	22.5880	23.8211	24.4581	28.0217	30.7175	34.9733	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.5400	(55)
Total storage loss	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(56)
If cylinder contains dedicated solar storage	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(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	276.5085	244.5034	259.1240	225.7019	217.4758	194.4794	190.5888	198.8099	201.7659	226.8138	243.4956	273.1575	(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	276.5085	244.5034	259.1240	225.7019	217.4758	194.4794	190.5888	198.8099	201.7659	226.8138	243.4956	273.1575	(64)
										Total per year (kWh/year) = Sum(64)m =		2752.4242	(64)
12Total per year (kWh/year)												2752	(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	110.6402	98.1887	104.8598	93.1437	91.0118	82.7623	82.0719	84.8054	85.1850	94.1167	99.0601	109.5260	(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	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	101.0207	111.8444	101.0207	104.3881	101.0207	104.3881	101.0207	101.0207	104.3881	101.0207	104.3881	101.0207	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.1476	182.0169	177.3062	167.2776	154.6182	142.7202	134.7716	132.9023	137.6130	147.6416	160.3010	172.1990	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)
Water heating gains (Table 5)	148.7100	146.1141	140.9406	129.3663	122.3277	114.9476	110.3117	113.9858	118.3125	126.5009	137.5835	147.2123	(72)
Total internal gains	483.8050	493.9022	473.1943	454.9587	431.8934	415.9826	400.0308	401.8355	414.2404	429.0900	456.1993	474.3587	(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	4.8900	10.6334	0.7200	0.7000	0.7700	18.1612	(74)
South	2.6000	46.7521	0.7200	0.7000	0.7700	42.4559	(78)

Solar gains	60.6171	104.2388	147.5468	194.8347	231.9252	236.9995	225.6295	196.4447	163.4309	116.3107	72.7289	51.8259	(83)
Total gains	544.4220	598.1409	620.7411	649.7933	663.8186	652.9821	625.6603	598.2802	577.6712	545.4007	528.9282	526.1846	(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	62.6046	62.7960	62.9885	63.9693	64.1691	65.1873	65.1873	65.3949	64.7762	64.1691	63.7707	63.3772	
alpha	5.1736	5.1864	5.1992	5.2646	5.2779	5.3458	5.3458	5.3597	5.3184	5.2779	5.2514	5.2251	
util living area	0.9573	0.9313	0.8907	0.7938	0.6458	0.4614	0.3335	0.3631	0.5582	0.8038	0.9231	0.9625	(86)
Living	20.2615	20.4258	20.6121	20.8298	20.9510	20.9933	20.9990	20.9985	20.9819	20.8454	20.5460	20.2365	
Non living	19.6043	19.7635	19.9411	20.1468	20.2484	20.2885	20.2917	20.2936	20.2777	20.1656	19.8897	19.5872	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.6222	20.4258	20.6121	20.8298	20.9510	20.9933	20.9990	20.9985	20.9819	20.8454	20.5460	20.3433	(87)
Th 2	20.2649	20.2670	20.2690	20.2795	20.2816	20.2920	20.2920	20.2941	20.2878	20.2816	20.2774	20.2732	(88)
util rest of house	0.9496	0.9197	0.8727	0.7639	0.6034	0.4119	0.2801	0.3079	0.5049	0.7694	0.9084	0.9556	(89)
MIT 2	19.9269	19.7635	19.9411	20.1468	20.2484	20.2885	20.2917	20.2936	20.2777	20.1656	19.8897	19.6831	(90)
Living area fraction									fLA = Living area / (4) =			0.3639	(91)
MIT	20.1799	20.0045	20.1853	20.3953	20.5040	20.5450	20.5491	20.5501	20.5339	20.4130	20.1285	19.9234	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1799	20.0045	20.1853	20.3953	20.5040	20.5450	20.5491	20.5501	20.5339	20.4130	20.1285	19.9234	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9486	0.9150	0.8705	0.7689	0.6168	0.4297	0.2995	0.3279	0.5236	0.7760	0.9050	0.9518	(94)
Useful gains	516.4422	547.2962	540.3592	499.6403	409.4471	280.6104	187.4030	196.1977	302.4718	423.2402	478.6673	500.8426	(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	785.5511	744.9139	672.8585	556.5209	424.9012	282.4352	187.6131	196.5363	307.6048	473.5943	632.7122	768.3235	(97)
Space heating kWh	200.2171	132.7991	98.5795	40.9540	11.4979	0.0000	0.0000	0.0000	0.0000	37.4635	110.9124	199.0058	(98a)
Space heating requirement - total per year (kWh/year)												831.4292	
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	200.2171	132.7991	98.5795	40.9540	11.4979	0.0000	0.0000	0.0000	0.0000	37.4635	110.9124	199.0058	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												831.4292	
Space heating per m2											(98c) / (4) =	13.2225	(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 %) 276.7307 (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	200.2171	132.7991	98.5795	40.9540	11.4979	0.0000	0.0000	0.0000	0.0000	37.4635	110.9124	199.0058	(98)
Space heating efficiency (main heating system 1)	276.7307	276.7307	276.7307	276.7307	276.7307	0.0000	0.0000	0.0000	0.0000	276.7307	276.7307	276.7307	(210)
Space heating fuel (main heating system)	72.3509	47.9886	35.6229	14.7992	4.1549	0.0000	0.0000	0.0000	0.0000	13.5379	40.0795	71.9132	(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	276.5085	244.5034	259.1240	225.7019	217.4758	194.4794	190.5888	198.8099	201.7659	226.8138	243.4956	273.1575	(64)
Efficiency of water heater												271.3270	(216)
(217)m	271.3270	271.3270	271.3270	271.3270	271.3270	271.3270	271.3270	271.3270	271.3270	271.3270	271.3270	271.3270	(217)
Fuel for water heating, kWh/month	101.9097	90.1139	95.5025	83.1845	80.1527	71.6771	70.2432	73.2732	74.3627	83.5943	89.7425	100.6746	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
(221)m	9.8545	8.9009	9.8545	9.5367	9.8545	9.5367	9.8545	9.8545	9.5367	9.8545	9.5367	9.8545	(231)
Pumps and Fa	26.3258	21.1196	19.0158	13.9318	10.7613	8.7921	9.8168	12.7603	16.5744	21.7465	24.5626	27.0575	(232)
Lighting													
Electricity generated by PVs (Appendix M) (negative quantity)	-24.9765	-40.8646	-68.2006	-84.5639	-95.6622	-90.4228	-88.7979	-81.2534	-66.9723	-49.4169	-28.8163	-20.6990	(233a)
(233a)m													
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
(234a)m													
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
(235a)m													
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
(235c)m													
Electricity generated by PVs (Appendix M) (negative quantity)	-7.9857	-20.9702	-53.5059	-99.4681	-147.7508	-154.9532	-150.8118	-117.7874	-74.1189	-34.2563	-11.6708	-5.9243	(233b)
(233b)m													
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
(234b)m													
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
(235b)m													
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
(235d)m													

Annual totals kWh/year

Space heating fuel - main system 1 300.4471 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 271.3270

Water heating fuel used	1014.4308	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)		
mechanical ventilation fans (SFP = 0.6050)	116.0293	(230a)
Total electricity for the above, kWh/year	116.0293	(231)
Electricity for lighting (calculated in Appendix L)	212.4646	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1619.8497	(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	23.5222	(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	300.4471	0.1571	47.2014	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1014.4308	0.1411	143.1239	(264)
Space and water heating			190.3253	(265)
Pumps, fans and electric keep-hot	116.0293	0.1387	16.0947	(267)
Energy for lighting	212.4646	0.1443	30.6652	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-740.6463	0.1326	-98.1884	
PV Unit electricity exported	-879.2034	0.1211	-106.4654	
Total			-204.6538	(269)
Total CO2, kg/year			32.4314	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			0.5200	(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	300.4471	1.5816	475.1834	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1014.4308	1.5217	1543.6608	(278)
Space and water heating			2018.8443	(279)
Pumps, fans and electric keep-hot	116.0293	1.5128	175.5292	(281)
Energy for lighting	212.4646	1.5338	325.8853	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-740.6463	1.4899	-1103.4587	
PV Unit electricity exported	-879.2034	0.4443	-390.5980	
Total			-1494.0568	(283)
Total Primary energy kWh/year			1026.2019	(286)
Dwelling Primary energy Rate (DPER)			16.3200	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		62.8800 (1b)	x	2.5000 (2b)	=	157.2000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	157.2000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	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) =	0.1272	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3772	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2924	(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													
	0.3727	0.3654	0.3581	0.3216	0.3143	0.2777	0.2777	0.2704	0.2924	0.3143	0.3289	0.3435	(22b)
Effective ac	0.5695	0.5668	0.5641	0.5517	0.5494	0.5386	0.5386	0.5366	0.5427	0.5494	0.5541	0.5590	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			7.4900	1.1450	8.5763			(27)
exposed bin store			12.6000	0.1300	1.6380			(28b)
over commercial			50.2800	0.1300	6.5364			(28b)
External Wall 1	55.2500	7.4900	47.7600	0.1800	8.5968			(29a)
sheltered	9.7500	2.1000	7.6500	0.1800	1.3770			(29a)
Total net area of external elements Aum(A, m2)			127.8800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.8245			(33)
Party Wall 1			21.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 187.3053 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6500	0.0500	0.2825
E3 Sill	4.6500	0.0500	0.2325
E4 Jamb	20.4000	0.0500	1.0200
E7 Party floor between dwellings (in blocks of flats)	9.8000	0.0700	0.6860
E20 Exposed floor (normal)	10.0000	0.3200	3.2000
E21 Exposed floor (inverted)	4.8000	0.3200	1.5360
E7 Party floor between dwellings (in blocks of flats)	12.6000	0.0700	0.8820
E16 Corner (normal)	2.4900	0.0900	0.2241
E18 Party wall between dwellings	4.9800	0.0600	0.2988
E16 Corner (normal)	2.4900	0.0900	0.2241
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.4000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.5860 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 37.4105 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.5418	29.4019	29.2647	28.6204	28.4999	27.9387	27.9387	27.8348	28.1549	28.4999	28.7438	28.9987	(38)
Heat transfer coeff	66.9524	66.8124	66.6753	66.0310	65.9104	65.3493	65.3493	65.2454	65.5654	65.9104	66.1543	66.4092	(39)
Average = Sum(39)m / 12 =												66.0304	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0648	1.0625	1.0604	1.0501	1.0482	1.0393	1.0393	1.0376	1.0427	1.0482	1.0521	1.0561	(40)
HLP (average)												1.0501	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0618 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	58.7889	57.9054	56.6180	54.1548	52.3370	50.3098	49.1576	50.4352	51.8358	54.0124	56.5285	58.5637	(42a)
Hot water usage for baths	25.4044	25.0271	24.4958	23.5162	22.7826	21.9692	21.5299	22.0575	22.6319	23.5023	24.5021	25.3185	(42b)
Hot water usage for other uses	35.7447	34.4449	33.1451	31.8453	30.5455	29.2457	29.2457	30.5455	31.8453	33.1451	34.4449	35.7447	(42c)
Average daily hot water use (litres/day)												110.2505	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	119.9380	117.3774	114.2589	109.5162	105.6651	101.5247	99.9331	103.0382	106.3130	110.6597	115.4755	119.6269	(44)
Energy conte	189.9525	167.1439	175.6117	149.9223	142.2455	124.8365	120.8605	127.5828	131.0946	150.1642	164.5160	187.3068	(45)
Energy content (annual)										Total = Sum(45)m =		1831.2372	
Distribution loss (46)m = 0.15 x (45)m	28.4929	25.0716	26.3418	22.4883	21.3368	18.7255	18.1291	19.1374	19.6642	22.5246	24.6774	28.0960	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	236.5474	209.2296	222.2066	195.0141	188.8404	169.9283	167.4554	174.1777	176.1864	196.7591	209.6078	233.9017	(62)
WWHRS	-26.8758	-23.7692	-24.8897	-20.6097	-19.2075	-16.4360	-15.4061	-16.3829	-17.0053	-20.0474	-22.7113	-26.3781	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	209.6716	185.4604	197.3168	174.4044	169.6329	153.4924	152.0492	157.7948	159.1811	176.7117	186.8966	207.5236	(64)
									Total per year (kWh/year) = Sum(64)m =			2130.1356	(64)
12Total per year (kWh/year)												2130	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	100.4351	89.2439	95.6668	85.9226	84.5726	77.5816	77.4620	79.6972	79.6624	87.2055	90.7750	99.5554	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	101.0207	111.8444	101.0207	104.3881	101.0207	104.3881	101.0207	101.0207	104.3881	101.0207	104.3881	101.0207	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	180.1476	182.0169	177.3062	167.2776	154.6182	142.7202	134.7716	132.9023	137.6130	147.6416	160.3010	172.1990	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)
Water heating gains (Table 5)													
	134.9934	132.8034	128.5844	119.3370	113.6728	107.7522	104.1156	107.1199	110.6422	117.2117	126.0764	133.8111	(72)
Total internal gains													
	473.0884	483.5915	463.8380	447.9293	426.2385	408.7873	393.8347	394.9696	406.5701	422.8008	447.6922	463.9575	(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	4.8900	10.6334	0.6300	0.7000	0.7700	15.8910	(74)
South	2.6000	46.7521	0.6300	0.7000	0.7700	37.1489	(78)

Solar gains	53.0399	91.2089	129.1035	170.4803	202.9346	207.3746	197.4258	171.8891	143.0020	101.7719	63.6378	45.3476	(83)
Total gains	526.1284	574.8004	592.9415	618.4097	629.1730	616.1618	591.2606	566.8587	549.5721	524.5727	511.3300	509.3051	(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	48.8646	48.9669	49.0677	49.5464	49.6371	50.0633	50.0633	50.1430	49.8982	49.6371	49.4541	49.2642	
alpha	4.2576	4.2645	4.2712	4.3031	4.3091	4.3376	4.3376	4.3429	4.3265	4.3091	4.2969	4.2843	
util living area	0.9782	0.9666	0.9481	0.8990	0.8009	0.6323	0.4751	0.5132	0.7260	0.9023	0.9627	0.9808	(86)
MIT	19.6915	19.8717	20.1218	20.4712	20.7626	20.9375	20.9856	20.9799	20.8836	20.5382	20.0707	19.6613	(87)
Th 2	20.0297	20.0315	20.0333	20.0418	20.0434	20.0507	20.0507	20.0521	20.0479	20.0434	20.0402	20.0368	(88)
util rest of house	0.9732	0.9591	0.9359	0.8745	0.7533	0.5542	0.3778	0.4146	0.6539	0.8739	0.9529	0.9764	(89)
MIT 2	18.5242	18.7518	19.0658	19.4977	19.8313	20.0095	20.0447	20.0430	19.9623	19.5853	19.0111	18.4911	(90)
Living area fraction									fLA = Living area / (4) =			0.3639	(91)
MIT	18.9490	19.1593	19.4501	19.8519	20.1702	20.3472	20.3871	20.3839	20.2975	19.9321	19.3966	18.9169	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9490	19.1593	19.4501	19.8519	20.1702	20.3472	20.3871	20.3839	20.2975	19.9321	19.3966	18.9169	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9660	0.9506	0.9270	0.8690	0.7602	0.5796	0.4129	0.4500	0.6741	0.8701	0.9448	0.9697	(94)
Useful gains	508.2495	546.3794	549.6659	537.3933	478.3000	357.1325	244.1589	255.0944	370.4865	456.4239	483.0855	493.8681	(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	980.7823	952.7003	863.4485	723.1679	558.2725	375.5730	247.4825	259.9323	406.3450	615.0798	813.4759	977.3398	(97)
Space heating kWh	351.5644	273.0477	233.4542	133.7577	59.4996	0.0000	0.0000	0.0000	0.0000	118.0399	237.8812	359.7029	(98a)
Space heating requirement - total per year (kWh/year)												1766.9475	
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	351.5644	273.0477	233.4542	133.7577	59.4996	0.0000	0.0000	0.0000	0.0000	118.0399	237.8812	359.7029	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1766.9475	
Space heating per m2											(98c) / (4) =	28.1003	(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	351.5644	273.0477	233.4542	133.7577	59.4996	0.0000	0.0000	0.0000	0.0000	118.0399	237.8812	359.7029	(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)	380.8932	295.8263	252.9298	144.9162	64.4632	0.0000	0.0000	0.0000	0.0000	127.8872	257.7261	389.7106	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	209.6716	185.4604	197.3168	174.4044	169.6329	153.4924	152.0492	157.7948	159.1811	176.7117	186.8966	207.5236	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.2098	84.9258	84.4379	83.4721	81.9570	79.8000	79.8000	79.8000	79.8000	83.1760	84.6018	85.2811	(217)
Fuel for water heating, kWh/month	246.0652	218.3794	233.6828	208.9375	206.9781	192.3463	190.5379	197.7379	199.4751	212.4553	220.9131	243.3405	(219)
Space cooling fuel requirement													

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	20.9901	16.8390	15.1617	11.1081	8.5802	7.0101	7.8272	10.1740	13.2151	17.3389	19.5842	21.5735	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.5109	-31.3628	-46.6025	-54.2280	-60.0693	-56.6639	-55.9959	-52.0977	-45.4534	-36.7079	-24.0242	-18.4802	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.1786	-19.5919	-39.4675	-60.0466	-80.1394	-80.7778	-79.8016	-67.2020	-48.7951	-28.2404	-12.3279	-7.2352	(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	1914.3527	(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	2570.8490	(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)	169.4022	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1036.0005	(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	3704.6033	(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	1914.3527	0.2100	402.0141	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2570.8490	0.2100	539.8783	(264)
Space and water heating			941.8923	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	169.4022	0.1443	24.4500	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-503.1966	0.1339	-67.3659	
PV Unit electricity exported	-532.8039	0.1255	-66.8807	
Total			-134.2467	(269)
Total CO2, kg/year			844.0249	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.4200	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1914.3527	1.1300	2163.2185	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2570.8490	1.1300	2905.0593	(278)
Space and water heating			5068.2779	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	169.4022	1.5338	259.8347	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-503.1966	1.4947	-752.1494	
PV Unit electricity exported	-532.8039	0.4607	-245.4893	
Total			-997.6387	(283)
Total Primary energy kWh/year			4460.5747	(286)
Target Primary Energy Rate (TPER)			70.9400	(287)

Full SAP Calculation Printout

Property Reference	Flat 5 Block A	**Issued on Date**	13/03/2024
Assessment Reference	Design stage for ES condition	**Prop Type Ref**	
Property	Flat 3 Block A, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	84 B	**DER**	1.33	**TER**	11.06
Environmental	99 A	**% DER < TER**			87.97
CO_2 Emissions (t/year)	0.06	**DFEE**	16.99	**TFEE**	14.56
Compliance Check	See BREL	**% DFEE < TFEE**			-16.71
% DPER < TPER	57.75	**DPER**	24.83	**TPER**	58.77

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	46.4600	(1b)	x 2.3000	(2b) =	106.8580	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.8580	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(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) =	81.0000	(23c)

Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			2.5200	1.1450	2.8855			(27)
External Wall 1	11.6800	2.5200	9.1600	0.1300	1.1908	70.0000	641.2000	(29a)
sheltered	15.5700	2.1000	13.4700	0.1300	1.7511	70.0000	942.9000	(29a)
void	4.3000		4.3000	0.1043	0.4483	9.0000	38.7000	(30)
Total net area of external elements Aum(A, m2)			31.5500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		9.2157			(33)
Party Wall 1			19.0000	0.0000	0.0000	180.0000	3420.0000	(32)
Party Wall 2 to existing			22.1800	0.0000	0.0000	180.0000	3992.4000	(32)
Party Floor 1			46.4600			30.0000	1393.8000	(32d)
Party Ceiling 1			62.8800			20.0000	1257.6000	(32b)
Internal Wall 1			16.4800			9.0000	148.3200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 11834.9200	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	254.7335	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	2.9400	0.0600	0.1764
E3 Sill	1.9400	0.0400	0.0776
E4 Jamb	9.4000	0.0200	0.1880
E7 Party floor between dwellings (in blocks of flats)	7.3000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	14.0000	0.2000	2.8000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	35.8000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	3.2000	0.1500	0.4800
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E17 Corner (inverted - internal area greater than external area)	2.4900	0.0000	0.0000
E16 Corner (normal)	2.4900	0.1800	0.4482

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5606 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 15.7763 (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	8.5767	8.4742	8.3717	7.8593	7.7568	7.2444	7.2444	7.1419	7.4493	7.7568	7.9618	8.1667	(38)
Heat transfer coeff	24.3530	24.2505	24.1480	23.6356	23.5331	23.0207	23.0207	22.9182	23.2257	23.5331	23.7381	23.9431	(39)
Average = Sum(39)m / 12 =												23.6100	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5242	0.5220	0.5198	0.5087	0.5065	0.4955	0.4955	0.4933	0.4999	0.5065	0.5109	0.5153	(40)
HLP (average)												0.5082	
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 1.5866 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	76.2330	75.0873	73.4179	70.2238	67.8666	65.2379	63.7438	65.4006	67.2167	70.0391	73.3018	75.9409	(42a)
Hot water usage for baths	21.9783	21.6519	21.1923	20.3448	19.7102	19.0065	18.6264	19.0828	19.5798	20.3328	21.1977	21.9040	(42b)
Hot water usage for other uses	30.8787	29.7558	28.6329	27.5101	26.3872	25.2644	25.2644	26.3872	27.5101	28.6329	29.7558	30.8787	(42c)
Average daily hot water use (litres/day)												118.7332	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.0900	126.4951	123.2432	118.0787	113.9640	109.5088	107.6345	110.8706	114.3066	119.0048	124.2554	128.7236	(44)
Energy conte	204.4470	180.1273	189.4201	161.6438	153.4175	134.6538	130.1746	137.2809	140.9514	161.4884	177.0246	201.5501	(45)
Energy content (annual)										Total = Sum(45)m =		1972.1795	
Distribution loss (46)m = 0.15 x (45)m	30.6670	27.0191	28.4130	24.2466	23.0126	20.1981	19.5262	20.5921	21.1427	24.2233	26.5537	30.2325	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.5400	(55)
Total storage loss	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(56)
If cylinder contains dedicated solar storage	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(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	244.4494	216.2585	229.4225	200.3558	193.4199	173.3658	170.1770	177.2833	179.6634	201.4908	215.7366	241.5525	(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	244.4494	216.2585	229.4225	200.3558	193.4199	173.3658	170.1770	177.2833	179.6634	201.4908	215.7366	241.5525	(64)
										Total per year (kWh/year) = Sum(64)m =		2443.1755	(64)
12Total per year (kWh/year)												2443	(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	99.9805	88.7973	94.9841	84.7162	83.0132	75.7420	75.2850	77.6478	77.8359	85.6968	89.8303	99.0173	(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	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	91.1174	100.8799	91.1174	94.1546	91.1174	94.1546	91.1174	91.1174	94.1546	91.1174	94.1546	91.1174	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	138.0513	139.4839	135.8739	128.1887	118.4876	109.3699	103.2787	101.8461	105.4561	113.1413	122.8424	131.9601	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)
Water heating gains (Table 5)	134.3824	132.1388	127.6668	117.6613	111.5769	105.1972	101.1895	104.3654	108.1055	115.1839	124.7643	133.0878	(72)
Total internal gains	410.3505	419.3020	401.4575	386.8041	367.9813	355.5211	342.3850	344.1283	354.5156	366.2419	388.5607	402.9647	(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	
South	2.5200	46.7521	0.6400	0.7000	0.7700	36.5774	(78)

Solar gains	36.5774	59.9043	76.3075	86.2440	89.8716	86.4892	84.5052	82.0663	79.7122	64.6124	43.3567	31.6062	(83)
Total gains	446.9279	479.2064	477.7650	473.0481	457.8529	442.0103	426.8902	426.1946	434.2278	430.8544	431.9174	434.5709	(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	134.9928	135.5632	136.1386	139.0900	139.6958	142.8052	142.8052	143.4438	141.5450	139.6958	138.4895	137.3040	
alpha	9.9995	10.0375	10.0759	10.2727	10.3131	10.5203	10.5203	10.5629	10.4363	10.3131	10.2326	10.1536	
util living area	0.8606	0.7932	0.7241	0.6032	0.4779	0.3333	0.2373	0.2474	0.3691	0.5673	0.7519	0.8712	(86)
Living	20.9435	20.9735	20.9892	20.9983	20.9999	21.0000	21.0000	21.0000	21.0000	20.9992	20.9866	20.9394	
Non living	20.4531	20.4802	20.4948	20.5117	20.5148	20.5250	20.5250	20.5270	20.5209	20.5144	20.5010	20.4576	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.9711	20.9735	20.9892	20.9983	20.9999	21.0000	21.0000	21.0000	21.0000	20.9992	20.9866	20.9479	(87)
Th 2	20.4987	20.5007	20.5028	20.5128	20.5149	20.5250	20.5250	20.5270	20.5209	20.5149	20.5108	20.5068	(88)
util rest of house	0.8428	0.7728	0.7013	0.5793	0.4530	0.3086	0.2117	0.2219	0.3434	0.5411	0.7282	0.8543	(89)
MIT 2	20.4754	20.4802	20.4948	20.5117	20.5148	20.5250	20.5250	20.5270	20.5209	20.5144	20.5010	20.4645	(90)
Living area fraction										fLA = Living area / (4) =		0.8717	(91)
MIT	20.9075	20.9103	20.9258	20.9359	20.9376	20.9391	20.9391	20.9393	20.9385	20.9370	20.9243	20.8859	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.9075	20.9103	20.9258	20.9359	20.9376	20.9391	20.9391	20.9393	20.9385	20.9370	20.9243	20.8859	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8574	0.7896	0.7207	0.6001	0.4747	0.3301	0.2340	0.2441	0.3658	0.5639	0.7483	0.8675	(94)
Useful gains	383.2029	378.3778	344.3196	283.8636	217.3376	145.9288	99.8882	104.0332	158.8268	242.9701	323.1958	376.9702	(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	404.4422	388.2568	348.3538	284.4763	217.3903	145.9296	99.8883	104.0332	158.8296	243.2621	328.1634	399.5105	(97)
Space heating kWh	15.8020	6.6387	3.0015	0.4411	0.0392	0.0000	0.0000	0.0000	0.0000	0.2172	3.5766	16.7700	(98a)
Space heating requirement - total per year (kWh/year)												46.4863	
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	15.8020	6.6387	3.0015	0.4411	0.0392	0.0000	0.0000	0.0000	0.0000	0.2172	3.5766	16.7700	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												46.4863	
Space heating per m2											(98c) / (4) =	1.0006	(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 %) 193.2228 (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	15.8020	6.6387	3.0015	0.4411	0.0392	0.0000	0.0000	0.0000	0.0000	0.2172	3.5766	16.7700	(98)
Space heating efficiency (main heating system 1)	193.2228	193.2228	193.2228	193.2228	193.2228	0.0000	0.0000	0.0000	0.0000	193.2228	193.2228	193.2228	(210)
Space heating fuel (main heating system)	8.1781	3.4358	1.5534	0.2283	0.0203	0.0000	0.0000	0.0000	0.0000	0.1124	1.8510	8.6791	(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	244.4494	216.2585	229.4225	200.3558	193.4199	173.3658	170.1770	177.2833	179.6634	201.4908	215.7366	241.5525	(64)
Efficiency of water heater												202.3693	(216)
(217)m	202.3693	202.3693	202.3693	202.3693	202.3693	202.3693	202.3693	202.3693	202.3693	202.3693	202.3693	202.3693	(217)
Fuel for water heating, kWh/month	120.7937	106.8633	113.3682	99.0050	95.5777	85.6680	84.0923	87.6039	88.7800	99.5659	106.6054	119.3622	(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	6.6987	6.0504	6.6987	6.4826	6.6987	6.4826	6.6987	6.6987	6.4826	6.6987	6.4826	6.6987	(231)
Lighting	24.0417	19.2872	17.3660	12.7231	9.8277	8.0293	8.9651	11.6532	15.1363	19.8597	22.4315	24.7099	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.5201	-30.5718	-51.7937	-65.9637	-76.5965	-73.3091	-71.9762	-65.3822	-53.1199	-37.9560	-21.5706	-15.3428	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.7760	-15.0059	-37.9148	-69.6843	-102.8206	-107.5549	-104.6375	-81.3286	-50.8769	-23.7186	-8.2719	-4.2810	(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												24.0584	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												202.3693	

Water heating fuel used	1207.2854	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)		
mechanical ventilation fans (SFP = 0.6050)	78.8719	(230a)
Total electricity for the above, kWh/year	78.8719	(231)
Electricity for lighting (calculated in Appendix L)	194.0307	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1193.9737	(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	310.2727	(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	24.0584	0.1607	3.8652	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1207.2854	0.1410	170.2584	(264)
Space and water heating			174.1236	(265)
Pumps, fans and electric keep-hot	78.8719	0.1387	10.9405	(267)
Energy for lighting	194.0307	0.1443	28.0046	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-582.1026	0.1321	-76.8882	
PV Unit electricity exported	-611.8711	0.1213	-74.2458	
Total			-151.1340	(269)
Total CO2, kg/year			61.9347	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.3300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	24.0584	1.5946	38.3639	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1207.2854	1.5215	1836.8471	(278)
Space and water heating			1875.2110	(279)
Pumps, fans and electric keep-hot	78.8719	1.5128	119.3174	(281)
Energy for lighting	194.0307	1.5338	297.6107	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-582.1026	1.4880	-866.1893	
PV Unit electricity exported	-611.8711	0.4452	-272.3989	
Total			-1138.5882	(283)
Total Primary energy kWh/year			1153.5509	(286)
Dwelling Primary energy Rate (DPER)			24.8300	(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	46.4600 (1b)	x	2.3000 (2b)	=	106.8580	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 46.4600						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.8580	(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) =	0.1872	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4372	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3388	(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													
	0.4320	0.4235	0.4150	0.3727	0.3642	0.3219	0.3219	0.3134	0.3388	0.3642	0.3812	0.3981	(22b)
Effective ac	0.5933	0.5897	0.5861	0.5694	0.5663	0.5518	0.5518	0.5491	0.5574	0.5663	0.5726	0.5792	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			2.5200	1.1450	2.8855			(27)
External Wall 1	11.6800	2.5200	9.1600	0.1800	1.6488			(29a)
sheltered	15.5700	2.1000	13.4700	0.1800	2.4246			(29a)
void	4.3000		4.3000	0.1100	0.4730			(30)
Total net area of external elements Aum(A, m2)			31.5500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	9.5319			(33)
Party Wall 1			19.0000	0.0000	0.0000			(32)
Party Wall 2 to existing			22.1800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 268.2678 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	2.9400	0.0500	0.1470
E3 Sill	1.9400	0.0500	0.0970
E4 Jamb	9.4000	0.0500	0.4700
E7 Party floor between dwellings (in blocks of flats)	7.3000	0.0700	0.5110
E7 Party floor between dwellings (in blocks of flats)	14.0000	0.0700	0.9800
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	35.8000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	3.2000	0.0400	0.1280
E18 Party wall between dwellings	4.9800	0.0600	0.2988
E18 Party wall between dwellings	4.9800	0.0600	0.2988
E17 Corner (inverted - internal area greater than external area)	2.4900	-0.0900	-0.2241
E16 Corner (normal)	2.4900	0.0900	0.2241

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 2.9306 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 12.4625 (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	20.9216	20.7939	20.6686	20.0805	19.9704	19.4581	19.4581	19.3632	19.6554	19.9704	20.1930	20.4258	(38)
Heat transfer coeff													
	33.3841	33.2564	33.1311	32.5430	32.4329	31.9206	31.9206	31.8257	32.1179	32.4329	32.6555	32.8883	(39)
Average = Sum(39)m / 12 =												32.5424	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7186	0.7158	0.7131	0.7005	0.6981	0.6871	0.6871	0.6850	0.6913	0.6981	0.7029	0.7079	(40)
HLP (average)												0.7004	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.5866 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	50.8220	50.0582	48.9453	46.8159	45.2444	43.4920	42.4958	43.6004	44.8111	46.6927	48.8679	50.6273	(42a)
Hot water usage for baths													
	21.9783	21.6519	21.1923	20.3448	19.7102	19.0065	18.6264	19.0828	19.5798	20.3328	21.1977	21.9040	(42b)
Hot water usage for other uses													
	30.8787	29.7558	28.6329	27.5101	26.3872	25.2644	25.2644	26.3872	27.5101	28.6329	29.7558	30.8787	(42c)
Average daily hot water use (litres/day)												95.3051	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	103.6790	101.4660	98.7705	94.6707	91.3418	87.7628	86.3866	89.0704	91.9010	95.6584	99.8214	103.4100	(44)
Energy conte	164.2022	144.4862	151.8066	129.5995	122.9636	107.9146	104.4771	110.2878	113.3231	129.8076	142.2139	161.9150	(45)
Energy content (annual)										Total = Sum(45)m =		1582.9972	
Distribution loss (46)m = 0.15 x (45)m													
	24.6303	21.6729	22.7710	19.4399	18.4445	16.1872	15.6716	16.5432	16.9985	19.4711	21.3321	24.2873	(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													
	210.7971	186.5719	198.4015	174.6913	169.5585	153.0064	151.0720	156.8827	158.4150	176.4025	187.3058	208.5099	(62)
WWHRS	-23.2337	-20.5481	-21.5168	-17.8167	-16.6045	-14.2086	-13.3183	-14.1627	-14.7008	-17.3306	-19.6335	-22.8034	(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													
	187.5634	166.0238	176.8848	156.8746	152.9540	138.7978	137.7537	142.7200	143.7142	159.0719	167.6723	185.7065	(64)
										Total per year (kWh/year) = Sum(64)m =		1915.7368	(64)
12Total per year (kWh/year)												1916	(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													
	91.8731	81.7102	87.7516	79.1653	78.1613	71.9551	72.0146	73.9466	73.7534	80.4370	83.3596	91.1127	(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	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	89.5294	99.1218	89.5294	92.5137	89.5294	92.5137	89.5294	89.5294	92.5137	89.5294	92.5137	89.5294	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	138.0513	139.4839	135.8739	128.1887	118.4876	109.3699	103.2787	101.8461	105.4561	113.1413	122.8424	131.9601	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	(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)													
	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)
Water heating gains (Table 5)													
	123.4854	121.5926	117.9457	109.9518	105.0555	99.9376	96.7938	99.3906	102.4353	108.1142	115.7772	122.4633	(72)
Total internal gains													
	400.8655	409.9977	393.1484	380.4537	362.8719	348.6206	336.4012	337.5655	347.2045	360.5843	380.9328	393.7522	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	2.5200	46.7521	0.6300	0.7000	0.7700	36.0059	(78)

Solar gains	36.0059	58.9683	75.1152	84.8965	88.4674	85.1378	83.1848	80.7840	78.4667	63.6029	42.6792	31.1124	(83)
Total gains	436.8714	468.9660	468.2636	465.3501	451.3393	433.7584	419.5860	418.3495	425.6712	424.1871	423.6120	424.8646	(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	103.7063	104.1047	104.4982	106.3869	106.7479	108.4611	108.4611	108.7844	107.7947	106.7479	106.0201	105.2699	
alpha	7.9138	7.9403	7.9665	8.0925	8.1165	8.2307	8.2307	8.2523	8.1863	8.1165	8.0680	8.0180	
util living area													
	0.9646	0.9376	0.8995	0.8030	0.6597	0.4705	0.3347	0.3499	0.5194	0.7662	0.9179	0.9690	(86)
MIT	20.6792	20.7743	20.8604	20.9525	20.9908	20.9995	21.0000	21.0000	20.9988	20.9710	20.8462	20.6675	(87)
Th 2	20.6407	20.6421	20.6434	20.6498	20.6510	20.6565	20.6565	20.6575	20.6543	20.6510	20.6486	20.6461	(88)
util rest of house													
	0.9602	0.9305	0.8888	0.7858	0.6367	0.4454	0.3086	0.3239	0.4938	0.7454	0.9081	0.9651	(89)
MIT 2	20.3437	20.4367	20.5198	20.6103	20.6440	20.6561	20.6565	20.6575	20.6536	20.6278	20.5120	20.3371	(90)
Living area fraction									fLA = Living area / (4) =			0.8717	(91)
MIT	20.6362	20.7310	20.8167	20.9086	20.9463	20.9554	20.9559	20.9560	20.9545	20.9270	20.8033	20.6251	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.6362	20.7310	20.8167	20.9086	20.9463	20.9554	20.9559	20.9560	20.9545	20.9270	20.8033	20.6251	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9601	0.9324	0.8941	0.7986	0.6562	0.4672	0.3314	0.3466	0.5161	0.7620	0.9125	0.9648	(94)
Useful gains	419.4367	437.2428	418.6767	371.6401	296.1499	202.6617	139.0327	144.9838	219.6703	323.2152	386.5457	409.9275	(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													
	545.3693	526.4812	474.3281	390.7964	299.8843	202.8694	139.0432	144.9989	220.1526	334.9331	447.4891	540.1934	(97)
Space heating kWh													
	93.6938	59.9682	41.4046	13.7925	2.7784	0.0000	0.0000	0.0000	0.0000	8.7181	43.8792	96.9179	(98a)
Space heating requirement - total per year (kWh/year)												361.1528	
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													
	93.6938	59.9682	41.4046	13.7925	2.7784	0.0000	0.0000	0.0000	0.0000	8.7181	43.8792	96.9179	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												361.1528	
Space heating per m2											(98c) / (4) =	7.7734	(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													
	93.6938	59.9682	41.4046	13.7925	2.7784	0.0000	0.0000	0.0000	0.0000	8.7181	43.8792	96.9179	(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)													
	101.5101	64.9710	44.8588	14.9431	3.0102	0.0000	0.0000	0.0000	0.0000	9.4454	47.5398	105.0031	(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													
	187.5634	166.0238	176.8848	156.8746	152.9540	138.7978	137.7537	142.7200	143.7142	159.0719	167.6723	185.7065	(64)
Efficiency of water heater												79.8000	(216)
(217)m	82.5884	82.0055	81.3642	80.4590	79.9446	79.8000	79.8000	79.8000	79.8000	80.2225	81.5136	82.6734	(217)
Fuel for water heating, kWh/month													
	227.1062	202.4546	217.3989	194.9745	191.3251	173.9321	172.6236	178.8471	180.0929	198.2885	205.6986	224.6268	(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	18.6024	14.9236	13.4370	9.8445	7.6042	6.2127	6.9368	9.0167	11.7118	15.3666	17.3565	19.1195	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-16.1018	-23.5804	-35.1900	-41.1359	-45.7435	-43.2384	-42.7673	-39.7353	-34.5478	-27.7278	-18.0335	-13.8243	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.5737	-14.0684	-28.4043	-43.2978	-57.8521	-58.3129	-57.5691	-48.4114	-35.0893	-20.2604	-8.8259	-5.1760	(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	391.2815	(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	2367.3689	(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)	150.1323	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-765.4673	(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	2229.3154	(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	391.2815	0.2100	82.1691	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2367.3689	0.2100	497.1475	(264)
Space and water heating			579.3166	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	150.1323	0.1443	21.6687	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-381.6261	0.1338	-51.0505	
PV Unit electricity exported	-383.8412	0.1255	-48.1665	
Total			-99.2169	(269)
Total CO2, kg/year			513.6976	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.0600	(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	391.2815	1.1300	442.1481	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2367.3689	1.1300	2675.1268	(278)
Space and water heating			3117.2750	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	150.1323	1.5338	230.2780	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-381.6261	1.4943	-570.2825	
PV Unit electricity exported	-383.8412	0.4606	-176.7971	
Total			-747.0796	(283)
Total Primary energy kWh/year			2730.5741	(286)
Target Primary Energy Rate (TPER)			58.7700	(287)

Full SAP Calculation Printout

Property Reference	Flat 5 Block A	**Issued on Date**	13/03/2024
Assessment Reference	Design stage for ES condition	**Prop Type Ref**	
Property	Flat 3 Block A, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	84 B	**DER**	1.33	**TER**	11.06
Environmental	99 A	**% DER < TER**			87.97
CO_2 Emissions (t/year)	0.06	**DFEE**	16.99	**TFEE**	14.56
Compliance Check	See BREL	**% DFEE < TFEE**			-16.71
% DPER < TPER	57.75	**DPER**	24.83	**TPER**	58.77

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	46.4600 (1b)	x	2.3000 (2b)	=	106.8580	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.8580	(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) =	0.1872	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3372	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2613	(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	0.3332	0.3266	0.3201	0.2874	0.2809	0.2482	0.2482	0.2417	0.2613	0.2809	0.2940	0.3070	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5555	0.5533	0.5512	0.5413	0.5395	0.5308	0.5308	0.5292	0.5341	0.5395	0.5432	0.5471	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			2.5200	1.1450	2.8855			(27)
External Wall 1	11.6800	2.5200	9.1600	0.1300	1.1908	70.0000	641.2000	(29a)
sheltered	15.5700	2.1000	13.4700	0.1300	1.7511	70.0000	942.9000	(29a)
void	4.3000		4.3000	0.1043	0.4483	9.0000	38.7000	(30)
Total net area of external elements Aum(A, m2)			31.5500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		9.2157			(33)
Party Wall 1			19.0000	0.0000	0.0000	180.0000	3420.0000	(32)
Party Wall 2 to existing			22.1800	0.0000	0.0000	180.0000	3992.4000	(32)
Party Floor 1			46.4600			30.0000	1393.8000	(32d)
Party Ceiling 1			62.8800			30.0000	1886.4000	(32b)
Internal Wall 1			16.4800			9.0000	148.3200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12463.7200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		268.2678 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	2.9400	0.0600	0.1764

E3 Sill	1.9400	0.0400	0.0776	
E4 Jamb	9.4000	0.0200	0.1880	
E7 Party floor between dwellings (in blocks of flats)	7.3000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	14.0000	0.2000	2.8000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	35.8000	0.0000	0.0000	
E11 Eaves (insulation at rafter level)	3.2000	0.1500	0.4800	
E18 Party wall between dwellings	4.9800	0.2400	1.1952	
E18 Party wall between dwellings	4.9800	0.2400	1.1952	
E17 Corner (inverted - internal area greater than external area)	2.4900	0.0000	0.0000	
E16 Corner (normal)	2.4900	0.1800	0.4482	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5606 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 15.7763 (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	19.5886	19.5126	19.4381	19.0882	19.0228	18.7181	18.7181	18.6616	18.8354	19.0228	19.1552	19.2937	(38)
Heat transfer coeff	35.3649	35.2889	35.2145	34.8646	34.7991	34.4944	34.4944	34.4380	34.6118	34.7991	34.9315	35.0700	(39)
Average = Sum(39)m / 12 =												34.8643	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7612	0.7596	0.7580	0.7504	0.7490	0.7425	0.7425	0.7412	0.7450	0.7490	0.7519	0.7548	(40)
HLP (average)												0.7504	
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 1.5866 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.9783	21.6519	21.1923	20.3448	19.7102	19.0065	18.6264	19.0828	19.5798	20.3328	21.1977	21.9040	(42b)

Hot water usage for other uses

30.8787	29.7558	28.6329	27.5101	26.3872	25.2644	25.2644	26.3872	27.5101	28.6329	29.7558	30.8787	(42c)

Average daily hot water use (litres/day) 48.4489 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	52.8570	51.4077	49.8252	47.8548	46.0974	44.2708	43.8907	45.4700	47.0899	48.9657	50.9535	52.7827	(44)
Energy conte	83.7126	73.2039	76.5795	65.5109	62.0559	54.4362	53.0820	56.3014	58.0665	66.4460	72.5926	82.6450	(45)
Energy content (annual)										Total = Sum(45)m =		804.6325	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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	71.1557	62.2233	65.0926	55.6843	52.7475	46.2707	45.1197	47.8562	49.3565	56.4791	61.7037	70.2482	(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	71.1557	62.2233	65.0926	55.6843	52.7475	46.2707	45.1197	47.8562	49.3565	56.4791	61.7037	70.2482	(64)
									Total per year (kWh/year) = Sum(64)m =			683.9376	(64)
12Total per year (kWh/year)												684	(64)
Electric shower(s)	40.6999	36.2640	39.5989	37.7887	38.4978	36.7232	37.9473	38.4978	37.7887	39.5989	38.8543	40.6999	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							462.9595	(64a)
Heat gains from water heating, kWh/month	27.9639	24.6218	26.1729	23.3682	22.8113	20.7485	20.7668	21.5885	21.7863	24.0195	25.1395	27.7370	(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	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	91.1174	100.8799	91.1174	94.1546	91.1174	94.1546	91.1174	91.1174	94.1546	91.1174	94.1546	91.1174	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	138.0513	139.4839	135.8739	128.1887	118.4876	109.3699	103.2787	101.8461	105.4561	113.1413	122.8424	131.9601	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)
Water heating gains (Table 5)	37.5859	36.6396	35.1786	32.4559	30.6604	28.8173	27.9123	29.0168	30.2588	32.2843	34.9160	37.2810	(72)
Total internal gains	313.5540	323.8028	308.9693	301.5987	287.0648	279.1412	269.1078	268.7797	276.6689	283.3423	298.7124	307.1579	(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	
South	2.5200	46.7521	0.6400	0.7000	0.7700	36.5774	(78)

Solar gains	36.5774	59.9043	76.3075	86.2440	89.8716	86.4892	84.5052	82.0663	79.7122	64.6124	43.3567	31.6062	(83)
Total gains	350.1314	383.7072	385.2767	387.8427	376.9364	365.6304	353.6130	350.8460	356.3811	347.9548	342.0691	338.7641	(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	97.8977	98.1085	98.3160	99.3026	99.4894	100.3683	100.3683	100.5328	100.0279	99.4894	99.1123	98.7210	
alpha	7.5265	7.5406	7.5544	7.6202	7.6326	7.6912	7.6912	7.7022	7.6685	7.6326	7.6075	7.5814	
util living area	0.9919	0.9826	0.9679	0.9176	0.8068	0.5988	0.4288	0.4510	0.6595	0.9008	0.9784	0.9935	(86)
MIT	20.4313	20.5530	20.6779	20.8454	20.9542	20.9957	20.9997	20.9996	20.9911	20.8864	20.6467	20.4088	(87)
Th 2	20.2871	20.2885	20.2899	20.2965	20.2977	20.3035	20.3035	20.3045	20.3013	20.2977	20.2952	20.2926	(88)
util rest of house	0.9895	0.9775	0.9583	0.8944	0.7612	0.5360	0.3612	0.3831	0.5973	0.8702	0.9711	0.9916	(89)
MIT 2	19.7753	19.8957	20.0176	20.1783	20.2690	20.3017	20.3034	20.3044	20.2971	20.2165	19.9937	19.7579	(90)
Living area fraction										fLA = Living area / (4) =		0.8717	(91)
MIT	20.3471	20.4687	20.5932	20.7599	20.8663	20.9067	20.9104	20.9104	20.9021	20.8005	20.5629	20.3253	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3471	20.4687	20.5932	20.7599	20.8663	20.9067	20.9104	20.9104	20.9021	20.8005	20.5629	20.3253	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9897	0.9789	0.9627	0.9102	0.7986	0.5905	0.4202	0.4423	0.6510	0.8928	0.9741	0.9917	(94)
Useful gains	346.5339	375.6041	370.9013	353.0280	301.0136	215.9025	148.5737	155.1653	232.0137	310.6486	333.2180	335.9381	(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	567.5048	549.4030	496.2833	413.4889	318.9805	217.5450	148.6838	155.3283	235.4332	354.9671	470.2801	565.5135	(97)
Space heating kWh	164.4023	116.7928	93.2842	43.5319	13.3674	0.0000	0.0000	0.0000	0.0000	32.9730	98.6847	170.8041	(98a)
Space heating requirement - total per year (kWh/year)												733.8404	
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	164.4023	116.7928	93.2842	43.5319	13.3674	0.0000	0.0000	0.0000	0.0000	32.9730	98.6847	170.8041	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												733.8404	
Space heating per m2											(98c) / (4) =	15.7951	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	324.2473	255.2585	261.7285	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9414	0.9806	0.9772	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	305.2325	250.3076	255.7705	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	378.9586	367.2853	365.9839	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	53.0828	87.0314	81.9988	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	13.2707	21.7579	20.4997	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												55.5283	(107)
Energy for space heating												15.7951	(99)
Energy for space cooling												1.1952	(108)
Total												16.9903	(109)
Fabric Energy Efficiency (DFEE)												17.0	(109)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	46.4600	(1b)	x 2.3000	(2b) =	106.8580	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.8580	(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) =	0.1872 (8)

Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4372	(18)
Number of sides sheltered	3	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3388	(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	0.4320	0.4235	0.4150	0.3727	0.3642	0.3219	0.3219	0.3134	0.3388	0.3642	0.3812	0.3981	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)
Effective ac	0.5933	0.5897	0.5861	0.5694	0.5663	0.5518	0.5518	0.5491	0.5574	0.5663	0.5726	0.5792	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			2.5200	1.1450	2.8855			(27)
External Wall 1	11.6800	2.5200	9.1600	0.1800	1.6488			(29a)
sheltered	15.5700	2.1000	13.4700	0.1800	2.4246			(29a)
void	4.3000		4.3000	0.1100	0.4730			(30)
Total net area of external elements Aum(A, m2)			31.5500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	9.5319			(33)
Party Wall 1			19.0000	0.0000	0.0000			(32)
Party Wall 2 to existing			22.1800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			268.2678	(35)
List of Thermal Bridges				
K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	2.9400	0.0500	0.1470	
E3 Sill	1.9400	0.0500	0.0970	
E4 Jamb	9.4000	0.0500	0.4700	
E7 Party floor between dwellings (in blocks of flats)	7.3000	0.0700	0.5110	
E7 Party floor between dwellings (in blocks of flats)	14.0000	0.0700	0.9800	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	35.8000	0.0000	0.0000	
E11 Eaves (insulation at rafter level)	3.2000	0.0400	0.1280	
E18 Party wall between dwellings	4.9800	0.0600	0.2988	
E18 Party wall between dwellings	4.9800	0.0600	0.2988	
E17 Corner (inverted - internal area greater than external area)	2.4900	-0.0900	-0.2241	
E16 Corner (normal)	2.4900	0.0900	0.2241	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			2.9306	(36)
Point Thermal bridges (36a) =			0.0000	
Total fabric heat loss (33) + (36) + (36a) =			12.4625	(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	20.9216	20.7939	20.6686	20.0805	19.9704	19.4581	19.4581	19.3632	19.6554	19.9704	20.1930	20.4258	(38)
Heat transfer coeff	33.3841	33.2564	33.1311	32.5430	32.4329	31.9206	31.9206	31.8257	32.1179	32.4329	32.6555	32.8883	(39)
Average = Sum(39)m / 12 =												32.5424	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7186	0.7158	0.7131	0.7005	0.6981	0.6871	0.6871	0.6850	0.6913	0.6981	0.7029	0.7079	(40)
HLP (average)												0.7004	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.5866	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.9783	21.6519	21.1923	20.3448	19.7102	19.0065	18.6264	19.0828	19.5798	20.3328	21.1977	21.9040	(42b)

Hot water usage for other uses

30.8787	29.7558	28.6329	27.5101	26.3872	25.2644	25.2644	26.3872	27.5101	28.6329	29.7558	30.8787	(42c)

Average daily hot water use (litres/day)	48.4489	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	52.8570	51.4077	49.8252	47.8548	46.0974	44.2708	43.8907	45.4700	47.0899	48.9657	50.9535	52.7827	(44)
Energy conte	83.7126	73.2039	76.5795	65.5109	62.0559	54.4362	53.0820	56.3014	58.0665	66.4460	72.5926	82.6450	(45)
Energy content (annual)										Total = Sum(45)m =		804.6325	

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

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 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

71.1557	62.2233	65.0926	55.6843	52.7475	46.2707	45.1197	47.8562	49.3565	56.4791	61.7037	70.2482	(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

71.1557	62.2233	65.0926	55.6843	52.7475	46.2707	45.1197	47.8562	49.3565	56.4791	61.7037	70.2482	(64)
								Total per year (kWh/year) = Sum(64)m =			683.9376	(64)
12Total per year (kWh/year)											684	(64)

Electric shower(s)

40.6999	36.2640	39.5989	37.7887	38.4978	36.7232	37.9473	38.4978	37.7887	39.5989	38.8543	40.6999	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				462.9595	(64a)

Heat gains from water heating, kWh/month

27.9639	24.6218	26.1729	23.3682	22.8113	20.7485	20.7668	21.5885	21.7863	24.0195	25.1395	27.7370	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	89.5294	99.1218	89.5294	92.5137	89.5294	92.5137	89.5294	89.5294	92.5137	89.5294	92.5137	89.5294	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	138.0513	139.4839	135.8739	128.1887	118.4876	109.3699	103.2787	101.8461	105.4561	113.1413	122.8424	131.9601	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)
Water heating gains (Table 5)													
	37.5859	36.6396	35.1786	32.4559	30.6604	28.8173	27.9123	29.0168	30.2588	32.2843	34.9160	37.2810	(72)
Total internal gains													
	311.9660	322.0447	307.3813	299.9577	285.4768	277.5003	267.5198	267.1917	275.0280	281.7543	297.0715	305.5699	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	2.5200	46.7521	0.6300	0.7000	0.7700	36.0059	(78)

Solar gains	36.0059	58.9683	75.1152	84.8965	88.4674	85.1378	83.1848	80.7840	78.4667	63.6029	42.6792	31.1124	(83)
Total gains	347.9719	381.0130	382.4965	384.8542	373.9441	362.6381	350.7046	347.9757	353.4947	345.3572	339.7507	336.6823	(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	103.7063	104.1047	104.4982	106.3869	106.7479	108.4611	108.4611	108.7844	107.7947	106.7479	106.0201	105.2699	
alpha	7.9138	7.9403	7.9665	8.0925	8.1165	8.2307	8.2307	8.2523	8.1863	8.1165	8.0680	8.0180	
util living area													
	0.9908	0.9797	0.9619	0.8999	0.7749	0.5612	0.4004	0.4205	0.6217	0.8795	0.9738	0.9926	(86)
MIT	20.4987	20.6177	20.7347	20.8879	20.9719	20.9981	20.9999	20.9998	20.9957	20.9206	20.7092	20.4845	(87)
Th 2	20.3245	20.3269	20.3293	20.3404	20.3425	20.3523	20.3523	20.3541	20.3485	20.3425	20.3383	20.3339	(88)
util rest of house													
	0.9881	0.9739	0.9511	0.8747	0.7301	0.5054	0.3415	0.3616	0.5653	0.8468	0.9655	0.9903	(89)
MIT 2	19.8741	19.9922	20.1066	20.2561	20.3253	20.3515	20.3523	20.3540	20.3465	20.2869	20.0918	19.8683	(90)
Living area fraction									fLA = Living area / (4) =			0.8717	(91)
MIT	20.4186	20.5375	20.6541	20.8068	20.8890	20.9152	20.9168	20.9170	20.9124	20.8393	20.6300	20.4054	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4186	20.5375	20.6541	20.8068	20.8890	20.9152	20.9168	20.9170	20.9124	20.8393	20.6300	20.4054	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9885	0.9759	0.9567	0.8930	0.7676	0.5539	0.3928	0.4130	0.6143	0.8721	0.9694	0.9906	(94)
Useful gains	343.9863	371.8287	365.9213	343.6840	287.0469	200.8678	137.7570	143.6995	217.1369	301.1801	329.3657	333.5133	(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													
	538.1057	520.0453	468.9423	387.4831	298.0253	201.5838	137.7953	143.7568	218.7997	332.0913	441.8290	532.9686	(97)
Space heating kWh													
	144.4248	99.6016	76.6476	31.5354	8.1679	0.0000	0.0000	0.0000	0.0000	22.9979	80.9736	148.3948	(98a)
Space heating requirement - total per year (kWh/year)												612.7436	
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													
	144.4248	99.6016	76.6476	31.5354	8.1679	0.0000	0.0000	0.0000	0.0000	22.9979	80.9736	148.3948	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												612.7436	
Space heating per m2										(98c) / (4) =		13.1886	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	300.0538	236.2125	241.8757	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9646	0.9901	0.9883	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	289.4423	233.8757	239.0430	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	377.2401	365.5919	364.2900	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	63.2144	97.9968	93.1838	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	15.8036	24.4992	23.2960	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												63.5988	(107)
Energy for space heating												13.1886	(99)
Energy for space cooling												1.3689	(108)
Total												14.5575	(109)
Fabric Energy Efficiency (TFEE)												14.6	(109)

Full SAP Calculation Printout

Property Reference	Flat 5 Block A	**Issued on Date**	13/03/2024
Assessment Reference	Design stage for ES condition	**Prop Type Ref**	
Property	Flat 3 Block A, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	84 B	**DER**	1.33	**TER**	11.06
Environmental	99 A	**% DER < TER**			87.97
CO_2 Emissions (t/year)	0.06	**DFEE**	16.99	**TFEE**	14.56
Compliance Check	See BREL	**% DFEE < TFEE**			-16.71
% DPER < TPER	57.75	**DPER**	24.83	**TPER**	58.77

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	46.4600	(1b)	x 2.3000	(2b) =	106.8580	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.8580	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(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) =	81.0000	(23c)

Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			2.5200	1.1450	2.8855			(27)
External Wall 1	11.6800	2.5200	9.1600	0.1300	1.1908	70.0000	641.2000	(29a)
sheltered	15.5700	2.1000	13.4700	0.1300	1.7511	70.0000	942.9000	(29a)
void	4.3000		4.3000	0.1043	0.4483	9.0000	38.7000	(30)
Total net area of external elements Aum(A, m2)			31.5500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		9.2157			(33)
Party Wall 1			19.0000	0.0000	0.0000	180.0000	3420.0000	(32)
Party Wall 2 to existing			22.1800	0.0000	0.0000	180.0000	3992.4000	(32)
Party Floor 1			46.4600			30.0000	1393.8000	(32d)
Party Ceiling 1			62.8800			20.0000	1257.6000	(32b)
Internal Wall 1			16.4800			9.0000	148.3200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 11834.9200	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	254.7335	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	2.9400	0.0600	0.1764
E3 Sill	1.9400	0.0400	0.0776
E4 Jamb	9.4000	0.0200	0.1880
E7 Party floor between dwellings (in blocks of flats)	7.3000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	14.0000	0.2000	2.8000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	35.8000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	3.2000	0.1500	0.4800
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E17 Corner (inverted - internal area greater than external area)	2.4900	0.0000	0.0000
E16 Corner (normal)	2.4900	0.1800	0.4482

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5606 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 15.7763 (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	8.5767	8.4742	8.3717	7.8593	7.7568	7.2444	7.2444	7.1419	7.4493	7.7568	7.9618	8.1667	(38)
Heat transfer coeff	24.3530	24.2505	24.1480	23.6356	23.5331	23.0207	23.0207	22.9182	23.2257	23.5331	23.7381	23.9431	(39)
Average = Sum(39)m / 12 =												23.6100	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5242	0.5220	0.5198	0.5087	0.5065	0.4955	0.4955	0.4933	0.4999	0.5065	0.5109	0.5153	(40)
HLP (average)												0.5082	
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 1.5866 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	76.2330	75.0873	73.4179	70.2238	67.8666	65.2379	63.7438	65.4006	67.2167	70.0391	73.3018	75.9409	(42a)
Hot water usage for baths	21.9783	21.6519	21.1923	20.3448	19.7102	19.0065	18.6264	19.0828	19.5798	20.3328	21.1977	21.9040	(42b)
Hot water usage for other uses	30.8787	29.7558	28.6329	27.5101	26.3872	25.2644	25.2644	26.3872	27.5101	28.6329	29.7558	30.8787	(42c)
Average daily hot water use (litres/day)												118.7332	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.0900	126.4951	123.2432	118.0787	113.9640	109.5088	107.6345	110.8706	114.3066	119.0048	124.2554	128.7236	(44)
Energy conte	204.4470	180.1273	189.4201	161.6438	153.4175	134.6538	130.1746	137.2809	140.9514	161.4884	177.0246	201.5501	(45)
Energy content (annual)										Total = Sum(45)m =		1972.1795	
Distribution loss (46)m = 0.15 x (45)m	30.6670	27.0191	28.4130	24.2466	23.0126	20.1981	19.5262	20.5921	21.1427	24.2233	26.5537	30.2325	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.5400	(55)
Total storage loss	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(56)
If cylinder contains dedicated solar storage	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(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	244.4494	216.2585	229.4225	200.3558	193.4199	173.3658	170.1770	177.2833	179.6634	201.4908	215.7366	241.5525	(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	244.4494	216.2585	229.4225	200.3558	193.4199	173.3658	170.1770	177.2833	179.6634	201.4908	215.7366	241.5525	(64)
										Total per year (kWh/year) = Sum(64)m =		2443.1755	(64)
12Total per year (kWh/year)												2443	(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	99.9805	88.7973	94.9841	84.7162	83.0132	75.7420	75.2850	77.6478	77.8359	85.6968	89.8303	99.0173	(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	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	91.1174	100.8799	91.1174	94.1546	91.1174	94.1546	91.1174	91.1174	94.1546	91.1174	94.1546	91.1174	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	138.0513	139.4839	135.8739	128.1887	118.4876	109.3699	103.2787	101.8461	105.4561	113.1413	122.8424	131.9601	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)
Water heating gains (Table 5)	134.3824	132.1388	127.6668	117.6613	111.5769	105.1972	101.1895	104.3654	108.1055	115.1839	124.7643	133.0878	(72)
Total internal gains	410.3505	419.3020	401.4575	386.8041	367.9813	355.5211	342.3850	344.1283	354.5156	366.2419	388.5607	402.9647	(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	
South	2.5200	46.7521	0.6400	0.7000	0.7700	36.5774	(78)

Solar gains	36.5774	59.9043	76.3075	86.2440	89.8716	86.4892	84.5052	82.0663	79.7122	64.6124	43.3567	31.6062	(83)
Total gains	446.9279	479.2064	477.7650	473.0481	457.8529	442.0103	426.8902	426.1946	434.2278	430.8544	431.9174	434.5709	(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	134.9928	135.5632	136.1386	139.0900	139.6958	142.8052	142.8052	143.4438	141.5450	139.6958	138.4895	137.3040	
alpha	9.9995	10.0375	10.0759	10.2727	10.3131	10.5203	10.5203	10.5629	10.4363	10.3131	10.2326	10.1536	
util living area	0.8606	0.7932	0.7241	0.6032	0.4779	0.3333	0.2373	0.2474	0.3691	0.5673	0.7519	0.8712	(86)
Living	20.9435	20.9735	20.9892	20.9983	20.9999	21.0000	21.0000	21.0000	21.0000	20.9992	20.9866	20.9394	
Non living	20.4531	20.4802	20.4948	20.5117	20.5148	20.5250	20.5250	20.5270	20.5209	20.5144	20.5010	20.4576	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.9711	20.9735	20.9892	20.9983	20.9999	21.0000	21.0000	21.0000	21.0000	20.9992	20.9866	20.9479	(87)
Th 2	20.4987	20.5007	20.5028	20.5128	20.5149	20.5250	20.5250	20.5270	20.5209	20.5149	20.5108	20.5068	(88)
util rest of house	0.8428	0.7728	0.7013	0.5793	0.4530	0.3086	0.2117	0.2219	0.3434	0.5411	0.7282	0.8543	(89)
MIT 2	20.4754	20.4802	20.4948	20.5117	20.5148	20.5250	20.5250	20.5270	20.5209	20.5144	20.5010	20.4645	(90)
Living area fraction										fLA = Living area / (4) =		0.8717	(91)
MIT	20.9075	20.9103	20.9258	20.9359	20.9376	20.9391	20.9391	20.9393	20.9385	20.9370	20.9243	20.8859	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.9075	20.9103	20.9258	20.9359	20.9376	20.9391	20.9391	20.9393	20.9385	20.9370	20.9243	20.8859	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8574	0.7896	0.7207	0.6001	0.4747	0.3301	0.2340	0.2441	0.3658	0.5639	0.7483	0.8675	(94)
Useful gains	383.2029	378.3778	344.3196	283.8636	217.3376	145.9288	99.8882	104.0332	158.8268	242.9701	323.1958	376.9702	(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	404.4422	388.2568	348.3538	284.4763	217.3903	145.9296	99.8883	104.0332	158.8296	243.2621	328.1634	399.5105	(97)
Space heating kWh	15.8020	6.6387	3.0015	0.4411	0.0392	0.0000	0.0000	0.0000	0.0000	0.2172	3.5766	16.7700	(98a)
Space heating requirement - total per year (kWh/year)												46.4863	
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	15.8020	6.6387	3.0015	0.4411	0.0392	0.0000	0.0000	0.0000	0.0000	0.2172	3.5766	16.7700	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												46.4863	
Space heating per m2											(98c) / (4) =	1.0006	(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 %) 193.2228 (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	15.8020	6.6387	3.0015	0.4411	0.0392	0.0000	0.0000	0.0000	0.0000	0.2172	3.5766	16.7700	(98)
Space heating efficiency (main heating system 1)	193.2228	193.2228	193.2228	193.2228	193.2228	0.0000	0.0000	0.0000	0.0000	193.2228	193.2228	193.2228	(210)
Space heating fuel (main heating system)	8.1781	3.4358	1.5534	0.2283	0.0203	0.0000	0.0000	0.0000	0.0000	0.1124	1.8510	8.6791	(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	244.4494	216.2585	229.4225	200.3558	193.4199	173.3658	170.1770	177.2833	179.6634	201.4908	215.7366	241.5525	(64)
Efficiency of water heater												202.3693	(216)
(217)m	202.3693	202.3693	202.3693	202.3693	202.3693	202.3693	202.3693	202.3693	202.3693	202.3693	202.3693	202.3693	(217)
Fuel for water heating, kWh/month	120.7937	106.8633	113.3682	99.0050	95.5777	85.6680	84.0923	87.6039	88.7800	99.5659	106.6054	119.3622	(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	6.6987	6.0504	6.6987	6.4826	6.6987	6.4826	6.6987	6.6987	6.4826	6.6987	6.4826	6.6987	(231)
Lighting	24.0417	19.2872	17.3660	12.7231	9.8277	8.0293	8.9651	11.6532	15.1363	19.8597	22.4315	24.7099	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.5201	-30.5718	-51.7937	-65.9637	-76.5965	-73.3091	-71.9762	-65.3822	-53.1199	-37.9560	-21.5706	-15.3428	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.7760	-15.0059	-37.9148	-69.6843	-102.8206	-107.5549	-104.6375	-81.3286	-50.8769	-23.7186	-8.2719	-4.2810	(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												24.0584	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												202.3693	

Water heating fuel used	1207.2854	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)		
mechanical ventilation fans (SFP = 0.6050)	78.8719	(230a)
Total electricity for the above, kWh/year	78.8719	(231)
Electricity for lighting (calculated in Appendix L)	194.0307	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1193.9737	(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	310.2727	(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	24.0584	0.1607	3.8652	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1207.2854	0.1410	170.2584	(264)
Space and water heating			174.1236	(265)
Pumps, fans and electric keep-hot	78.8719	0.1387	10.9405	(267)
Energy for lighting	194.0307	0.1443	28.0046	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-582.1026	0.1321	-76.8882	
PV Unit electricity exported	-611.8711	0.1213	-74.2458	
Total			-151.1340	(269)
Total CO2, kg/year			61.9347	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.3300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	24.0584	1.5946	38.3639	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1207.2854	1.5215	1836.8471	(278)
Space and water heating			1875.2110	(279)
Pumps, fans and electric keep-hot	78.8719	1.5128	119.3174	(281)
Energy for lighting	194.0307	1.5338	297.6107	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-582.1026	1.4880	-866.1893	
PV Unit electricity exported	-611.8711	0.4452	-272.3989	
Total			-1138.5882	(283)
Total Primary energy kWh/year			1153.5509	(286)
Dwelling Primary energy Rate (DPER)			24.8300	(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	46.4600 (1b)	x	2.3000 (2b)	=	106.8580	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 46.4600						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.8580	(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) =	0.1872	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4372	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3388	(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													
	0.4320	0.4235	0.4150	0.3727	0.3642	0.3219	0.3219	0.3134	0.3388	0.3642	0.3812	0.3981	(22b)
Effective ac	0.5933	0.5897	0.5861	0.5694	0.5663	0.5518	0.5518	0.5491	0.5574	0.5663	0.5726	0.5792	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			2.5200	1.1450	2.8855			(27)
External Wall 1	11.6800	2.5200	9.1600	0.1800	1.6488			(29a)
sheltered	15.5700	2.1000	13.4700	0.1800	2.4246			(29a)
void	4.3000		4.3000	0.1100	0.4730			(30)
Total net area of external elements Aum(A, m2)			31.5500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	9.5319			(33)
Party Wall 1			19.0000	0.0000	0.0000			(32)
Party Wall 2 to existing			22.1800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 268.2678 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	2.9400	0.0500	0.1470
E3 Sill	1.9400	0.0500	0.0970
E4 Jamb	9.4000	0.0500	0.4700
E7 Party floor between dwellings (in blocks of flats)	7.3000	0.0700	0.5110
E7 Party floor between dwellings (in blocks of flats)	14.0000	0.0700	0.9800
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	35.8000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	3.2000	0.0400	0.1280
E18 Party wall between dwellings	4.9800	0.0600	0.2988
E18 Party wall between dwellings	4.9800	0.0600	0.2988
E17 Corner (inverted - internal area greater than external area)	2.4900	-0.0900	-0.2241
E16 Corner (normal)	2.4900	0.0900	0.2241

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 2.9306 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 12.4625 (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	20.9216	20.7939	20.6686	20.0805	19.9704	19.4581	19.4581	19.3632	19.6554	19.9704	20.1930	20.4258	(38)
Heat transfer coeff													
	33.3841	33.2564	33.1311	32.5430	32.4329	31.9206	31.9206	31.8257	32.1179	32.4329	32.6555	32.8883	(39)
Average = Sum(39)m / 12 =												32.5424	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7186	0.7158	0.7131	0.7005	0.6981	0.6871	0.6871	0.6850	0.6913	0.6981	0.7029	0.7079	(40)
HLP (average)												0.7004	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.5866 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	50.8220	50.0582	48.9453	46.8159	45.2444	43.4920	42.4958	43.6004	44.8111	46.6927	48.8679	50.6273	(42a)
Hot water usage for baths													
	21.9783	21.6519	21.1923	20.3448	19.7102	19.0065	18.6264	19.0828	19.5798	20.3328	21.1977	21.9040	(42b)
Hot water usage for other uses													
	30.8787	29.7558	28.6329	27.5101	26.3872	25.2644	25.2644	26.3872	27.5101	28.6329	29.7558	30.8787	(42c)
Average daily hot water use (litres/day)												95.3051	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	103.6790	101.4660	98.7705	94.6707	91.3418	87.7628	86.3866	89.0704	91.9010	95.6584	99.8214	103.4100	(44)
Energy conte	164.2022	144.4862	151.8066	129.5995	122.9636	107.9146	104.4771	110.2878	113.3231	129.8076	142.2139	161.9150	(45)
Energy content (annual)										Total = Sum(45)m =		1582.9972	
Distribution loss (46)m = 0.15 x (45)m													
	24.6303	21.6729	22.7710	19.4399	18.4445	16.1872	15.6716	16.5432	16.9985	19.4711	21.3321	24.2873	(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													
	210.7971	186.5719	198.4015	174.6913	169.5585	153.0064	151.0720	156.8827	158.4150	176.4025	187.3058	208.5099	(62)
WWHRS	-23.2337	-20.5481	-21.5168	-17.8167	-16.6045	-14.2086	-13.3183	-14.1627	-14.7008	-17.3306	-19.6335	-22.8034	(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													
	187.5634	166.0238	176.8848	156.8746	152.9540	138.7978	137.7537	142.7200	143.7142	159.0719	167.6723	185.7065	(64)
										Total per year (kWh/year) = Sum(64)m =		1915.7368	(64)
12Total per year (kWh/year)												1916	(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													
	91.8731	81.7102	87.7516	79.1653	78.1613	71.9551	72.0146	73.9466	73.7534	80.4370	83.3596	91.1127	(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	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	79.3314	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	89.5294	99.1218	89.5294	92.5137	89.5294	92.5137	89.5294	89.5294	92.5137	89.5294	92.5137	89.5294	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	138.0513	139.4839	135.8739	128.1887	118.4876	109.3699	103.2787	101.8461	105.4561	113.1413	122.8424	131.9601	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	30.9331	(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)													
	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	-63.4651	(71)
Water heating gains (Table 5)													
	123.4854	121.5926	117.9457	109.9518	105.0555	99.9376	96.7938	99.3906	102.4353	108.1142	115.7772	122.4633	(72)
Total internal gains													
	400.8655	409.9977	393.1484	380.4537	362.8719	348.6206	336.4012	337.5655	347.2045	360.5843	380.9328	393.7522	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	2.5200	46.7521	0.6300	0.7000	0.7700	36.0059	(78)

Solar gains	36.0059	58.9683	75.1152	84.8965	88.4674	85.1378	83.1848	80.7840	78.4667	63.6029	42.6792	31.1124	(83)
Total gains	436.8714	468.9660	468.2636	465.3501	451.3393	433.7584	419.5860	418.3495	425.6712	424.1871	423.6120	424.8646	(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	103.7063	104.1047	104.4982	106.3869	106.7479	108.4611	108.4611	108.7844	107.7947	106.7479	106.0201	105.2699	
alpha	7.9138	7.9403	7.9665	8.0925	8.1165	8.2307	8.2307	8.2523	8.1863	8.1165	8.0680	8.0180	
util living area													
	0.9646	0.9376	0.8995	0.8030	0.6597	0.4705	0.3347	0.3499	0.5194	0.7662	0.9179	0.9690	(86)
MIT	20.6792	20.7743	20.8604	20.9525	20.9908	20.9995	21.0000	21.0000	20.9988	20.9710	20.8462	20.6675	(87)
Th 2	20.6407	20.6421	20.6434	20.6498	20.6510	20.6565	20.6565	20.6575	20.6543	20.6510	20.6486	20.6461	(88)
util rest of house													
	0.9602	0.9305	0.8888	0.7858	0.6367	0.4454	0.3086	0.3239	0.4938	0.7454	0.9081	0.9651	(89)
MIT 2	20.3437	20.4367	20.5198	20.6103	20.6440	20.6561	20.6565	20.6575	20.6536	20.6278	20.5120	20.3371	(90)
Living area fraction									fLA = Living area / (4) =			0.8717	(91)
MIT	20.6362	20.7310	20.8167	20.9086	20.9463	20.9554	20.9559	20.9560	20.9545	20.9270	20.8033	20.6251	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.6362	20.7310	20.8167	20.9086	20.9463	20.9554	20.9559	20.9560	20.9545	20.9270	20.8033	20.6251	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9601	0.9324	0.8941	0.7986	0.6562	0.4672	0.3314	0.3466	0.5161	0.7620	0.9125	0.9648	(94)
Useful gains	419.4367	437.2428	418.6767	371.6401	296.1499	202.6617	139.0327	144.9838	219.6703	323.2152	386.5457	409.9275	(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													
	545.3693	526.4812	474.3281	390.7964	299.8843	202.8694	139.0432	144.9989	220.1526	334.9331	447.4891	540.1934	(97)
Space heating kWh													
	93.6938	59.9682	41.4046	13.7925	2.7784	0.0000	0.0000	0.0000	0.0000	8.7181	43.8792	96.9179	(98a)
Space heating requirement - total per year (kWh/year)												361.1528	
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													
	93.6938	59.9682	41.4046	13.7925	2.7784	0.0000	0.0000	0.0000	0.0000	8.7181	43.8792	96.9179	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												361.1528	
Space heating per m2											(98c) / (4) =	7.7734	(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													
	93.6938	59.9682	41.4046	13.7925	2.7784	0.0000	0.0000	0.0000	0.0000	8.7181	43.8792	96.9179	(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)													
	101.5101	64.9710	44.8588	14.9431	3.0102	0.0000	0.0000	0.0000	0.0000	9.4454	47.5398	105.0031	(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													
	187.5634	166.0238	176.8848	156.8746	152.9540	138.7978	137.7537	142.7200	143.7142	159.0719	167.6723	185.7065	(64)
Efficiency of water heater												79.8000	(216)
(217)m	82.5884	82.0055	81.3642	80.4590	79.9446	79.8000	79.8000	79.8000	79.8000	80.2225	81.5136	82.6734	(217)
Fuel for water heating, kWh/month													
	227.1062	202.4546	217.3989	194.9745	191.3251	173.9321	172.6236	178.8471	180.0929	198.2885	205.6986	224.6268	(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	18.6024	14.9236	13.4370	9.8445	7.6042	6.2127	6.9368	9.0167	11.7118	15.3666	17.3565	19.1195	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-16.1018	-23.5804	-35.1900	-41.1359	-45.7435	-43.2384	-42.7673	-39.7353	-34.5478	-27.7278	-18.0335	-13.8243	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.5737	-14.0684	-28.4043	-43.2978	-57.8521	-58.3129	-57.5691	-48.4114	-35.0893	-20.2604	-8.8259	-5.1760	(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	391.2815	(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	2367.3689	(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)	150.1323	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-765.4673	(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	2229.3154	(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	391.2815	0.2100	82.1691	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2367.3689	0.2100	497.1475	(264)
Space and water heating			579.3166	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	150.1323	0.1443	21.6687	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-381.6261	0.1338	-51.0505	
PV Unit electricity exported	-383.8412	0.1255	-48.1665	
Total			-99.2169	(269)
Total CO2, kg/year			513.6976	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.0600	(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	391.2815	1.1300	442.1481	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2367.3689	1.1300	2675.1268	(278)
Space and water heating			3117.2750	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	150.1323	1.5338	230.2780	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-381.6261	1.4943	-570.2825	
PV Unit electricity exported	-383.8412	0.4606	-176.7971	
Total			-747.0796	(283)
Total Primary energy kWh/year			2730.5741	(286)
Target Primary Energy Rate (TPER)			58.7700	(287)

Full SAP Calculation Printout

Property Reference	Flat 6 Block A	**Issued on Date**	13/03/2024
Assessment Reference	Design stage for ES condition	**Prop Type Ref**	
Property	Flat 6 Block A, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	87 B	**DER**	0.07	**TER**	11.55
Environmental	100 A	**% DER < TER**			99.39
CO_2 Emissions (t/year)	-0.02	**DFEE**	21.96	**TFEE**	26.19
Compliance Check	See BREL	**% DFEE < TFEE**			16.15
% DPER < TPER	80.26	**DPER**	12.02	**TPER**	60.89

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.8800	(1b)	x 2.3000	(2b) =	144.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	144.6240	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(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) =												81.0000	(23c)
Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
External Wall 1	50.8300	6.9800	43.8500	0.1300	5.7005	70.0000	3069.5000	(29a)
sheltered	8.9700	2.1000	6.8700	0.1300	0.8931	70.0000	480.9000	(29a)
void above	4.3000		4.3000	0.1043	0.4483	9.0000	38.7000	(30)
flat balcony above	13.1100		13.1100	0.1100	1.4421	9.0000	117.9900	(30)
Total net area of external elements Aum(A, m2)			77.2100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4164			(33)
Party Wall 1			19.3200	0.0000	0.0000	180.0000	3477.6000	(32)
Party Floor 1			62.8800			30.0000	1886.4000	(32d)
Party Ceiling 1			49.7700			20.0000	995.4000	(32b)
Internal Wall 1			99.6800			9.0000	897.1200	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		10963.6100	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							174.3577	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6500	0.0600	0.3390
E3 Sill	4.6500	0.0400	0.1860
E4 Jamb	19.2000	0.0200	0.3840
E7 Party floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	8.0000	0.2000	1.6000
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E16 Corner (normal)	2.4900	0.0500	0.1245
E16 Corner (normal)	2.4900	0.1800	0.4482
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.0000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	2.7000	0.1500	0.4050
E15 Flat roof with parapet	7.3000	0.3000	2.1900

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8719 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 26.2883 (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	11.6078	11.4691	11.3304	10.6369	10.4982	9.8047	9.8047	9.6660	10.0821	10.4982	10.7756	11.0530	(38)
Heat transfer coeff	37.8961	37.7574	37.6187	36.9252	36.7865	36.0930	36.0930	35.9543	36.3704	36.7865	37.0639	37.3413	(39)
Average = Sum(39)m / 12 =												36.8905	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6027	0.6005	0.5983	0.5872	0.5850	0.5740	0.5740	0.5718	0.5784	0.5850	0.5894	0.5939	(40)
HLP (average)												0.5867	
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 2.0618 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	88.1834	86.8581	84.9270	81.2322	78.5055	75.4647	73.7363	75.6528	77.7537	81.0185	84.7927	87.8455	(42a)
Hot water usage for baths	25.4044	25.0271	24.4958	23.5162	22.7826	21.9692	21.5299	22.0575	22.6319	23.5023	24.5021	25.3185	(42b)
Hot water usage for other uses	35.7447	34.4449	33.1451	31.8453	30.5455	29.2457	29.2457	30.5455	31.8453	33.1451	34.4449	35.7447	(42c)
Average daily hot water use (litres/day)												137.3512	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.3325	146.3301	142.5679	136.5936	131.8336	126.6796	124.5119	128.2558	132.2309	137.6659	143.7397	148.9087	(44)
Energy conte	236.5061	208.3722	219.1216	186.9899	177.4734	155.7674	150.5864	158.8075	163.0539	186.8114	204.7836	233.1551	(45)
Energy content (annual)										Total = Sum(45)m =		2281.4282	
Distribution loss (46)m = 0.15 x (45)m	35.4759	31.2558	32.8682	28.0485	26.6210	23.3651	22.5880	23.8211	24.4581	28.0217	30.7175	34.9733	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.5400	(55)
Total storage loss	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(56)
If cylinder contains dedicated solar storage	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(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	276.5085	244.5034	259.1240	225.7019	217.4758	194.4794	190.5888	198.8099	201.7659	226.8138	243.4956	273.1575	(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	276.5085	244.5034	259.1240	225.7019	217.4758	194.4794	190.5888	198.8099	201.7659	226.8138	243.4956	273.1575	(64)
										Total per year (kWh/year) = Sum(64)m =		2752.4242	(64)
12Total per year (kWh/year)												2752	(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	110.6402	98.1887	104.8598	93.1437	91.0118	82.7623	82.0719	84.8054	85.1850	94.1167	99.0601	109.5260	(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	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	102.5991	113.5918	102.5991	106.0191	102.5991	106.0191	102.5991	102.5991	106.0191	102.5991	106.0191	102.5991	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.1476	182.0169	177.3062	167.2776	154.6182	142.7202	134.7716	132.9023	137.6130	147.6416	160.3010	172.1990	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)
Water heating gains (Table 5)	148.7100	146.1141	140.9406	129.3663	122.3277	114.9476	110.3117	113.9858	118.3125	126.5009	137.5835	147.2123	(72)
Total internal gains	485.3833	495.6496	474.7726	456.5896	433.4718	417.6136	401.6091	403.4139	415.8714	430.6684	457.8303	475.9371	(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	4.3800	10.6334	0.7200	0.7000	0.7700	16.2671	(74)
South	2.6000	46.7521	0.7200	0.7000	0.7700	42.4559	(78)

Solar gains	58.7230	100.6190	141.3960	184.9548	218.6162	222.7518	212.3275	185.8912	156.0356	112.0019	70.3922	50.2468	(83)
Total gains	544.1063	596.2687	616.1686	641.5445	652.0880	640.3654	613.9366	589.3051	571.9069	542.6703	528.2226	526.1840	(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	80.3630	80.6582	80.9556	82.4761	82.7870	84.3778	84.3778	84.7033	83.7342	82.7870	82.1674	81.5570	
alpha	6.3575	6.3772	6.3970	6.4984	6.5191	6.6252	6.6252	6.6469	6.5823	6.5191	6.4778	6.4371	
util living area	0.9200	0.8726	0.8069	0.6749	0.5209	0.3605	0.2586	0.2806	0.4377	0.6820	0.8552	0.9287	(86)
Living	20.6589	20.7741	20.8753	20.9642	20.9937	20.9996	21.0000	20.9999	20.9984	20.9677	20.8358	20.6416	
Non living	20.1267	20.2353	20.3287	20.4143	20.4393	20.4532	20.4534	20.4554	20.4486	20.4200	20.3028	20.1177	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.8255	20.7741	20.8753	20.9642	20.9937	20.9996	21.0000	20.9999	20.9984	20.9677	20.8358	20.6917	(87)
Th 2	20.4276	20.4296	20.4316	20.4415	20.4435	20.4535	20.4535	20.4555	20.4495	20.4435	20.4395	20.4355	(88)
util rest of house	0.9088	0.8571	0.7859	0.6479	0.4907	0.3298	0.2265	0.2474	0.4032	0.6506	0.8360	0.9185	(89)
MIT 2	20.2737	20.2353	20.3287	20.4143	20.4393	20.4532	20.4534	20.4554	20.4486	20.4200	20.3028	20.1622	(90)
Living area fraction									fLA = Living area / (4) =			0.3639	(91)
MIT	20.4745	20.4313	20.5276	20.6144	20.6410	20.6520	20.6523	20.6536	20.6486	20.6193	20.4967	20.3549	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4745	20.4313	20.5276	20.6144	20.6410	20.6520	20.6523	20.6536	20.6486	20.6193	20.4967	20.3549	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9098	0.8571	0.7896	0.6564	0.5015	0.3409	0.2382	0.2595	0.4157	0.6607	0.8380	0.9169	(94)
Useful gains	495.0248	511.0888	486.4964	421.0811	327.0153	218.3196	146.2515	152.9191	237.7400	358.5331	442.6636	482.4829	(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	612.9503	586.4235	527.6997	432.5552	328.9078	218.4353	146.2598	152.9336	238.1760	368.5760	496.5349	603.2444	(97)
Space heating kWh	87.7366	50.6250	30.6553	8.2614	1.4081	0.0000	0.0000	0.0000	0.0000	7.4719	38.7873	89.8466	(98a)
Space heating requirement - total per year (kWh/year)												314.7921	
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	87.7366	50.6250	30.6553	8.2614	1.4081	0.0000	0.0000	0.0000	0.0000	7.4719	38.7873	89.8466	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												314.7921	
Space heating per m2											(98c) / (4) =	5.0062	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	266.1549	(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	87.7366	50.6250	30.6553	8.2614	1.4081	0.0000	0.0000	0.0000	0.0000	7.4719	38.7873	89.8466	(98)
Space heating efficiency (main heating system 1)	266.1549	266.1549	266.1549	266.1549	266.1549	0.0000	0.0000	0.0000	0.0000	266.1549	266.1549	266.1549	(210)
Space heating fuel (main heating system)	32.9645	19.0209	11.5178	3.1040	0.5290	0.0000	0.0000	0.0000	0.0000	2.8074	14.5732	33.7573	(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	276.5085	244.5034	259.1240	225.7019	217.4758	194.4794	190.5888	198.8099	201.7659	226.8138	243.4956	273.1575	(64)
Efficiency of water heater												266.5825	(216)
(217)m	266.5825	266.5825	266.5825	266.5825	266.5825	266.5825	266.5825	266.5825	266.5825	266.5825	266.5825	266.5825	(217)
Fuel for water heating, kWh/month	103.7234	91.7177	97.2022	84.6649	81.5792	72.9528	71.4934	74.5772	75.6861	85.0820	91.3397	102.4664	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.0662	8.1888	9.0662	8.7737	9.0662	8.7737	9.0662	9.0662	8.7737	9.0662	8.7737	9.0662	(231)
Lighting	26.7372	21.4495	19.3129	14.1495	10.9295	8.9295	9.9702	12.9597	16.8333	22.0863	24.9464	27.4803	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.7397	-40.3210	-67.1330	-83.6352	-95.4532	-90.7462	-89.1113	-81.5625	-67.2460	-49.1589	-28.5637	-20.5324	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.3772	-21.8041	-55.1449	-101.2608	-149.1026	-155.7818	-151.6233	-118.4128	-74.5076	-34.9072	-12.1134	-6.2159	(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												118.2740	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	266.5825	
Water heating fuel used	1032.4851	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)		
mechanical ventilation fans (SFP = 0.6050)	106.7470	(230a)
Total electricity for the above, kWh/year	106.7470	(231)
Electricity for lighting (calculated in Appendix L)	215.7842	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1627.4546	(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	-154.1643	(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	118.2740	0.1588	18.7773	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1032.4851	0.1411	145.6712	(264)
Space and water heating			164.4484	(265)
Pumps, fans and electric keep-hot	106.7470	0.1387	14.8071	(267)
Energy for lighting	215.7842	0.1443	31.1443	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-738.2030	0.1325	-97.7803	
PV Unit electricity exported	-889.2515	0.1214	-107.9215	
Total			-205.7019	(269)
Total CO2, kg/year			4.6980	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			0.0700	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	118.2740	1.5877	187.7790	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1032.4851	1.5217	1571.1340	(278)
Space and water heating			1758.9131	(279)
Pumps, fans and electric keep-hot	106.7470	1.5128	161.4868	(281)
Energy for lighting	215.7842	1.5338	330.9770	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-738.2030	1.4894	-1099.5003	
PV Unit electricity exported	-889.2515	0.4453	-395.9557	
Total			-1495.4559	(283)
Total Primary energy kWh/year			755.9210	(286)
Dwelling Primary energy Rate (DPER)			12.0200	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		62.8800 (1b)	x	2.3000 (2b)	=	144.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	144.6240	(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) =	0.1383	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3883	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3009 (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	0.3837	0.3762	0.3686	0.3310	0.3235	0.2859	0.2859	0.2784	0.3009	0.3235	0.3385	0.3536	(22b)
Effective ac	0.5736	0.5707	0.5679	0.5548	0.5523	0.5409	0.5409	0.5387	0.5453	0.5523	0.5573	0.5625	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
External Wall 1	50.8300	6.9800	43.8500	0.1800	7.8930			(29a)
sheltered	8.9700	2.1000	6.8700	0.1800	1.2366			(29a)
void above	4.3000		4.3000	0.1100	0.4730			(30)
flat balcony above	13.1100		13.1100	0.1100	1.4421			(30)
Total net area of external elements Aum(A, m2)			77.2100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.1371			(33)
Party Wall 1			19.3200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 182.2727 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	5.6500	0.0500	0.2825
E3	Sill	4.6500	0.0500	0.2325
E4	Jamb	19.2000	0.0500	0.9600
E7	Party floor between dwellings (in blocks of flats)	16.0000	0.0700	1.1200
E7	Party floor between dwellings (in blocks of flats)	8.0000	0.0700	0.5600
E18	Party wall between dwellings	4.9800	0.0600	0.2988
E16	Corner (normal)	2.4900	0.0900	0.2241
E16	Corner (normal)	2.4900	0.0900	0.2241
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	34.0000	0.0000	0.0000
E11	Eaves (insulation at rafter level)	2.7000	0.0400	0.1080
E15	Flat roof with parapet	7.3000	0.5600	4.0880

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.0980 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 29.2351 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.3758	27.2394	27.1057	26.4777	26.3602	25.8132	25.8132	25.7119	26.0239	26.3602	26.5979	26.8464	(38)
Heat transfer coeff	56.6109	56.4745	56.3408	55.7127	55.5952	55.0483	55.0483	54.9470	55.2589	55.5952	55.8329	56.0815	(39)
Average = Sum(39)m / 12 =												55.7122	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9003	0.8981	0.8960	0.8860	0.8841	0.8754	0.8754	0.8738	0.8788	0.8841	0.8879	0.8919	(40)
HLP (average)												0.8860	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0618 (42)

Hot water usage for mixer showers

58.7889	57.9054	56.6180	54.1548	52.3370	50.3098	49.1576	50.4352	51.8358	54.0124	56.5285	58.5637	(42a)

Hot water usage for baths

25.4044	25.0271	24.4958	23.5162	22.7826	21.9692	21.5299	22.0575	22.6319	23.5023	24.5021	25.3185	(42b)

Hot water usage for other uses

35.7447	34.4449	33.1451	31.8453	30.5455	29.2457	29.2457	30.5455	31.8453	33.1451	34.4449	35.7447	(42c)

Average daily hot water use (litres/day) 110.2505 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	119.9380	117.3774	114.2589	109.5162	105.6651	101.5247	99.9331	103.0382	106.3130	110.6597	115.4755	119.6269	(44)
Energy conte	189.9525	167.1439	175.6117	149.9223	142.2455	124.8365	120.8605	127.5828	131.0946	150.1642	164.5160	187.3068	(45)
Energy content (annual)										Total = Sum(45)m =		1831.2372	
Distribution loss (46)m = 0.15 x (45)m	28.4929	25.0716	26.3418	22.4883	21.3368	18.7255	18.1291	19.1374	19.6642	22.5246	24.6774	28.0960	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	236.5474	209.2296	222.2066	195.0141	188.8404	169.9283	167.4554	174.1777	176.1864	196.7591	209.6078	233.9017	(62)
WWHRS	-26.8758	-23.7692	-24.8897	-20.6097	-19.2075	-16.4360	-15.4061	-16.3829	-17.0053	-20.0474	-22.7113	-26.3781	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	209.6716	185.4604	197.3168	174.4044	169.6329	153.4924	152.0492	157.7948	159.1811	176.7117	186.8966	207.5236	(64)
										Total per year (kWh/year) = Sum(64)m =		2130.1356	(64)
12Total per year (kWh/year)												2130	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	100.4351	89.2439	95.6668	85.9226	84.5726	77.5816	77.4620	79.6972	79.6624	87.2055	90.7750	99.5554	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	102.5991	113.5918	102.5991	106.0191	102.5991	106.0191	102.5991	102.5991	106.0191	102.5991	106.0191	102.5991	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	180.1476	182.0169	177.3062	167.2776	154.6182	142.7202	134.7716	132.9023	137.6130	147.6416	160.3010	172.1990	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)
Water heating gains (Table 5)													
	134.9934	132.8034	128.5844	119.3370	113.6728	107.7522	104.1156	107.1199	110.6422	117.2117	126.0764	133.8111	(72)
Total internal gains													
	474.6668	485.3390	465.4164	449.5603	427.8168	410.4183	395.4131	396.5480	408.2011	424.3792	449.3232	465.5358	(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	4.3800	10.6334	0.6300	0.7000	0.7700	14.2337	(74)
South	2.6000	46.7521	0.6300	0.7000	0.7700	37.1489	(78)

Solar gains	51.3826	88.0417	123.7215	161.8355	191.2892	194.9078	185.7865	162.6548	136.5311	98.0016	61.5932	43.9660	(83)
Total gains	526.0494	573.3806	589.1379	611.3958	619.1060	605.3261	581.1996	559.2028	544.7322	522.3808	510.9164	509.5018	(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	56.2383	56.3741	56.5079	57.1449	57.2656	57.8347	57.8347	57.9413	57.6141	57.2656	57.0218	56.7692	
alpha	4.7492	4.7583	4.7672	4.8097	4.8177	4.8556	4.8556	4.8628	4.8409	4.8177	4.8015	4.7846	
util living area													
	0.9716	0.9557	0.9308	0.8657	0.7461	0.5637	0.4133	0.4467	0.6573	0.8673	0.9496	0.9750	(86)
MIT	20.0000	20.1677	20.3809	20.6653	20.8726	20.9743	20.9953	20.9932	20.9462	20.7107	20.3281	19.9723	(87)
Th 2	20.1672	20.1691	20.1709	20.1794	20.1810	20.1884	20.1884	20.1898	20.1856	20.1810	20.1778	20.1744	(88)
util rest of house													
	0.9658	0.9469	0.9167	0.8390	0.7001	0.4987	0.3387	0.3705	0.5930	0.8361	0.9381	0.9699	(89)
MIT 2	19.0143	19.2248	19.4902	19.8371	20.0680	20.1713	20.1864	20.1866	20.1462	19.8965	19.4343	18.9850	(90)
Living area fraction									fLA = Living area / (4) =			0.3639	(91)
MIT	19.3729	19.5679	19.8143	20.1385	20.3608	20.4635	20.4807	20.4801	20.4373	20.1927	19.7595	19.3442	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3729	19.5679	19.8143	20.1385	20.3608	20.4635	20.4807	20.4801	20.4373	20.1927	19.7595	19.3442	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9589	0.9392	0.9098	0.8376	0.7107	0.5212	0.3658	0.3981	0.6136	0.8366	0.9312	0.9634	(94)
Useful gains	504.4266	538.5396	535.9718	512.0906	440.0057	315.4783	212.5760	222.6040	334.2531	437.0086	475.7643	490.8502	(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													
	853.2925	828.3628	750.1366	626.1258	481.4993	322.7736	213.6262	224.1884	350.1924	533.3111	706.8185	849.3105	(97)
Space heating kWh													
	259.5563	194.7611	159.3386	82.1054	30.8712	0.0000	0.0000	0.0000	0.0000	71.6490	166.3591	266.6945	(98a)
Space heating requirement - total per year (kWh/year)												1231.3351	
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													
	259.5563	194.7611	159.3386	82.1054	30.8712	0.0000	0.0000	0.0000	0.0000	71.6490	166.3591	266.6945	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1231.3351	
Space heating per m2											(98c) / (4) =	19.5823	(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													
	259.5563	194.7611	159.3386	82.1054	30.8712	0.0000	0.0000	0.0000	0.0000	71.6490	166.3591	266.6945	(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)													
	281.2094	211.0088	172.6312	88.9549	33.4466	0.0000	0.0000	0.0000	0.0000	77.6263	180.2373	288.9431	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	209.6716	185.4604	197.3168	174.4044	169.6329	153.4924	152.0492	157.7948	159.1811	176.7117	186.8966	207.5236	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.5396	84.1697	83.5847	82.4756	81.0650	79.8000	79.8000	79.8000	79.8000	82.2035	83.7997	84.6234	(217)
Fuel for water heating, kWh/month													
	248.0159	220.3411	236.0682	211.4618	209.2555	192.3463	190.5379	197.7379	199.4751	214.9686	223.0277	245.2318	(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	21.3181	17.1021	15.3986	11.2817	8.7143	7.1196	7.9495	10.3330	13.4216	17.6098	19.8902	21.9106	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.5161	-31.3720	-46.6171	-54.2447	-60.0863	-56.6792	-56.0130	-52.1170	-45.4723	-36.7220	-24.0315	-18.4847	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.1734	-19.5827	-39.4528	-60.0298	-80.1223	-80.7625	-79.7845	-67.1827	-48.7761	-28.2263	-12.3207	-7.2307	(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	1334.0576	(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	2588.4677	(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)	172.0490	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1036.0005	(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	3144.5738	(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	1334.0576	0.2100	280.1521	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2588.4677	0.2100	543.5782	(264)
Space and water heating			823.7303	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	172.0490	0.1443	24.8320	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-503.3560	0.1339	-67.3871	
PV Unit electricity exported	-532.6445	0.1255	-66.8595	
Total			-134.2466	(269)
Total CO2, kg/year			726.2450	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5500	(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	1334.0576	1.1300	1507.4851	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2588.4677	1.1300	2924.9685	(278)
Space and water heating			4432.4536	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	172.0490	1.5338	263.8945	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-503.3560	1.4947	-752.3870	
PV Unit electricity exported	-532.6445	0.4607	-245.4113	
Total			-997.7983	(283)
Total Primary energy kWh/year			3828.6506	(286)
Target Primary Energy Rate (TPER)			60.8900	(287)

Full SAP Calculation Printout

Property Reference	Flat 6 Block A	**Issued on Date**	13/03/2024
Assessment Reference	Design stage for ES condition	**Prop Type Ref**	
Property	Flat 6 Block A, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	87 B	**DER**	0.07	**TER**	11.55
Environmental	100 A	**% DER < TER**			99.39
CO_2 Emissions (t/year)	-0.02	**DFEE**	21.96	**TFEE**	26.19
Compliance Check	See BREL	**% DFEE < TFEE**			16.15
% DPER < TPER	80.26	**DPER**	12.02	**TPER**	60.89

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.8800	(1b)	x 2.3000	(2b) =	144.6240	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(c)+(1d)+(1e)...(1n)	62.8800					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		144.6240	(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	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) =	0.1383 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.2883 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2234 (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	0.2849	0.2793	0.2737	0.2458	0.2402	0.2123	0.2123	0.2067	0.2234	0.2402	0.2514	0.2625	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5406	0.5390	0.5375	0.5302	0.5288	0.5225	0.5225	0.5214	0.5250	0.5288	0.5316	0.5345	(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	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
External Wall 1	50.8300	6.9800	43.8500	0.1300	5.7005	70.0000	3069.5000	(29a)
sheltered	8.9700	2.1000	6.8700	0.1300	0.8931	70.0000	480.9000	(29a)
void above	4.3000		4.3000	0.1043	0.4483	9.0000	38.7000	(30)
flat balcony above	13.1100		13.1100	0.1100	1.4421	9.0000	117.9900	(30)
Total net area of external elements Aum(A, m2)			77.2100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4164			(33)
Party Wall 1			19.3200	0.0000	0.0000	180.0000	3477.6000	(32)
Party Floor 1			62.8800			30.0000	1886.4000	(32d)
Party Ceiling 1			49.7700			30.0000	1493.1000	(32b)
Internal Wall 1			99.6800			9.0000	897.1200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11461.3100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		182.2727 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6500	0.0600	0.3390

E3 Sill	4.6500	0.0400	0.1860	
E4 Jamb	19.2000	0.0200	0.3840	
E7 Party floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	8.0000	0.2000	1.6000	
E18 Party wall between dwellings	4.9800	0.2400	1.1952	
E16 Corner (normal)	2.4900	0.0500	0.1245	
E16 Corner (normal)	2.4900	0.1800	0.4482	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.0000	0.0000	0.0000	
E11 Eaves (insulation at rafter level)	2.7000	0.1500	0.4050	
E15 Flat roof with parapet	7.3000	0.3000	2.1900	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8719 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 26.2883 (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	25.7994	25.7242	25.6505	25.3043	25.2395	24.9380	24.9380	24.8822	25.0542	25.2395	25.3706	25.5076	(38)
Heat transfer coeff	52.0877	52.0125	51.9388	51.5926	51.5279	51.2263	51.2263	51.1705	51.3425	51.5279	51.6589	51.7959	(39)
Average = Sum(39)m / 12 =												51.5923	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8284	0.8272	0.8260	0.8205	0.8195	0.8147	0.8147	0.8138	0.8165	0.8195	0.8215	0.8237	(40)
HLP (average)												0.8205	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0618 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

25.4044	25.0271	24.4958	23.5162	22.7826	21.9692	21.5299	22.0575	22.6319	23.5023	24.5021	25.3185	(42b)

Hot water usage for other uses

35.7447	34.4449	33.1451	31.8453	30.5455	29.2457	29.2457	30.5455	31.8453	33.1451	34.4449	35.7447	(42c)

Average daily hot water use (litres/day) 56.0491 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	61.1491	59.4720	57.6409	55.3614	53.3281	51.2149	50.7756	52.6030	54.4772	56.6474	58.9470	61.0632	(44)
Energy conte	96.8452	84.6873	88.5919	75.7871	71.7899	62.9747	61.4087	65.1335	67.1759	76.8700	83.9808	95.6102	(45)
Energy content (annual)											Total = Sum(45)m =	930.8551	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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													
	82.3184	71.9842	75.3031	64.4190	61.0214	53.5285	52.1974	55.3635	57.0995	65.3395	71.3837	81.2687	(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													
	82.3184	71.9842	75.3031	64.4190	61.0214	53.5285	52.1974	55.3635	57.0995	65.3395	71.3837	81.2687	(64)
										Total per year (kWh/year) = Sum(64)m =		791.2268	(64)
12Total per year (kWh/year)												791	(64)
Electric shower(s)													
	47.0801	41.9488	45.8065	43.7125	44.5328	42.4800	43.8960	44.5328	43.7125	45.8065	44.9451	47.0801	(64a)
Heat gains from water heating, kWh/month													
	32.3496	28.4833	30.2774	27.0329	26.3885	24.0021	24.0233	24.9741	25.2030	27.7865	29.0822	32.0872	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	102.5991	113.5918	102.5991	106.0191	102.5991	106.0191	102.5991	102.5991	106.0191	102.5991	106.0191	102.5991	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	180.1476	182.0169	177.3062	167.2776	154.6182	142.7202	134.7716	132.9023	137.6130	147.6416	160.3010	172.1990	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)
Water heating gains (Table 5)													
	43.4807	42.3858	40.6954	37.5457	35.4685	33.3363	32.2894	33.5673	35.0042	37.3474	40.3919	43.1280	(72)
Total internal gains													
	380.1541	391.9213	374.5274	364.7690	346.6125	336.0023	323.5869	322.9954	332.5630	341.5149	360.6387	371.8528	(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	4.3800	10.6334	0.7200	0.7000	0.7700	16.2671	(74)
South	2.6000	46.7521	0.7200	0.7000	0.7700	42.4559	(78)

Solar gains	58.7230	100.6190	141.3960	184.9548	218.6162	222.7518	212.3275	185.8912	156.0356	112.0019	70.3922	50.2468	(83)
Total gains	438.8770	492.5403	515.9234	549.7239	565.2287	558.7541	535.9144	508.8866	488.5986	453.5167	431.0310	422.0996	(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	61.1218	61.2102	61.2971	61.7084	61.7859	62.1496	62.1496	62.2174	62.0090	61.7859	61.6292	61.4662	
alpha	5.0748	5.0807	5.0865	5.1139	5.1191	5.1433	5.1433	5.1478	5.1339	5.1191	5.1086	5.0977	
util living area	0.9844	0.9711	0.9489	0.8847	0.7607	0.5705	0.4177	0.4578	0.6806	0.8978	0.9692	0.9870	(86)
MIT	19.9736	20.1579	20.3818	20.6760	20.8843	20.9787	20.9964	20.9943	20.9489	20.6975	20.2948	19.9355	(87)
Th 2	20.2288	20.2298	20.2309	20.2356	20.2365	20.2406	20.2406	20.2414	20.2390	20.2365	20.2347	20.2328	(88)
util rest of house	0.9810	0.9651	0.9381	0.8612	0.7173	0.5086	0.3470	0.3845	0.6192	0.8720	0.9617	0.9841	(89)
MIT 2	19.2931	19.4748	19.6933	19.9739	20.1556	20.2294	20.2394	20.2393	20.2093	19.9990	19.6148	19.2588	(90)
Living area fraction										fLA = Living area / (4) =		0.3639	(91)
MIT	19.5407	19.7234	19.9438	20.2294	20.4207	20.5020	20.5148	20.5140	20.4784	20.2532	19.8622	19.5050	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5407	19.7234	19.9438	20.2294	20.4207	20.5020	20.5148	20.5140	20.4784	20.2532	19.8622	19.5050	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9773	0.9603	0.9334	0.8610	0.7282	0.5303	0.3727	0.4111	0.6393	0.8726	0.9573	0.9808	(94)
Useful gains	428.9095	473.0045	481.5776	473.3034	411.6227	296.3074	199.7411	209.1981	312.3383	395.7594	412.6381	413.9841	(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	793.8554	771.0003	698.2565	584.5129	449.3593	302.3394	200.5429	210.5163	327.4849	497.4088	659.2815	792.7372	(97)
Space heating kWh	271.5198	200.2532	161.2091	80.0708	28.0761	0.0000	0.0000	0.0000	0.0000	75.6271	177.5832	281.7923	(98a)
Space heating requirement - total per year (kWh/year)												1276.1316	
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	271.5198	200.2532	161.2091	80.0708	28.0761	0.0000	0.0000	0.0000	0.0000	75.6271	177.5832	281.7923	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1276.1316	
Space heating per m2										(98c) / (4) =		20.2947	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	481.5275	379.0748	388.8957	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9169	0.9586	0.9451	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	441.5291	363.3760	367.5360	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	606.3559	581.9842	552.4809	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	118.6753	162.6445	137.5990	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	29.6688	40.6611	34.3997	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												104.7297	(107)
Energy for space heating												20.2947	(99)
Energy for space cooling												1.6655	(108)
Total												21.9603	(109)
Fabric Energy Efficiency (DFEE)												22.0	(109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.8800 (1b)	x	2.3000 (2b)	=	144.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	144.6240	(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	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) =	0.1383	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3883	(18)
Number of sides sheltered	3	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3009	(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	0.3837	0.3762	0.3686	0.3310	0.3235	0.2859	0.2859	0.2784	0.3009	0.3235	0.3385	0.3536	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

Effective ac	0.5736	0.5707	0.5679	0.5548	0.5523	0.5409	0.5409	0.5387	0.5453	0.5523	0.5573	0.5625	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
External Wall 1	50.8300	6.9800	43.8500	0.1800	7.8930			(29a)
sheltered	8.9700	2.1000	6.8700	0.1800	1.2366			(29a)
void above	4.3000		4.3000	0.1100	0.4730			(30)
flat balcony above	13.1100		13.1100	0.1100	1.4421			(30)
Total net area of external elements Aum(A, m2)			77.2100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.1371			(33)
Party Wall 1			19.3200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	182.2727	(35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	5.6500	0.0500	0.2825
E3	Sill	4.6500	0.0500	0.2325
E4	Jamb	19.2000	0.0500	0.9600
E7	Party floor between dwellings (in blocks of flats)	16.0000	0.0700	1.1200
E7	Party floor between dwellings (in blocks of flats)	8.0000	0.0700	0.5600
E18	Party wall between dwellings	4.9800	0.0600	0.2988
E16	Corner (normal)	2.4900	0.0900	0.2241
E16	Corner (normal)	2.4900	0.0900	0.2241
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	34.0000	0.0000	0.0000
E11	Eaves (insulation at rafter level)	2.7000	0.0400	0.1080
E15	Flat roof with parapet	7.3000	0.5600	4.0880

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.0980	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	29.2351	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.3758	27.2394	27.1057	26.4777	26.3602	25.8132	25.8132	25.7119	26.0239	26.3602	26.5979	26.8464	(38)
Heat transfer coeff	56.6109	56.4745	56.3408	55.7127	55.5952	55.0483	55.0483	54.9470	55.2589	55.5952	55.8329	56.0815	(39)
Average = Sum(39)m / 12 =												55.7122	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9003	0.8981	0.8960	0.8860	0.8841	0.8754	0.8754	0.8738	0.8788	0.8841	0.8879	0.8919	(40)
HLP (average)												0.8860	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0618	(42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	25.4044	25.0271	24.4958	23.5162	22.7826	21.9692	21.5299	22.0575	22.6319	23.5023	24.5021	25.3185	(42b)

Hot water usage for other uses

	35.7447	34.4449	33.1451	31.8453	30.5455	29.2457	29.2457	30.5455	31.8453	33.1451	34.4449	35.7447	(42c)

Average daily hot water use (litres/day)	56.0491	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	61.1491	59.4720	57.6409	55.3614	53.3281	51.2149	50.7756	52.6030	54.4772	56.6474	58.9470	61.0632	(44)
Energy conte	96.8452	84.6873	88.5919	75.7871	71.7899	62.9747	61.4087	65.1335	67.1759	76.8700	83.9808	95.6102	(45)

Energy content (annual) Total = Sum(45)m =	930.8551	

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

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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

	82.3184	71.9842	75.3031	64.4190	61.0214	53.5285	52.1974	55.3635	57.0995	65.3395	71.3837	81.2687	(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

	82.3184	71.9842	75.3031	64.4190	61.0214	53.5285	52.1974	55.3635	57.0995	65.3395	71.3837	81.2687	(64)

Total per year (kWh/year) = Sum(64)m =	791.2268	(64)
12Total per year (kWh/year)	791	(64)

Electric shower(s)

	47.0801	41.9488	45.8065	43.7125	44.5328	42.4800	43.8960	44.5328	43.7125	45.8065	44.9451	47.0801	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	535.5336	(64a)

Heat gains from water heating, kWh/month

	32.3496	28.4833	30.2774	27.0329	26.3885	24.0021	24.0233	24.9741	25.2030	27.7865	29.0822	32.0872	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	102.5991	113.5918	102.5991	106.0191	102.5991	106.0191	102.5991	102.5991	106.0191	102.5991	106.0191	102.5991	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	180.1476	182.0169	177.3062	167.2776	154.6182	142.7202	134.7716	132.9023	137.6130	147.6416	160.3010	172.1990	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)
Water heating gains (Table 5)													
	43.4807	42.3858	40.6954	37.5457	35.4685	33.3363	32.2894	33.5673	35.0042	37.3474	40.3919	43.1280	(72)
Total internal gains													
	380.1541	391.9213	374.5274	364.7690	346.6125	336.0023	323.5869	322.9954	332.5630	341.5149	360.6387	371.8528	(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	4.3800	10.6334	0.6300	0.7000	0.7700	14.2337	(74)
South	2.6000	46.7521	0.6300	0.7000	0.7700	37.1489	(78)

Solar gains	51.3826	88.0417	123.7215	161.8355	191.2892	194.9078	185.7865	162.6548	136.5311	98.0016	61.5932	43.9660	(83)
Total gains	431.5367	479.9630	498.2489	526.6045	537.9017	530.9101	509.3734	485.6502	469.0941	439.5165	422.2319	415.8187	(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	56.2383	56.3741	56.5079	57.1449	57.2656	57.8347	57.8347	57.9413	57.6141	57.2656	57.0218	56.7692	
alpha	4.7492	4.7583	4.7672	4.8097	4.8177	4.8556	4.8556	4.8628	4.8409	4.8177	4.8015	4.7846	
util living area													
	0.9867	0.9768	0.9608	0.9124	0.8113	0.6301	0.4687	0.5098	0.7333	0.9197	0.9747	0.9887	(86)
MIT	19.8036	19.9854	20.2204	20.5525	20.8136	20.9588	20.9919	20.9880	20.9137	20.5978	20.1581	19.7747	(87)
Th 2	20.1672	20.1691	20.1709	20.1794	20.1810	20.1884	20.1884	20.1898	20.1856	20.1810	20.1778	20.1744	(88)
util rest of house													
	0.9838	0.9717	0.9518	0.8921	0.7694	0.5615	0.3854	0.4248	0.6696	0.8971	0.9683	0.9862	(89)
MIT 2	19.0764	19.2569	19.4886	19.8129	20.0478	20.1663	20.1856	20.1853	20.1342	19.8611	19.4356	19.0535	(90)
Living area fraction									fLA = Living area / (4) =			0.3639	(91)
MIT	19.3410	19.5220	19.7549	20.0820	20.3264	20.4547	20.4790	20.4774	20.4178	20.1292	19.6985	19.3159	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3410	19.5220	19.7549	20.0820	20.3264	20.4547	20.4790	20.4774	20.4178	20.1292	19.6985	19.3159	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9800	0.9669	0.9465	0.8894	0.7774	0.5847	0.4156	0.4555	0.6888	0.8955	0.9636	0.9829	(94)
Useful gains	422.9252	464.0624	471.5758	468.3676	418.1732	310.4317	211.7002	221.2044	323.1185	393.5657	406.8812	408.6897	(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													
	851.4847	825.7696	746.7902	622.9814	479.5887	322.2897	213.5317	224.0387	349.1173	529.7768	703.4104	847.7224	(97)
Space heating kWh													
	318.8483	243.0673	204.7595	111.3220	45.6931	0.0000	0.0000	0.0000	0.0000	101.3411	213.5011	326.6403	(98a)
Space heating requirement - total per year (kWh/year)												1565.1726	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	318.8483	243.0673	204.7595	111.3220	45.6931	0.0000	0.0000	0.0000	0.0000	101.3411	213.5011	326.6403	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1565.1726	
Space heating per m2											(98c) / (4) =	24.8914	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	517.4536	407.3571	417.5969	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8691	0.9275	0.9092	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	449.7088	377.8128	379.6654	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	573.8110	550.9623	525.3214	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	89.3536	128.8232	108.3681	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	22.3384	32.2058	27.0920	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												81.6362	(107)
Energy for space heating												24.8914	(99)
Energy for space cooling												1.2983	(108)
Total												26.1897	(109)
Fabric Energy Efficiency (TFEE)												26.2	(109)

Full SAP Calculation Printout

Property Reference	Flat 6 Block A	**Issued on Date**	13/03/2024
Assessment Reference	Design stage for ES condition	**Prop Type Ref**	
Property	Flat 6 Block A, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	87 B	**DER**	0.07	**TER**	11.55
Environmental	100 A	**% DER < TER**			99.39
CO_2 Emissions (t/year)	-0.02	**DFEE**	21.96	**TFEE**	26.19
Compliance Check	See BREL	**% DFEE < TFEE**			16.15
% DPER < TPER	80.26	**DPER**	12.02	**TPER**	60.89

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.8800	(1b)	x 2.3000	(2b) =	144.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	144.6240	(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		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(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) =												81.0000	(23c)
Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.1000	1.4000	2.9400			(26)
window (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
External Wall 1	50.8300	6.9800	43.8500	0.1300	5.7005	70.0000	3069.5000	(29a)
sheltered	8.9700	2.1000	6.8700	0.1300	0.8931	70.0000	480.9000	(29a)
void above	4.3000		4.3000	0.1043	0.4483	9.0000	38.7000	(30)
flat balcony above	13.1100		13.1100	0.1100	1.4421	9.0000	117.9900	(30)
Total net area of external elements Aum(A, m2)			77.2100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4164			(33)
Party Wall 1			19.3200	0.0000	0.0000	180.0000	3477.6000	(32)
Party Floor 1			62.8800			30.0000	1886.4000	(32d)
Party Ceiling 1			49.7700			20.0000	995.4000	(32b)
Internal Wall 1			99.6800			9.0000	897.1200	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		10963.6100	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							174.3577	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6500	0.0600	0.3390
E3 Sill	4.6500	0.0400	0.1860
E4 Jamb	19.2000	0.0200	0.3840
E7 Party floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	8.0000	0.2000	1.6000
E18 Party wall between dwellings	4.9800	0.2400	1.1952
E16 Corner (normal)	2.4900	0.0500	0.1245
E16 Corner (normal)	2.4900	0.1800	0.4482
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.0000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	2.7000	0.1500	0.4050
E15 Flat roof with parapet	7.3000	0.3000	2.1900

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8719 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 26.2883 (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	11.6078	11.4691	11.3304	10.6369	10.4982	9.8047	9.8047	9.6660	10.0821	10.4982	10.7756	11.0530	(38)
Heat transfer coeff	37.8961	37.7574	37.6187	36.9252	36.7865	36.0930	36.0930	35.9543	36.3704	36.7865	37.0639	37.3413	(39)
Average = Sum(39)m / 12 =												36.8905	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6027	0.6005	0.5983	0.5872	0.5850	0.5740	0.5740	0.5718	0.5784	0.5850	0.5894	0.5939	(40)
HLP (average)												0.5867	
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 2.0618 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	88.1834	86.8581	84.9270	81.2322	78.5055	75.4647	73.7363	75.6528	77.7537	81.0185	84.7927	87.8455	(42a)
Hot water usage for baths	25.4044	25.0271	24.4958	23.5162	22.7826	21.9692	21.5299	22.0575	22.6319	23.5023	24.5021	25.3185	(42b)
Hot water usage for other uses	35.7447	34.4449	33.1451	31.8453	30.5455	29.2457	29.2457	30.5455	31.8453	33.1451	34.4449	35.7447	(42c)
Average daily hot water use (litres/day)												137.3512	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.3325	146.3301	142.5679	136.5936	131.8336	126.6796	124.5119	128.2558	132.2309	137.6659	143.7397	148.9087	(44)
Energy conte	236.5061	208.3722	219.1216	186.9899	177.4734	155.7674	150.5864	158.8075	163.0539	186.8114	204.7836	233.1551	(45)
Energy content (annual)										Total = Sum(45)m =		2281.4282	
Distribution loss (46)m = 0.15 x (45)m	35.4759	31.2558	32.8682	28.0485	26.6210	23.3651	22.5880	23.8211	24.4581	28.0217	30.7175	34.9733	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.5400	(55)
Total storage loss	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(56)
If cylinder contains dedicated solar storage	16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(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	276.5085	244.5034	259.1240	225.7019	217.4758	194.4794	190.5888	198.8099	201.7659	226.8138	243.4956	273.1575	(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	276.5085	244.5034	259.1240	225.7019	217.4758	194.4794	190.5888	198.8099	201.7659	226.8138	243.4956	273.1575	(64)
										Total per year (kWh/year) = Sum(64)m =		2752.4242	(64)
12Total per year (kWh/year)												2752	(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	110.6402	98.1887	104.8598	93.1437	91.0118	82.7623	82.0719	84.8054	85.1850	94.1167	99.0601	109.5260	(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	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	102.5991	113.5918	102.5991	106.0191	102.5991	106.0191	102.5991	102.5991	106.0191	102.5991	106.0191	102.5991	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.1476	182.0169	177.3062	167.2776	154.6182	142.7202	134.7716	132.9023	137.6130	147.6416	160.3010	172.1990	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)
Water heating gains (Table 5)	148.7100	146.1141	140.9406	129.3663	122.3277	114.9476	110.3117	113.9858	118.3125	126.5009	137.5835	147.2123	(72)
Total internal gains	485.3833	495.6496	474.7726	456.5896	433.4718	417.6136	401.6091	403.4139	415.8714	430.6684	457.8303	475.9371	(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	4.3800	10.6334	0.7200	0.7000	0.7700	16.2671	(74)
South	2.6000	46.7521	0.7200	0.7000	0.7700	42.4559	(78)

Solar gains	58.7230	100.6190	141.3960	184.9548	218.6162	222.7518	212.3275	185.8912	156.0356	112.0019	70.3922	50.2468	(83)
Total gains	544.1063	596.2687	616.1686	641.5445	652.0880	640.3654	613.9366	589.3051	571.9069	542.6703	528.2226	526.1840	(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	80.3630	80.6582	80.9556	82.4761	82.7870	84.3778	84.3778	84.7033	83.7342	82.7870	82.1674	81.5570	
alpha	6.3575	6.3772	6.3970	6.4984	6.5191	6.6252	6.6252	6.6469	6.5823	6.5191	6.4778	6.4371	
util living area	0.9200	0.8726	0.8069	0.6749	0.5209	0.3605	0.2586	0.2806	0.4377	0.6820	0.8552	0.9287	(86)
Living	20.6589	20.7741	20.8753	20.9642	20.9937	20.9996	21.0000	20.9999	20.9984	20.9677	20.8358	20.6416	
Non living	20.1267	20.2353	20.3287	20.4143	20.4393	20.4532	20.4534	20.4554	20.4486	20.4200	20.3028	20.1177	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.8255	20.7741	20.8753	20.9642	20.9937	20.9996	21.0000	20.9999	20.9984	20.9677	20.8358	20.6917	(87)
Th 2	20.4276	20.4296	20.4316	20.4415	20.4435	20.4535	20.4535	20.4555	20.4495	20.4435	20.4395	20.4355	(88)
util rest of house	0.9088	0.8571	0.7859	0.6479	0.4907	0.3298	0.2265	0.2474	0.4032	0.6506	0.8360	0.9185	(89)
MIT 2	20.2737	20.2353	20.3287	20.4143	20.4393	20.4532	20.4534	20.4554	20.4486	20.4200	20.3028	20.1622	(90)
Living area fraction									fLA = Living area / (4) =			0.3639	(91)
MIT	20.4745	20.4313	20.5276	20.6144	20.6410	20.6520	20.6523	20.6536	20.6486	20.6193	20.4967	20.3549	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4745	20.4313	20.5276	20.6144	20.6410	20.6520	20.6523	20.6536	20.6486	20.6193	20.4967	20.3549	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9098	0.8571	0.7896	0.6564	0.5015	0.3409	0.2382	0.2595	0.4157	0.6607	0.8380	0.9169	(94)
Useful gains	495.0248	511.0888	486.4964	421.0811	327.0153	218.3196	146.2515	152.9191	237.7400	358.5331	442.6636	482.4829	(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	612.9503	586.4235	527.6997	432.5552	328.9078	218.4353	146.2598	152.9336	238.1760	368.5760	496.5349	603.2444	(97)
Space heating kWh	87.7366	50.6250	30.6553	8.2614	1.4081	0.0000	0.0000	0.0000	0.0000	7.4719	38.7873	89.8466	(98a)
Space heating requirement - total per year (kWh/year)												314.7921	
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	87.7366	50.6250	30.6553	8.2614	1.4081	0.0000	0.0000	0.0000	0.0000	7.4719	38.7873	89.8466	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												314.7921	
Space heating per m2											(98c) / (4) =	5.0062	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	266.1549	(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	87.7366	50.6250	30.6553	8.2614	1.4081	0.0000	0.0000	0.0000	0.0000	7.4719	38.7873	89.8466	(98)
Space heating efficiency (main heating system 1)	266.1549	266.1549	266.1549	266.1549	266.1549	0.0000	0.0000	0.0000	0.0000	266.1549	266.1549	266.1549	(210)
Space heating fuel (main heating system)	32.9645	19.0209	11.5178	3.1040	0.5290	0.0000	0.0000	0.0000	0.0000	2.8074	14.5732	33.7573	(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	276.5085	244.5034	259.1240	225.7019	217.4758	194.4794	190.5888	198.8099	201.7659	226.8138	243.4956	273.1575	(64)
Efficiency of water heater												266.5825	(216)
(217)m	266.5825	266.5825	266.5825	266.5825	266.5825	266.5825	266.5825	266.5825	266.5825	266.5825	266.5825	266.5825	(217)
Fuel for water heating, kWh/month	103.7234	91.7177	97.2022	84.6649	81.5792	72.9528	71.4934	74.5772	75.6861	85.0820	91.3397	102.4664	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.0662	8.1888	9.0662	8.7737	9.0662	8.7737	9.0662	9.0662	8.7737	9.0662	8.7737	9.0662	(231)
Lighting	26.7372	21.4495	19.3129	14.1495	10.9295	8.9295	9.9702	12.9597	16.8333	22.0863	24.9464	27.4803	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.7397	-40.3210	-67.1330	-83.6352	-95.4532	-90.7462	-89.1113	-81.5625	-67.2460	-49.1589	-28.5637	-20.5324	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.3772	-21.8041	-55.1449	-101.2608	-149.1026	-155.7818	-151.6233	-118.4128	-74.5076	-34.9072	-12.1134	-6.2159	(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												118.2740	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	266.5825	
Water heating fuel used	1032.4851	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)		
mechanical ventilation fans (SFP = 0.6050)	106.7470	(230a)
Total electricity for the above, kWh/year	106.7470	(231)
Electricity for lighting (calculated in Appendix L)	215.7842	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1627.4546	(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	-154.1643	(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	118.2740	0.1588	18.7773	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1032.4851	0.1411	145.6712	(264)
Space and water heating			164.4484	(265)
Pumps, fans and electric keep-hot	106.7470	0.1387	14.8071	(267)
Energy for lighting	215.7842	0.1443	31.1443	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-738.2030	0.1325	-97.7803	
PV Unit electricity exported	-889.2515	0.1214	-107.9215	
Total			-205.7019	(269)
Total CO2, kg/year			4.6980	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			0.0700	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	118.2740	1.5877	187.7790	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1032.4851	1.5217	1571.1340	(278)
Space and water heating			1758.9131	(279)
Pumps, fans and electric keep-hot	106.7470	1.5128	161.4868	(281)
Energy for lighting	215.7842	1.5338	330.9770	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-738.2030	1.4894	-1099.5003	
PV Unit electricity exported	-889.2515	0.4453	-395.9557	
Total			-1495.4559	(283)
Total Primary energy kWh/year			755.9210	(286)
Dwelling Primary energy Rate (DPER)			12.0200	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		62.8800 (1b)	x	2.3000 (2b)	=	144.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	144.6240	(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) =	0.1383	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3883	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3009 (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	0.3837	0.3762	0.3686	0.3310	0.3235	0.2859	0.2859	0.2784	0.3009	0.3235	0.3385	0.3536	(22b)
Effective ac	0.5736	0.5707	0.5679	0.5548	0.5523	0.5409	0.5409	0.5387	0.5453	0.5523	0.5573	0.5625	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
External Wall 1	50.8300	6.9800	43.8500	0.1800	7.8930			(29a)
sheltered	8.9700	2.1000	6.8700	0.1800	1.2366			(29a)
void above	4.3000		4.3000	0.1100	0.4730			(30)
flat balcony above	13.1100		13.1100	0.1100	1.4421			(30)
Total net area of external elements Aum(A, m2)			77.2100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.1371			(33)
Party Wall 1			19.3200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 182.2727 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	5.6500	0.0500	0.2825
E3	Sill	4.6500	0.0500	0.2325
E4	Jamb	19.2000	0.0500	0.9600
E7	Party floor between dwellings (in blocks of flats)	16.0000	0.0700	1.1200
E7	Party floor between dwellings (in blocks of flats)	8.0000	0.0700	0.5600
E18	Party wall between dwellings	4.9800	0.0600	0.2988
E16	Corner (normal)	2.4900	0.0900	0.2241
E16	Corner (normal)	2.4900	0.0900	0.2241
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	34.0000	0.0000	0.0000
E11	Eaves (insulation at rafter level)	2.7000	0.0400	0.1080
E15	Flat roof with parapet	7.3000	0.5600	4.0880

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.0980 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 29.2351 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.3758	27.2394	27.1057	26.4777	26.3602	25.8132	25.8132	25.7119	26.0239	26.3602	26.5979	26.8464	(38)
Heat transfer coeff	56.6109	56.4745	56.3408	55.7127	55.5952	55.0483	55.0483	54.9470	55.2589	55.5952	55.8329	56.0815	(39)
Average = Sum(39)m / 12 =												55.7122	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9003	0.8981	0.8960	0.8860	0.8841	0.8754	0.8754	0.8738	0.8788	0.8841	0.8879	0.8919	(40)
HLP (average)												0.8860	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0618 (42)

Hot water usage for mixer showers

58.7889	57.9054	56.6180	54.1548	52.3370	50.3098	49.1576	50.4352	51.8358	54.0124	56.5285	58.5637	(42a)

Hot water usage for baths

25.4044	25.0271	24.4958	23.5162	22.7826	21.9692	21.5299	22.0575	22.6319	23.5023	24.5021	25.3185	(42b)

Hot water usage for other uses

35.7447	34.4449	33.1451	31.8453	30.5455	29.2457	29.2457	30.5455	31.8453	33.1451	34.4449	35.7447	(42c)

Average daily hot water use (litres/day) 110.2505 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	119.9380	117.3774	114.2589	109.5162	105.6651	101.5247	99.9331	103.0382	106.3130	110.6597	115.4755	119.6269	(44)
Energy conte	189.9525	167.1439	175.6117	149.9223	142.2455	124.8365	120.8605	127.5828	131.0946	150.1642	164.5160	187.3068	(45)
Energy content (annual)										Total = Sum(45)m =		1831.2372	
Distribution loss (46)m = 0.15 x (45)m	28.4929	25.0716	26.3418	22.4883	21.3368	18.7255	18.1291	19.1374	19.6642	22.5246	24.6774	28.0960	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	236.5474	209.2296	222.2066	195.0141	188.8404	169.9283	167.4554	174.1777	176.1864	196.7591	209.6078	233.9017	(62)
WWHRS	-26.8758	-23.7692	-24.8897	-20.6097	-19.2075	-16.4360	-15.4061	-16.3829	-17.0053	-20.0474	-22.7113	-26.3781	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	209.6716	185.4604	197.3168	174.4044	169.6329	153.4924	152.0492	157.7948	159.1811	176.7117	186.8966	207.5236	(64)
										Total per year (kWh/year) = Sum(64)m =		2130.1356	(64)
12Total per year (kWh/year)												2130	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	100.4351	89.2439	95.6668	85.9226	84.5726	77.5816	77.4620	79.6972	79.6624	87.2055	90.7750	99.5554	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	103.0891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	102.5991	113.5918	102.5991	106.0191	102.5991	106.0191	102.5991	102.5991	106.0191	102.5991	106.0191	102.5991	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	180.1476	182.0169	177.3062	167.2776	154.6182	142.7202	134.7716	132.9023	137.6130	147.6416	160.3010	172.1990	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	33.3089	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	-82.4713	(71)
Water heating gains (Table 5)													
	134.9934	132.8034	128.5844	119.3370	113.6728	107.7522	104.1156	107.1199	110.6422	117.2117	126.0764	133.8111	(72)
Total internal gains													
	474.6668	485.3390	465.4164	449.5603	427.8168	410.4183	395.4131	396.5480	408.2011	424.3792	449.3232	465.5358	(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	4.3800	10.6334	0.6300	0.7000	0.7700	14.2337	(74)
South	2.6000	46.7521	0.6300	0.7000	0.7700	37.1489	(78)

Solar gains	51.3826	88.0417	123.7215	161.8355	191.2892	194.9078	185.7865	162.6548	136.5311	98.0016	61.5932	43.9660	(83)
Total gains	526.0494	573.3806	589.1379	611.3958	619.1060	605.3261	581.1996	559.2028	544.7322	522.3808	510.9164	509.5018	(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	56.2383	56.3741	56.5079	57.1449	57.2656	57.8347	57.8347	57.9413	57.6141	57.2656	57.0218	56.7692	
alpha	4.7492	4.7583	4.7672	4.8097	4.8177	4.8556	4.8556	4.8628	4.8409	4.8177	4.8015	4.7846	
util living area													
	0.9716	0.9557	0.9308	0.8657	0.7461	0.5637	0.4133	0.4467	0.6573	0.8673	0.9496	0.9750	(86)
MIT	20.0000	20.1677	20.3809	20.6653	20.8726	20.9743	20.9953	20.9932	20.9462	20.7107	20.3281	19.9723	(87)
Th 2	20.1672	20.1691	20.1709	20.1794	20.1810	20.1884	20.1884	20.1898	20.1856	20.1810	20.1778	20.1744	(88)
util rest of house													
	0.9658	0.9469	0.9167	0.8390	0.7001	0.4987	0.3387	0.3705	0.5930	0.8361	0.9381	0.9699	(89)
MIT 2	19.0143	19.2248	19.4902	19.8371	20.0680	20.1713	20.1864	20.1866	20.1462	19.8965	19.4343	18.9850	(90)
Living area fraction									fLA = Living area / (4) =			0.3639	(91)
MIT	19.3729	19.5679	19.8143	20.1385	20.3608	20.4635	20.4807	20.4801	20.4373	20.1927	19.7595	19.3442	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3729	19.5679	19.8143	20.1385	20.3608	20.4635	20.4807	20.4801	20.4373	20.1927	19.7595	19.3442	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9589	0.9392	0.9098	0.8376	0.7107	0.5212	0.3658	0.3981	0.6136	0.8366	0.9312	0.9634	(94)
Useful gains	504.4266	538.5396	535.9718	512.0906	440.0057	315.4783	212.5760	222.6040	334.2531	437.0086	475.7643	490.8502	(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													
	853.2925	828.3628	750.1366	626.1258	481.4993	322.7736	213.6262	224.1884	350.1924	533.3111	706.8185	849.3105	(97)
Space heating kWh													
	259.5563	194.7611	159.3386	82.1054	30.8712	0.0000	0.0000	0.0000	0.0000	71.6490	166.3591	266.6945	(98a)
Space heating requirement - total per year (kWh/year)												1231.3351	
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													
	259.5563	194.7611	159.3386	82.1054	30.8712	0.0000	0.0000	0.0000	0.0000	71.6490	166.3591	266.6945	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1231.3351	
Space heating per m2											(98c) / (4) =	19.5823	(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													
	259.5563	194.7611	159.3386	82.1054	30.8712	0.0000	0.0000	0.0000	0.0000	71.6490	166.3591	266.6945	(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)													
	281.2094	211.0088	172.6312	88.9549	33.4466	0.0000	0.0000	0.0000	0.0000	77.6263	180.2373	288.9431	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	209.6716	185.4604	197.3168	174.4044	169.6329	153.4924	152.0492	157.7948	159.1811	176.7117	186.8966	207.5236	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.5396	84.1697	83.5847	82.4756	81.0650	79.8000	79.8000	79.8000	79.8000	82.2035	83.7997	84.6234	(217)
Fuel for water heating, kWh/month													
	248.0159	220.3411	236.0682	211.4618	209.2555	192.3463	190.5379	197.7379	199.4751	214.9686	223.0277	245.2318	(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	21.3181	17.1021	15.3986	11.2817	8.7143	7.1196	7.9495	10.3330	13.4216	17.6098	19.8902	21.9106	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.5161	-31.3720	-46.6171	-54.2447	-60.0863	-56.6792	-56.0130	-52.1170	-45.4723	-36.7220	-24.0315	-18.4847	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.1734	-19.5827	-39.4528	-60.0298	-80.1223	-80.7625	-79.7845	-67.1827	-48.7761	-28.2263	-12.3207	-7.2307	(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	1334.0576	(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	2588.4677	(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)	172.0490	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1036.0005	(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	3144.5738	(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	1334.0576	0.2100	280.1521	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2588.4677	0.2100	543.5782	(264)
Space and water heating			823.7303	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	172.0490	0.1443	24.8320	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-503.3560	0.1339	-67.3871	
PV Unit electricity exported	-532.6445	0.1255	-66.8595	
Total			-134.2466	(269)
Total CO2, kg/year			726.2450	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5500	(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	1334.0576	1.1300	1507.4851	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2588.4677	1.1300	2924.9685	(278)
Space and water heating			4432.4536	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	172.0490	1.5338	263.8945	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-503.3560	1.4947	-752.3870	
PV Unit electricity exported	-532.6445	0.4607	-245.4113	
Total			-997.7983	(283)
Total Primary energy kWh/year			3828.6506	(286)
Target Primary Energy Rate (TPER)			60.8900	(287)

Full SAP Calculation Printout

Property Reference	Flat 7 Block A	**Issued on Date**	13/03/2024
Assessment Reference	Design stage for ES condition	**Prop Type Ref**	
Property	Flat 7 Block A, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	83 B	**DER**	0.72	**TER**	14.59
Environmental	99 A	**% DER < TER**			95.07
CO_2 Emissions (t/year)	0.01	**DFEE**	46.81	**TFEE**	47.38
Compliance Check	See BREL	**% DFEE < TFEE**			1.21
% DPER < TPER	75.99	**DPER**	18.52	**TPER**	77.15

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	86.7500	(1b)	x 3.1000	(2b) =	268.9250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		268.9250	(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		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(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) =		81.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			1.8900	1.4000	2.6460			(26)
window (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
RL			1.4500	1.2357	1.7918			(27a)
External Wall 1	40.6700	4.5500	36.1200	0.1300	4.6956	70.0000	2528.4000	(29a)
dormer wall	20.6000	2.4300	18.1700	0.1800	3.2706	70.0000	1271.9000	(29a)
sheltered 3rd floor only	16.4300	1.8900	14.5400	0.1800	2.6172	9.0000	130.8600	(29a)
main sloping roof	56.3000	1.4500	54.8500	0.1100	6.0335	9.0000	493.6500	(30)
flat roof rear	45.0000		45.0000	0.1100	4.9500	9.0000	405.0000	(30)
Total net area of external elements Aum(A, m2)			179.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.9971			(33)
Party Wall 1			20.8300	0.0000	0.0000	180.0000	3749.4000	(32)
Party Floor 1			86.7500			30.0000	2602.5000	(32d)
Party Ceiling 1			86.7500			20.0000	1735.0000	(32b)
Internal Wall 1			173.6000			9.0000	1562.4000	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 14479.1100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 166.9062 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6100	0.0600	0.3366
E3 Sill	4.7100	0.0400	0.1884
E4 Jamb	19.0800	0.0200	0.3816
R11 Upstands or kerbs of rooflights	6.8000	0.2400	1.6320
E24 Eaves (insulation at ceiling level - inverted)	24.9000	0.1500	3.7350
E7 Party floor between dwellings (in blocks of flats)	6.8000	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.0000	0.0000	0.0000
E16 Corner (normal)	15.5000	0.0500	0.7750
R4 Ridge (vaulted ceiling)	11.0000	0.1200	1.3200
E15 Flat roof with parapet	14.2000	0.3000	4.2600
E11 Eaves (insulation at rafter level)	14.4000	0.1500	2.1600
P4 Party wall - Roof (insulation at ceiling level)	8.0000	0.4800	3.8400
P5 Party wall - Roof (insulation at rafter level)	12.8000	0.4800	6.1440
R4 Ridge (vaulted ceiling)	7.0000	0.1200	0.8400
R7 Flat ceiling (inverted)	12.0000	0.1200	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 27.0526 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 61.0497 (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	21.5845	21.3266	21.0687	19.7791	19.5212	18.2316	18.2316	17.9737	18.7474	19.5212	20.0370	20.5528	(38)
Heat transfer coeff	82.6342	82.3763	82.1184	80.8288	80.5709	79.2813	79.2813	79.0234	79.7971	80.5709	81.0867	81.6025	(39)
Average = Sum(39)m / 12 =												80.7643	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9526	0.9496	0.9466	0.9317	0.9288	0.9139	0.9139	0.9109	0.9199	0.9288	0.9347	0.9407	(40)
HLP (average)												0.9310	
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 2.5786 (42)
Hot water usage for mixer showers

101.1809	99.6603	97.4446	93.2052	90.0766	86.5876	84.6045	86.8034	89.2139	92.9600	97.2905	100.7932	(42a)

Hot water usage for baths

29.1306	28.6980	28.0887	26.9654	26.1243	25.1916	24.6878	25.2928	25.9515	26.9495	28.0960	29.0321	(42b)

Hot water usage for other uses

41.0372	39.5449	38.0526	36.5604	35.0681	33.5759	33.5759	35.0681	36.5604	38.0526	39.5449	41.0372	(42c)

Average daily hot water use (litres/day) 157.6005 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	171.3486	167.9032	163.5860	156.7310	151.2690	145.3551	142.8682	147.1644	151.7258	157.9622	164.9314	170.8625	(44)
Energy conte	271.3744	239.0919	251.4255	214.5568	203.6371	178.7310	172.7867	182.2202	187.0931	214.3532	234.9750	267.5294	(45)
Energy content (annual)										Total = Sum(45)m =		2617.7742	
Distribution loss (46)m = 0.15 x (45)m	40.7062	35.8638	37.7138	32.1835	30.5456	26.8097	25.9180	27.3330	28.0640	32.1530	35.2462	40.1294	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.0000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.5400 (55)
Total storage loss

16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(56)

If cylinder contains dedicated solar storage

16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(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

311.3768	275.2231	291.4279	253.2688	243.6395	217.4430	212.7891	222.2226	225.8051	254.3556	273.6870	307.5318	(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

311.3768	275.2231	291.4279	253.2688	243.6395	217.4430	212.7891	222.2226	225.8051	254.3556	273.6870	307.5318	(64)

Total per year (kWh/year) = Sum(64)m = 3088.7702 (64)
12Total per year (kWh/year) 3089 (64)
Electric shower(s)

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

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

122.2339	108.4030	115.6009	102.3098	99.7113	90.3977	89.4535	92.5901	93.1781	103.2743	109.0988	120.9554	(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	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	135.5171	150.0368	135.5171	140.0344	135.5171	140.0344	135.5171	135.5171	140.0344	135.5171	140.0344	135.5171	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.9699	235.3874	229.2954	216.3262	199.9550	184.5683	174.2890	171.8715	177.9635	190.9327	207.3040	222.6907	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	(71)
Water heating gains (Table 5)	164.2929	161.3140	155.3776	142.0969	134.0205	125.5523	120.2332	124.4491	129.4140	138.8096	151.5261	162.5745	(72)
Total internal gains	594.4585	608.4168	581.8687	560.1360	531.1712	511.8335	491.7179	493.5163	509.0904	526.9380	560.5430	582.4609	(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	4.5500	10.6334	0.7200	0.7000	0.7700	16.8985	(74)
South	2.4300	46.7521	0.7200	0.7000	0.7700	39.6799	(78)
North	1.4500	26.0000	0.7200	0.7000	1.0000	17.1007	(82)

Solar gains	73.6791	132.7962	200.7962	280.3608	342.5142	352.4811	334.6572	286.4428	228.0889	151.9440	89.5854	62.1866	(83)
Total gains	668.1376	741.2130	782.6649	840.4969	873.6853	864.3146	826.3751	779.9592	737.1793	678.8821	650.1284	644.6475	(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	48.6720	48.8244	48.9778	49.7592	49.9185	50.7304	50.7304	50.8960	50.4025	49.9185	49.6009	49.2874	
alpha	4.2448	4.2550	4.2652	4.3173	4.3279	4.3820	4.3820	4.3931	4.3602	4.3279	4.3067	4.2858	
util living area	0.9757	0.9611	0.9357	0.8679	0.7452	0.5621	0.4165	0.4572	0.6799	0.8868	0.9582	0.9787	(86)
Living	19.7171	19.9174	20.1911	20.5596	20.8259	20.9617	20.9917	20.9877	20.9123	20.5817	20.1075	19.6921	
Non living	18.9621	19.1600	19.4277	19.7849	20.0203	20.1351	20.1527	20.1535	20.0985	19.8140	19.3584	18.9453	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.3437	19.9174	20.1911	20.5596	20.8259	20.9617	20.9917	20.9877	20.9123	20.5817	20.1075	19.8750	(87)
Th 2	20.1231	20.1256	20.1281	20.1406	20.1431	20.1557	20.1557	20.1582	20.1507	20.1431	20.1381	20.1331	(88)
util rest of house	0.9709	0.9534	0.9228	0.8421	0.6994	0.4962	0.3391	0.3774	0.6151	0.8591	0.9487	0.9744	(89)
MIT 2	19.5292	19.1600	19.4277	19.7849	20.0203	20.1351	20.1527	20.1535	20.0985	19.8140	19.3584	19.1114	(90)
Living area fraction										fLA = Living area / (4) =		0.4460	(91)
MIT	19.8924	19.4978	19.7682	20.1304	20.3796	20.5038	20.5269	20.5255	20.4614	20.1564	19.6925	19.4520	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8924	19.4978	19.7682	20.1304	20.3796	20.5038	20.5269	20.5255	20.4614	20.1564	19.6925	19.4520	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9694	0.9469	0.9167	0.8418	0.7127	0.5240	0.3735	0.4127	0.6399	0.8596	0.9428	0.9703	(94)
Useful gains	647.6800	701.8361	717.4779	707.5213	622.6486	452.8988	308.6243	321.8662	471.6865	583.5817	612.9439	625.5251	(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	1288.4692	1202.5152	1089.5613	907.7420	699.3231	468.0572	311.3306	326.0145	507.6229	769.9662	1021.0822	1244.6007	(97)
Space heating kWh	476.7472	336.4564	276.8300	144.1589	57.0459	0.0000	0.0000	0.0000	0.0000	138.6701	293.8595	460.5922	(98a)
Space heating requirement - total per year (kWh/year)												2184.3601	
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	476.7472	336.4564	276.8300	144.1589	57.0459	0.0000	0.0000	0.0000	0.0000	138.6701	293.8595	460.5922	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2184.3601	
Space heating per m2										(98c) / (4) =		25.1799	(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 %)	284.8744 (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	476.7472	336.4564	276.8300	144.1589	57.0459	0.0000	0.0000	0.0000	0.0000	138.6701	293.8595	460.5922	(98)
Space heating efficiency (main heating system 1)	284.8744	284.8744	284.8744	284.8744	284.8744	0.0000	0.0000	0.0000	0.0000	284.8744	284.8744	284.8744	(210)
Space heating fuel (main heating system)	167.3535	118.1069	97.1762	50.6044	20.0249	0.0000	0.0000	0.0000	0.0000	48.6776	103.1541	161.6826	(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	311.3768	275.2231	291.4279	253.2688	243.6395	217.4430	212.7891	222.2226	225.8051	254.3556	273.6870	307.5318	(64)
Efficiency of water heater												279.1993	(216)
(217)m	279.1993	279.1993	279.1993	279.1993	279.1993	279.1993	279.1993	279.1993	279.1993	279.1993	279.1993	279.1993	(217)
Fuel for water heating, kWh/month	111.5249	98.5759	104.3799	90.7126	87.2636	77.8809	76.2140	79.5928	80.8759	91.1018	98.0256	110.1477	(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	16.8584	15.2269	16.8584	16.3145	16.8584	16.3145	16.8584	16.8584	16.3145	16.8584	16.3145	16.8584	(231)
Lighting	36.5581	29.3283	26.4069	19.3468	14.9440	12.2094	13.6324	17.7200	23.0165	30.1989	34.1096	37.5742	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.7325	-56.7598	-94.4559	-115.7489	-128.1107	-118.2301	-116.1687	-106.8816	-88.9124	-67.9309	-39.9631	-28.7517	(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	-10.9193	-28.8798	-74.1048	-139.1311	-209.0106	-221.6099	-215.6850	-168.7853	-106.4956	-47.9546	-16.1105	-8.1209	(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	766.7801	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.1993	
Water heating fuel used	1106.2957	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)		
mechanical ventilation fans (SFP = 0.6050)	198.4935	(230a)
Total electricity for the above, kWh/year	198.4935	(231)
Electricity for lighting (calculated in Appendix L)	295.0451	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2243.4538	(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	123.1607	(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	766.7801	0.1558	119.4741	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1106.2957	0.1411	156.1440	(264)
Space and water heating			275.6181	(265)
Pumps, fans and electric keep-hot	198.4935	0.1387	27.5335	(267)
Energy for lighting	295.0451	0.1443	42.5841	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-996.6463	0.1330	-132.5174	
PV Unit electricity exported	-1246.8075	0.1207	-150.5306	
Total			-283.0479	(269)
Total CO2, kg/year			62.6878	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			0.7200	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	766.7801	1.5768	1209.0826	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1106.2957	1.5219	1683.6732	(278)
Space and water heating			2892.7558	(279)
Pumps, fans and electric keep-hot	198.4935	1.5128	300.2810	(281)
Energy for lighting	295.0451	1.5338	452.5500	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-996.6463	1.4913	-1486.3366	
PV Unit electricity exported	-1246.8075	0.4429	-552.2218	
Total			-2038.5584	(283)
Total Primary energy kWh/year			1607.0284	(286)
Dwelling Primary energy Rate (DPER)			18.5200	(287)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	86.7500 (1b)	x	3.1000 (2b)	=	268.9250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 86.7500						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	268.9250	(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	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) = 0.1116	(8)

Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3616	(18)
Number of sides sheltered	3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2802	(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	0.3573	0.3503	0.3433	0.3082	0.3012	0.2662	0.2662	0.2592	0.2802	0.3012	0.3152	0.3292	(22b)
Effective ac	0.5638	0.5613	0.5589	0.5475	0.5454	0.5354	0.5354	0.5336	0.5393	0.5454	0.5497	0.5542	(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			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
RL			1.4500	2.0221	2.9320			(27a)
External Wall 1	40.6700	4.5500	36.1200	0.1800	6.5016			(29a)
dormer wall	20.6000	2.4300	18.1700	0.1800	3.2706			(29a)
sheltered 3rd floor only	16.4300	1.8900	14.5400	0.1800	2.6172			(29a)
main sloping roof	56.3000	1.4500	54.8500	0.1100	6.0335			(30)
flat roof rear	45.0000		45.0000	0.1100	4.9500			(30)
Total net area of external elements Aum(A, m2)			179.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1873			(33)
Party Wall 1			20.8300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 176.9062 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6100	0.0500	0.2805
E3 Sill	4.7100	0.0500	0.2355
E4 Jamb	19.0800	0.0500	0.9540
R11 Upstands or kerbs of rooflights	6.8000	0.0800	0.5440
E24 Eaves (insulation at ceiling level - inverted)	24.9000	0.2400	5.9760
E7 Party floor between dwellings (in blocks of flats)	6.8000	0.0700	0.4760
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.0000	0.0000	0.0000
E16 Corner (normal)	15.5000	0.0900	1.3950
R4 Ridge (vaulted ceiling)	11.0000	0.0800	0.8800
E15 Flat roof with parapet	14.2000	0.5600	7.9520
E11 Eaves (insulation at rafter level)	14.4000	0.0400	0.5760
P4 Party wall - Roof (insulation at ceiling level)	8.0000	0.1200	0.9600
P5 Party wall - Roof (insulation at rafter level)	12.8000	0.0800	1.0240
R4 Ridge (vaulted ceiling)	7.0000	0.0800	0.5600
R7 Flat ceiling (inverted)	12.0000	0.0400	0.4800

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	22.2930	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 58.4803	(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	50.0362	49.8162	49.6007	48.5882	48.3987	47.5169	47.5169	47.3536	47.8565	48.3987	48.7820	49.1826	(38)
Heat transfer coeff	108.5164	108.2965	108.0809	107.0684	106.8790	105.9971	105.9971	105.8338	106.3368	106.8790	107.2622	107.6629	(39)
Average = Sum(39)m / 12 =												107.0675	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2509	1.2484	1.2459	1.2342	1.2320	1.2219	1.2219	1.2200	1.2258	1.2320	1.2365	1.2411	(40)
HLP (average)												1.2342	
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	2.5786	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4539	66.4402	64.9630	62.1368	60.0510	57.7251	56.4030	57.8690	59.4759	61.9733	64.8603	67.1955	(42a)
Hot water usage for baths	29.1306	28.6980	28.0887	26.9654	26.1243	25.1916	24.6878	25.2928	25.9515	26.9495	28.0960	29.0321	(42b)
Hot water usage for other uses	41.0372	39.5449	38.0526	36.5604	35.0681	33.5759	33.5759	35.0681	36.5604	38.0526	39.5449	41.0372	(42c)
Average daily hot water use (litres/day)												126.5054	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.6217	134.6831	131.1044	125.6626	121.2435	116.4925	114.6667	118.2299	121.9878	126.9755	132.5012	137.2648	(44)
Energy conte	217.9591	191.7869	201.5026	172.0258	163.2170	143.2412	138.6794	146.3933	150.4232	172.3045	188.7722	214.9234	(45)
Energy content (annual)										Total = Sum(45)m =		2101.2287	
Distribution loss (46)m = 0.15 x (45)m	32.6939	28.7680	30.2254	25.8039	24.4825	21.4862	20.8019	21.9590	22.5635	25.8457	28.3158	32.2385	(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	264.5540	233.8726	248.0975	217.1176	209.8119	188.3330	185.2743	192.9882	195.5150	218.8994	233.8641	261.5183	(62)
WWHRS	-30.8371	-27.2726	-28.5583	-23.6474	-22.0385	-18.8585	-17.6769	-18.7976	-19.5117	-23.0022	-26.0587	-30.2661	(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	233.7169	206.6000	219.5392	193.4702	187.7734	169.4745	167.5974	174.1906	176.0033	195.8972	207.8054	231.2523	(64)

											Total per year (kWh/year) = Sum(64)m =	2363.3205	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
109.7473	97.4377	104.2755	93.2720	91.5456	83.7012	83.3868	85.9517	86.0892	94.5672	98.8402	108.7380	(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	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	135.5171	150.0368	135.5171	140.0344	135.5171	140.0344	135.5171	135.5171	140.0344	135.5171	140.0344	135.5171	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	232.9699	235.3874	229.2954	216.3262	199.9550	184.5683	174.2890	171.8715	177.9635	190.9327	207.3040	222.6907	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	(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)													
	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	(71)
Water heating gains (Table 5)													
	147.5098	144.9966	140.1553	129.5445	123.0451	116.2516	112.0791	115.5265	119.5683	127.1064	137.2781	146.1532	(72)
Total internal gains													
	580.6755	595.0994	569.6464	550.5837	523.1958	502.5328	483.5638	484.5937	499.2448	518.2349	549.2951	569.0396	(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	4.5500	10.6334	0.6300	0.7000	0.7700	14.7861	(74)
South	2.4300	46.7521	0.6300	0.7000	0.7700	34.7199	(78)
North	1.4500	26.0000	0.6300	0.7000	1.0000	14.9631	(82)

Solar gains	64.4692	116.1967	175.6967	245.3157	299.6999	308.4210	292.8251	250.6375	199.5778	132.9510	78.3872	54.4133	(83)
Total gains	645.1447	711.2961	745.3431	795.8994	822.8957	810.9538	776.3889	735.2312	698.8226	651.1859	627.6823	623.4529	(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	39.2839	39.3637	39.4422	39.8152	39.8857	40.2176	40.2176	40.2796	40.0891	39.8857	39.7432	39.5953	
alpha	3.6189	3.6242	3.6295	3.6543	3.6590	3.6812	3.6812	3.6853	3.6726	3.6590	3.6495	3.6397	
util living area													
	0.9845	0.9767	0.9635	0.9275	0.8527	0.7114	0.5602	0.6049	0.8047	0.9362	0.9749	0.9863	(86)
MIT	19.1524	19.3527	19.6658	20.1218	20.5391	20.8396	20.9503	20.9334	20.7294	20.2087	19.6156	19.1219	(87)
Th 2	19.8795	19.8815	19.8835	19.8927	19.8945	19.9025	19.9025	19.9040	19.8994	19.8945	19.8909	19.8873	(88)
util rest of house													
	0.9808	0.9711	0.9542	0.9075	0.8091	0.6258	0.4374	0.4835	0.7344	0.9146	0.9679	0.9831	(89)
MIT 2	17.7488	18.0038	18.4007	18.9734	19.4697	19.7919	19.8813	19.8728	19.6898	19.0897	18.3461	17.7150	(90)
Living area fraction										fLA = Living area / (4) =		0.4460	(91)
MIT	18.3748	18.6054	18.9649	19.4856	19.9466	20.2592	20.3581	20.3459	20.1534	19.5888	18.9123	18.3425	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3748	18.6054	18.9649	19.4856	19.9466	20.2592	20.3581	20.3459	20.1534	19.5888	18.9123	18.3425	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9740	0.9625	0.9443	0.8986	0.8115	0.6558	0.4907	0.5352	0.7526	0.9072	0.9596	0.9767	(94)
Useful gains	628.3575	684.6501	703.8165	715.2066	667.7581	531.8052	380.9515	393.4654	525.9256	590.7492	602.3121	608.9458	(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													
1527.3501	1484.2434	1347.2206	1133.3788	881.3925	599.8583	398.3447	417.6061	643.7036	960.7108	1267.0113	1522.6177	(97)	
Space heating kWh													
668.8505	537.3267	478.6927	301.0840	158.9440	0.0000	0.0000	0.0000	0.0000	275.2514	478.5834	679.7719	(98a)	
Space heating requirement - total per year (kWh/year)												3578.5046	
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													
668.8505	537.3267	478.6927	301.0840	158.9440	0.0000	0.0000	0.0000	0.0000	275.2514	478.5834	679.7719	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												3578.5046	
Space heating per m2											(98c) / (4) =	41.2508	(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													
668.8505	537.3267	478.6927	301.0840	158.9440	0.0000	0.0000	0.0000	0.0000	275.2514	478.5834	679.7719	(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)													
724.6484	582.1525	518.6269	326.2015	172.2037	0.0000	0.0000	0.0000	0.0000	298.2139	518.5086	736.4809	(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												
233.7169	206.6000	219.5392	193.4702	187.7734	169.4745	167.5974	174.1906	176.0033	195.8972	207.8054	231.2523	(64)
Efficiency of water heater											79.8000	(216)
(217)m 86.2802	86.1031	85.7589	85.0477	83.6883	79.8000	79.8000	79.8000	79.8000	84.8224	85.8680	86.3286	(217)
Fuel for water heating, kWh/month												
270.8812	239.9449	255.9959	227.4845	224.3722	212.3741	210.0219	218.2840	220.5555	230.9499	242.0055	267.8746	(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 28.1578	22.5892	20.3391	14.9013	11.5102	9.4039	10.5000	13.6483	17.7277	23.2598	26.2718	28.9404	(232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m -29.2407	-42.3985	-62.6402	-72.4322	-79.8037	-75.0848	-74.1683	-69.2035	-60.6935	-49.3985	-32.5650	-25.1452	(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 -13.0990	-27.8992	-56.1029	-85.2224	-113.6298	-114.5314	-113.1796	-95.3838	-69.3327	-40.2049	-17.5868	-10.3321	(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	3877.0364	(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	2820.7440	(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)	227.2494	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1429.2787	(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	5581.7511	(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	3877.0364	0.2100	814.1776	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2820.7440	0.2100	592.3562	(264)
Space and water heating			1406.5339	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	227.2494	0.1443	32.7991	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-672.7742	0.1340	-90.1583	
PV Unit electricity exported	-756.5045	0.1256	-94.9895	
Total			-185.1478	(269)
Total CO2, kg/year			1266.1144	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.5900	(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	3877.0364	1.1300	4381.0511	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2820.7440	1.1300	3187.4407	(278)
Space and water heating			7568.4918	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	227.2494	1.5338	348.5628	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-672.7742	1.4952	-1005.9622	
PV Unit electricity exported	-756.5045	0.4609	-348.6648	
Total			-1354.6270	(283)
Total Primary energy kWh/year			6692.5284	(286)
Target Primary Energy Rate (TPER)			77.1500	(287)

Full SAP Calculation Printout

Property Reference	Flat 7 Block A	**Issued on Date**	13/03/2024
Assessment Reference	Design stage for ES condition	**Prop Type Ref**	
Property	Flat 7 Block A, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	83 B	**DER**	0.72	**TER**	14.59
Environmental	99 A	**% DER < TER**			95.07
CO_2 Emissions (t/year)	0.01	**DFEE**	46.81	**TFEE**	47.38
Compliance Check	See BREL	**% DFEE < TFEE**			1.21
% DPER < TPER	75.99	**DPER**	18.52	**TPER**	77.15

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	86.7500	(1b)	x 3.1000	(2b) =	268.9250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		268.9250	(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) =	0.1116	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2616	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2027	(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	0.2584	0.2534	0.2483	0.2230	0.2179	0.1926	0.1926	0.1875	0.2027	0.2179	0.2280	0.2382	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5334	0.5321	0.5308	0.5249	0.5237	0.5185	0.5185	0.5176	0.5205	0.5237	0.5260	0.5284	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			1.8900	1.4000	2.6460			(26)
window (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
RL			1.4500	1.2357	1.7918			(27a)
External Wall 1	40.6700	4.5500	36.1200	0.1300	4.6956	70.0000	2528.4000	(29a)
dormer wall	20.6000	2.4300	18.1700	0.1800	3.2706	70.0000	1271.9000	(29a)
sheltered 3rd floor only	16.4300	1.8900	14.5400	0.1800	2.6172	9.0000	130.8600	(29a)
main sloping roof	56.3000	1.4500	54.8500	0.1100	6.0335	9.0000	493.6500	(30)
flat roof rear	45.0000		45.0000	0.1100	4.9500	9.0000	405.0000	(30)
Total net area of external elements Aum(A, m2)			179.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.9971			(33)
Party Wall 1			20.8300	0.0000	0.0000	180.0000	3749.4000	(32)
Party Floor 1			86.7500			30.0000	2602.5000	(32d)
Party Ceiling 1			86.7500			30.0000	2602.5000	(32b)
Internal Wall 1			173.6000			9.0000	1562.4000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15346.6100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	176.9062 (35)
List of Thermal Bridges	

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6100	0.0600	0.3366
E3 Sill	4.7100	0.0400	0.1884
E4 Jamb	19.0800	0.0200	0.3816
R11 Upstands or kerbs of rooflights	6.8000	0.2400	1.6320
E24 Eaves (insulation at ceiling level - inverted)	24.9000	0.1500	3.7350
E7 Party floor between dwellings (in blocks of flats)	6.8000	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.0000	0.0000	0.0000
E16 Corner (normal)	15.5000	0.0500	0.7750
R4 Ridge (vaulted ceiling)	11.0000	0.1200	1.3200
E15 Flat roof with parapet	14.2000	0.3000	4.2600
E11 Eaves (insulation at rafter level)	14.4000	0.1500	2.1600
P4 Party wall - Roof (insulation at ceiling level)	8.0000	0.4800	3.8400
P5 Party wall - Roof (insulation at rafter level)	12.8000	0.4800	6.1440
R4 Ridge (vaulted ceiling)	7.0000	0.1200	0.8400
R7 Flat ceiling (inverted)	12.0000	0.1200	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 27.0526 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 61.0497 (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	47.3365	47.2214	47.1086	46.5788	46.4796	46.0181	46.0181	45.9326	46.1959	46.4796	46.6802	46.8898	(38)
Heat transfer coeff	108.3862	108.2711	108.1583	107.6284	107.5293	107.0678	107.0678	106.9823	107.2456	107.5293	107.7299	107.9395	(39)

Average = Sum(39)m / 12 = 107.6280

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2494	1.2481	1.2468	1.2407	1.2395	1.2342	1.2342	1.2332	1.2363	1.2395	1.2418	1.2443	(40)
HLP (average)												1.2407	
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 2.5786 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1306	28.6980	28.0887	26.9654	26.1243	25.1916	24.6878	25.2928	25.9515	26.9495	28.0960	29.0321	(42b)

Hot water usage for other uses

41.0372	39.5449	38.0526	36.5604	35.0681	33.5759	33.5759	35.0681	36.5604	38.0526	39.5449	41.0372	(42c)

Average daily hot water use (litres/day) 64.3152 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1678	68.2429	66.1414	63.5258	61.1924	58.7675	58.2637	60.3609	62.5119	65.0021	67.6409	70.0693	(44)
Energy conte	111.1286	97.1769	101.6568	86.9636	82.3768	72.2615	70.4649	74.7394	77.0834	88.2073	96.3668	109.7116	(45)

Energy content (annual) Total = Sum(45)m = 1068.1377

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

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 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

94.4593	82.6004	86.4083	73.9191	70.0202	61.4222	59.8952	63.5285	65.5209	74.9762	81.9118	93.2548	(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

94.4593	82.6004	86.4083	73.9191	70.0202	61.4222	59.8952	63.5285	65.5209	74.9762	81.9118	93.2548	(64)

Total per year (kWh/year) = Sum(64)m = 907.9170 (64)

12Total per year (kWh/year) 908 (64)

Electric shower(s)

54.0193	48.1317	52.5579	50.1554	51.0966	48.7412	50.3659	51.0966	50.1554	52.5579	51.5697	54.0193	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 614.4669 (64a)

Heat gains from water heating, kWh/month

37.1197	32.6830	34.7416	31.0186	30.2792	27.5409	27.5653	28.6563	28.9191	31.8835	33.3704	36.8185	(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	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	135.5171	150.0368	135.5171	140.0344	135.5171	140.0344	135.5171	135.5171	140.0344	135.5171	140.0344	135.5171	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.9699	235.3874	229.2954	216.3262	199.9550	184.5683	174.2890	171.8715	177.9635	190.9327	207.3040	222.6907	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	(71)
Water heating gains (Table 5)	49.8920	48.6354	46.6957	43.0814	40.6978	38.2512	37.0501	38.5165	40.1654	42.8542	46.3477	49.4873	(72)
Total internal gains	480.0577	495.7383	473.1868	461.1206	437.8485	424.5324	408.5348	407.5837	419.8419	430.9826	455.3647	469.3737	(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	4.5500	10.6334	0.7200	0.7000	0.7700	16.8985	(74)
South	2.4300	46.7521	0.7200	0.7000	0.7700	39.6799	(78)
North	1.4500	26.0000	0.7200	0.7000	1.0000	17.1007	(82)

Solar gains	73.6791	132.7962	200.7962	280.3608	342.5142	352.4811	334.6572	286.4428	228.0889	151.9440	89.5854	62.1866	(83)
Total gains	553.7368	628.5345	673.9830	741.4814	780.3627	777.0135	743.1920	694.0265	647.9308	582.9267	544.9501	531.5603	(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	39.3311	39.3729	39.4140	39.6080	39.6445	39.8154	39.8154	39.8472	39.7494	39.6445	39.5707	39.4938	
alpha	3.6221	3.6249	3.6276	3.6405	3.6430	3.6544	3.6544	3.6565	3.6500	3.6430	3.6380	3.6329	
util living area	0.9904	0.9840	0.9728	0.9402	0.8699	0.7333	0.5841	0.6356	0.8338	0.9531	0.9838	0.9918	(86)
MIT	19.0190	19.2335	19.5661	20.0479	20.4945	20.8181	20.9416	20.9196	20.6854	20.1144	19.4879	18.9780	(87)
Th 2	19.8807	19.8817	19.8828	19.8876	19.8885	19.8927	19.8927	19.8935	19.8911	19.8885	19.8867	19.8848	(88)
util rest of house	0.9881	0.9800	0.9656	0.9230	0.8293	0.6484	0.4575	0.5111	0.7680	0.9362	0.9790	0.9898	(89)
MIT 2	18.0882	18.3015	18.6311	19.1037	19.5212	19.7937	19.8730	19.8636	19.6967	19.1755	18.5591	18.0503	(90)
Living area fraction										fLA = Living area / (4) =		0.4460	(91)
MIT	18.5033	18.7171	19.0481	19.5248	19.9553	20.2506	20.3496	20.3345	20.1376	19.5943	18.9733	18.4641	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5033	18.7171	19.0481	19.5248	19.9553	20.2506	20.3496	20.3345	20.1376	19.5943	18.9733	18.4641	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9841	0.9745	0.9586	0.9161	0.8321	0.6782	0.5124	0.5640	0.7847	0.9306	0.9737	0.9862	(94)
Useful gains	544.9236	612.5218	646.1106	679.3055	649.3217	526.9791	380.8413	391.4412	508.4241	542.4515	530.6435	524.2008	(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	1539.4447	1495.9981	1357.1822	1143.5326	887.6864	604.9931	401.4611	420.9261	647.5093	967.1464	1279.1115	1539.6568	(97)
Space heating kWh	739.9238	593.6961	529.0372	334.2435	177.3434	0.0000	0.0000	0.0000	0.0000	315.9730	538.8970	755.4992	(98a)
Space heating requirement - total per year (kWh/year)												3984.6133	
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	739.9238	593.6961	529.0372	334.2435	177.3434	0.0000	0.0000	0.0000	0.0000	315.9730	538.8970	755.4992	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3984.6133	
Space heating per m2										(98c) / (4) =		45.9321	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1006.4373	792.3017	813.0657	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6986	0.7814	0.7432	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	703.0931	619.0973	604.2834	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	819.9871	784.7871	733.6857	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	84.1636	123.2732	96.2754	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	21.0409	30.8183	24.0688	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												75.9280	(107)
Energy for space heating												45.9321	(99)
Energy for space cooling												0.8753	(108)
Total												46.8074	(109)
Fabric Energy Efficiency (DFEE)												46.8	(109)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	86.7500	(1b)	x 3.1000	(2b) =	268.9250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		268.9250	(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) =	0.1116	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3616	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2802	(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	0.3573	0.3503	0.3433	0.3082	0.3012	0.2662	0.2662	0.2592	0.2802	0.3012	0.3152	0.3292	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5638	0.5613	0.5589	0.5475	0.5454	0.5354	0.5354	0.5336	0.5393	0.5454	0.5497	0.5542	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
RL			1.4500	2.0221	2.9320			(27a)
External Wall 1	40.6700	4.5500	36.1200	0.1800	6.5016			(29a)
dormer wall	20.6000	2.4300	18.1700	0.1800	3.2706			(29a)
sheltered 3rd floor only	16.4300	1.8900	14.5400	0.1800	2.6172			(29a)
main sloping roof	56.3000	1.4500	54.8500	0.1100	6.0335			(30)
flat roof rear	45.0000		45.0000	0.1100	4.9500			(30)
Total net area of external elements Aum(A, m2)			179.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1873			(33)
Party Wall 1			20.8300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 176.9062 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	5.6100	0.0500	0.2805
E3	Sill	4.7100	0.0500	0.2355
E4	Jamb	19.0800	0.0500	0.9540
R11	Upstands or kerbs of rooflights	6.8000	0.0800	0.5440
E24	Eaves (insulation at ceiling level - inverted)	24.9000	0.2400	5.9760
E7	Party floor between dwellings (in blocks of flats)	6.8000	0.0700	0.4760
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	11.0000	0.0000	0.0000
E16	Corner (normal)	15.5000	0.0900	1.3950
R4	Ridge (vaulted ceiling)	11.0000	0.0800	0.8800
E15	Flat roof with parapet	14.2000	0.5600	7.9520
E11	Eaves (insulation at rafter level)	14.4000	0.0400	0.5760
P4	Party wall - Roof (insulation at ceiling level)	8.0000	0.1200	0.9600
P5	Party wall - Roof (insulation at rafter level)	12.8000	0.0800	1.0240
R4	Ridge (vaulted ceiling)	7.0000	0.0800	0.5600
R7	Flat ceiling (inverted)	12.0000	0.0400	0.4800

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		22.2930 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	58.4803 (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	50.0362	49.8162	49.6007	48.5882	48.3987	47.5169	47.5169	47.3536	47.8565	48.3987	48.7820	49.1826	(38)
Heat transfer coeff	108.5164	108.2965	108.0809	107.0684	106.8790	105.9971	105.9971	105.8338	106.3368	106.8790	107.2622	107.6629	(39)
Average = Sum(39)m / 12 =												107.0675	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2509	1.2484	1.2459	1.2342	1.2320	1.2219	1.2219	1.2200	1.2258	1.2320	1.2365	1.2411	(40)
HLP (average)												1.2342	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5786 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1306	28.6980	28.0887	26.9654	26.1243	25.1916	24.6878	25.2928	25.9515	26.9495	28.0960	29.0321	(42b)

Hot water usage for other uses

41.0372	39.5449	38.0526	36.5604	35.0681	33.5759	33.5759	35.0681	36.5604	38.0526	39.5449	41.0372	(42c)

Average daily hot water use (litres/day) 64.3152 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1678	68.2429	66.1414	63.5258	61.1924	58.7675	58.2637	60.3609	62.5119	65.0021	67.6409	70.0693	(44)
Energy conte	111.1286	97.1769	101.6568	86.9636	82.3768	72.2615	70.4649	74.7394	77.0834	88.2073	96.3668	109.7116	(45)
Energy content (annual)										Total = Sum(45)m =		1068.1377	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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	94.4593	82.6004	86.4083	73.9191	70.0202	61.4222	59.8952	63.5285	65.5209	74.9762	81.9118	93.2548	(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													
	94.4593	82.6004	86.4083	73.9191	70.0202	61.4222	59.8952	63.5285	65.5209	74.9762	81.9118	93.2548	(64)
									Total per year (kWh/year) = Sum(64)m =			907.9170	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)													
	54.0193	48.1317	52.5579	50.1554	51.0966	48.7412	50.3659	51.0966	50.1554	52.5579	51.5697	54.0193	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				614.4669	(64a)
Heat gains from water heating, kWh/month													
	37.1197	32.6830	34.7416	31.0186	30.2792	27.5409	27.5653	28.6563	28.9191	31.8835	33.3704	36.8185	(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	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	135.5171	150.0368	135.5171	140.0344	135.5171	140.0344	135.5171	135.5171	140.0344	135.5171	140.0344	135.5171	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	232.9699	235.3874	229.2954	216.3262	199.9550	184.5683	174.2890	171.8715	177.9635	190.9327	207.3040	222.6907	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	(71)
Water heating gains (Table 5)													
	49.8920	48.6354	46.6957	43.0814	40.6978	38.2512	37.0501	38.5165	40.1654	42.8542	46.3477	49.4873	(72)
Total internal gains													
	480.0577	495.7383	473.1868	461.1206	437.8485	424.5324	408.5348	407.5837	419.8419	430.9826	455.3647	469.3737	(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	4.5500	10.6334	0.6300	0.7000	0.7700	14.7861	(74)
South	2.4300	46.7521	0.6300	0.7000	0.7700	34.7199	(78)
North	1.4500	26.0000	0.6300	0.7000	1.0000	14.9631	(82)

Solar gains	64.4692	116.1967	175.6967	245.3157	299.6999	308.4210	292.8251	250.6375	199.5778	132.9510	78.3872	54.4133	(83)
Total gains	544.5269	611.9349	648.8834	706.4363	737.5484	732.9534	701.3599	658.2212	619.4197	563.9337	533.7519	523.7870	(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	39.2839	39.3637	39.4422	39.8152	39.8857	40.2176	40.2176	40.2796	40.0891	39.8857	39.7432	39.5953	
alpha	3.6189	3.6242	3.6295	3.6543	3.6590	3.6812	3.6812	3.6853	3.6726	3.6590	3.6495	3.6397	
util living area													
	0.9909	0.9853	0.9757	0.9473	0.8847	0.7550	0.6067	0.6559	0.8470	0.9570	0.9848	0.9922	(86)
MIT	19.0024	19.2085	19.5322	20.0131	20.4617	20.8024	20.9355	20.9128	20.6699	20.0985	19.4797	18.9720	(87)
Th 2	19.8795	19.8815	19.8835	19.8927	19.8945	19.9025	19.9025	19.9040	19.8994	19.8945	19.8909	19.8873	(88)
util rest of house													
	0.9887	0.9816	0.9692	0.9318	0.8472	0.6723	0.4790	0.5316	0.7842	0.9413	0.9803	0.9902	(89)
MIT 2	18.0709	18.2767	18.5986	19.0753	19.4988	19.7930	19.8802	19.8709	19.6927	19.1653	18.5542	18.0462	(90)
Living area fraction									fLA = Living area / (4) =			0.4460	(91)
MIT	18.4863	18.6923	19.0150	19.4936	19.9282	20.2432	20.3508	20.3356	20.1286	19.5815	18.9670	18.4591	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4863	18.6923	19.0150	19.4936	19.9282	20.2432	20.3508	20.3356	20.1286	19.5815	18.9670	18.4591	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9848	0.9764	0.9626	0.9249	0.8485	0.7004	0.5342	0.5841	0.7993	0.9357	0.9752	0.9868	(94)
Useful gains	536.2733	597.4709	624.6013	653.3519	625.8179	513.3396	374.6622	384.4371	495.0833	527.6720	520.5249	516.8505	(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													
	1539.4494	1493.6603	1352.6303	1134.2347	879.4244	598.1621	397.5791	416.5194	641.0576	959.9313	1272.8774	1535.1753	(97)
Space heating kWh													
	746.3630	602.2393	541.6536	346.2356	188.6832	0.0000	0.0000	0.0000	0.0000	321.6009	541.6938	757.6337	(98a)
Space heating requirement - total per year (kWh/year)												4046.1031	
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													
	746.3630	602.2393	541.6536	346.2356	188.6832	0.0000	0.0000	0.0000	0.0000	321.6009	541.6938	757.6337	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4046.1031	
Space heating per m2											(98c) / (4) =	46.6410	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	996.3729	784.3786	804.3369	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6765	0.7621	0.7251	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	674.0733	597.7582	583.2617	0.0000	0.0000	0.0000	0.0000	(102)

Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	771.2643	738.5158	694.0146	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	69.9775	104.7236	82.4002	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction										fC = cooled area / (4) =		1.0000 (105)
Intermittency factor (Table 10b)												
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	17.4944	26.1809	20.6000	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												64.2753 (107)
Energy for space heating												46.6410 (99)
Energy for space cooling												0.7409 (108)
Total												47.3819 (109)
Fabric Energy Efficiency (TFEE)												47.4 (109)

Full SAP Calculation Printout

Property Reference	Flat 7 Block A	**Issued on Date**	13/03/2024
Assessment Reference	Design stage for ES condition	**Prop Type Ref**	
Property	Flat 7 Block A, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	83 B	**DER**	0.72	**TER**	14.59
Environmental	99 A	**% DER < TER**			95.07
CO_2 Emissions (t/year)	0.01	**DFEE**	46.81	**TFEE**	47.38
Compliance Check	See BREL	**% DFEE < TFEE**			1.21
% DPER < TPER	75.99	**DPER**	18.52	**TPER**	77.15

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	86.7500	(1b)	x 3.1000	(2b) =	268.9250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		268.9250	(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		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(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) =												81.0000	(23c)
Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			1.8900	1.4000	2.6460			(26)
window (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
RL			1.4500	1.2357	1.7918			(27a)
External Wall 1	40.6700	4.5500	36.1200	0.1300	4.6956	70.0000	2528.4000	(29a)
dormer wall	20.6000	2.4300	18.1700	0.1800	3.2706	70.0000	1271.9000	(29a)
sheltered 3rd floor only	16.4300	1.8900	14.5400	0.1800	2.6172	9.0000	130.8600	(29a)
main sloping roof	56.3000	1.4500	54.8500	0.1100	6.0335	9.0000	493.6500	(30)
flat roof rear	45.0000		45.0000	0.1100	4.9500	9.0000	405.0000	(30)
Total net area of external elements Aum(A, m2)			179.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.9971			(33)
Party Wall 1			20.8300	0.0000	0.0000	180.0000	3749.4000	(32)
Party Floor 1			86.7500			30.0000	2602.5000	(32d)
Party Ceiling 1			86.7500			20.0000	1735.0000	(32b)
Internal Wall 1			173.6000			9.0000	1562.4000	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 14479.1100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 166.9062 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6100	0.0600	0.3366
E3 Sill	4.7100	0.0400	0.1884
E4 Jamb	19.0800	0.0200	0.3816
R11 Upstands or kerbs of rooflights	6.8000	0.2400	1.6320
E24 Eaves (insulation at ceiling level - inverted)	24.9000	0.1500	3.7350
E7 Party floor between dwellings (in blocks of flats)	6.8000	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.0000	0.0000	0.0000
E16 Corner (normal)	15.5000	0.0500	0.7750
R4 Ridge (vaulted ceiling)	11.0000	0.1200	1.3200
E15 Flat roof with parapet	14.2000	0.3000	4.2600
E11 Eaves (insulation at rafter level)	14.4000	0.1500	2.1600
P4 Party wall - Roof (insulation at ceiling level)	8.0000	0.4800	3.8400
P5 Party wall - Roof (insulation at rafter level)	12.8000	0.4800	6.1440
R4 Ridge (vaulted ceiling)	7.0000	0.1200	0.8400
R7 Flat ceiling (inverted)	12.0000	0.1200	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 27.0526 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 61.0497 (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	21.5845	21.3266	21.0687	19.7791	19.5212	18.2316	18.2316	17.9737	18.7474	19.5212	20.0370	20.5528	(38)
Heat transfer coeff	82.6342	82.3763	82.1184	80.8288	80.5709	79.2813	79.2813	79.0234	79.7971	80.5709	81.0867	81.6025	(39)
Average = Sum(39)m / 12 =												80.7643	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9526	0.9496	0.9466	0.9317	0.9288	0.9139	0.9139	0.9109	0.9199	0.9288	0.9347	0.9407	(40)
HLP (average)												0.9310	
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 2.5786 (42)
Hot water usage for mixer showers

101.1809	99.6603	97.4446	93.2052	90.0766	86.5876	84.6045	86.8034	89.2139	92.9600	97.2905	100.7932	(42a)

Hot water usage for baths

29.1306	28.6980	28.0887	26.9654	26.1243	25.1916	24.6878	25.2928	25.9515	26.9495	28.0960	29.0321	(42b)

Hot water usage for other uses

41.0372	39.5449	38.0526	36.5604	35.0681	33.5759	33.5759	35.0681	36.5604	38.0526	39.5449	41.0372	(42c)

Average daily hot water use (litres/day) 157.6005 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	171.3486	167.9032	163.5860	156.7310	151.2690	145.3551	142.8682	147.1644	151.7258	157.9622	164.9314	170.8625	(44)
Energy conte	271.3744	239.0919	251.4255	214.5568	203.6371	178.7310	172.7867	182.2202	187.0931	214.3532	234.9750	267.5294	(45)
Energy content (annual)										Total = Sum(45)m =		2617.7742	
Distribution loss (46)m = 0.15 x (45)m	40.7062	35.8638	37.7138	32.1835	30.5456	26.8097	25.9180	27.3330	28.0640	32.1530	35.2462	40.1294	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.0000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.5400 (55)
Total storage loss

16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(56)

If cylinder contains dedicated solar storage

16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(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

311.3768	275.2231	291.4279	253.2688	243.6395	217.4430	212.7891	222.2226	225.8051	254.3556	273.6870	307.5318	(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

311.3768	275.2231	291.4279	253.2688	243.6395	217.4430	212.7891	222.2226	225.8051	254.3556	273.6870	307.5318	(64)

Total per year (kWh/year) = Sum(64)m = 3088.7702 (64)
12Total per year (kWh/year) 3089 (64)
Electric shower(s)

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

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

122.2339	108.4030	115.6009	102.3098	99.7113	90.3977	89.4535	92.5901	93.1781	103.2743	109.0988	120.9554	(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	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	135.5171	150.0368	135.5171	140.0344	135.5171	140.0344	135.5171	135.5171	140.0344	135.5171	140.0344	135.5171	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.9699	235.3874	229.2954	216.3262	199.9550	184.5683	174.2890	171.8715	177.9635	190.9327	207.3040	222.6907	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	(71)
Water heating gains (Table 5)	164.2929	161.3140	155.3776	142.0969	134.0205	125.5523	120.2332	124.4491	129.4140	138.8096	151.5261	162.5745	(72)
Total internal gains	594.4585	608.4168	581.8687	560.1360	531.1712	511.8335	491.7179	493.5163	509.0904	526.9380	560.5430	582.4609	(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	4.5500	10.6334	0.7200	0.7000	0.7700	16.8985	(74)
South	2.4300	46.7521	0.7200	0.7000	0.7700	39.6799	(78)
North	1.4500	26.0000	0.7200	0.7000	1.0000	17.1007	(82)

Solar gains	73.6791	132.7962	200.7962	280.3608	342.5142	352.4811	334.6572	286.4428	228.0889	151.9440	89.5854	62.1866	(83)
Total gains	668.1376	741.2130	782.6649	840.4969	873.6853	864.3146	826.3751	779.9592	737.1793	678.8821	650.1284	644.6475	(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	48.6720	48.8244	48.9778	49.7592	49.9185	50.7304	50.7304	50.8960	50.4025	49.9185	49.6009	49.2874	
alpha	4.2448	4.2550	4.2652	4.3173	4.3279	4.3820	4.3820	4.3931	4.3602	4.3279	4.3067	4.2858	
util living area	0.9757	0.9611	0.9357	0.8679	0.7452	0.5621	0.4165	0.4572	0.6799	0.8868	0.9582	0.9787	(86)
Living	19.7171	19.9174	20.1911	20.5596	20.8259	20.9617	20.9917	20.9877	20.9123	20.5817	20.1075	19.6921	
Non living	18.9621	19.1600	19.4277	19.7849	20.0203	20.1351	20.1527	20.1535	20.0985	19.8140	19.3584	18.9453	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.3437	19.9174	20.1911	20.5596	20.8259	20.9617	20.9917	20.9877	20.9123	20.5817	20.1075	19.8750	(87)
Th 2	20.1231	20.1256	20.1281	20.1406	20.1431	20.1557	20.1557	20.1582	20.1507	20.1431	20.1381	20.1331	(88)
util rest of house	0.9709	0.9534	0.9228	0.8421	0.6994	0.4962	0.3391	0.3774	0.6151	0.8591	0.9487	0.9744	(89)
MIT 2	19.5292	19.1600	19.4277	19.7849	20.0203	20.1351	20.1527	20.1535	20.0985	19.8140	19.3584	19.1114	(90)
Living area fraction										fLA = Living area / (4) =		0.4460	(91)
MIT	19.8924	19.4978	19.7682	20.1304	20.3796	20.5038	20.5269	20.5255	20.4614	20.1564	19.6925	19.4520	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8924	19.4978	19.7682	20.1304	20.3796	20.5038	20.5269	20.5255	20.4614	20.1564	19.6925	19.4520	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9694	0.9469	0.9167	0.8418	0.7127	0.5240	0.3735	0.4127	0.6399	0.8596	0.9428	0.9703	(94)
Useful gains	647.6800	701.8361	717.4779	707.5213	622.6486	452.8988	308.6243	321.8662	471.6865	583.5817	612.9439	625.5251	(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	1288.4692	1202.5152	1089.5613	907.7420	699.3231	468.0572	311.3306	326.0145	507.6229	769.9662	1021.0822	1244.6007	(97)
Space heating kWh	476.7472	336.4564	276.8300	144.1589	57.0459	0.0000	0.0000	0.0000	0.0000	138.6701	293.8595	460.5922	(98a)
Space heating requirement - total per year (kWh/year)												2184.3601	
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	476.7472	336.4564	276.8300	144.1589	57.0459	0.0000	0.0000	0.0000	0.0000	138.6701	293.8595	460.5922	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2184.3601	
Space heating per m2										(98c) / (4) =		25.1799	(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 %)	284.8744 (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	476.7472	336.4564	276.8300	144.1589	57.0459	0.0000	0.0000	0.0000	0.0000	138.6701	293.8595	460.5922	(98)
Space heating efficiency (main heating system 1)	284.8744	284.8744	284.8744	284.8744	284.8744	0.0000	0.0000	0.0000	0.0000	284.8744	284.8744	284.8744	(210)
Space heating fuel (main heating system)	167.3535	118.1069	97.1762	50.6044	20.0249	0.0000	0.0000	0.0000	0.0000	48.6776	103.1541	161.6826	(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	311.3768	275.2231	291.4279	253.2688	243.6395	217.4430	212.7891	222.2226	225.8051	254.3556	273.6870	307.5318	(64)
Efficiency of water heater												279.1993	(216)
(217)m	279.1993	279.1993	279.1993	279.1993	279.1993	279.1993	279.1993	279.1993	279.1993	279.1993	279.1993	279.1993	(217)
Fuel for water heating, kWh/month	111.5249	98.5759	104.3799	90.7126	87.2636	77.8809	76.2140	79.5928	80.8759	91.1018	98.0256	110.1477	(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	16.8584	15.2269	16.8584	16.3145	16.8584	16.3145	16.8584	16.8584	16.3145	16.8584	16.3145	16.8584	(231)
Lighting	36.5581	29.3283	26.4069	19.3468	14.9440	12.2094	13.6324	17.7200	23.0165	30.1989	34.1096	37.5742	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.7325	-56.7598	-94.4559	-115.7489	-128.1107	-118.2301	-116.1687	-106.8816	-88.9124	-67.9309	-39.9631	-28.7517	(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	-10.9193	-28.8798	-74.1048	-139.1311	-209.0106	-221.6099	-215.6850	-168.7853	-106.4956	-47.9546	-16.1105	-8.1209	(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	766.7801	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.1993	
Water heating fuel used	1106.2957	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6050)		
mechanical ventilation fans (SFP = 0.6050)	198.4935	(230a)
Total electricity for the above, kWh/year	198.4935	(231)
Electricity for lighting (calculated in Appendix L)	295.0451	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2243.4538	(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	123.1607	(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	766.7801	0.1558	119.4741	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1106.2957	0.1411	156.1440	(264)
Space and water heating			275.6181	(265)
Pumps, fans and electric keep-hot	198.4935	0.1387	27.5335	(267)
Energy for lighting	295.0451	0.1443	42.5841	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-996.6463	0.1330	-132.5174	
PV Unit electricity exported	-1246.8075	0.1207	-150.5306	
Total			-283.0479	(269)
Total CO2, kg/year			62.6878	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			0.7200	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	766.7801	1.5768	1209.0826	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1106.2957	1.5219	1683.6732	(278)
Space and water heating			2892.7558	(279)
Pumps, fans and electric keep-hot	198.4935	1.5128	300.2810	(281)
Energy for lighting	295.0451	1.5338	452.5500	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-996.6463	1.4913	-1486.3366	
PV Unit electricity exported	-1246.8075	0.4429	-552.2218	
Total			-2038.5584	(283)
Total Primary energy kWh/year			1607.0284	(286)
Dwelling Primary energy Rate (DPER)			18.5200	(287)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	86.7500 (1b)	x	3.1000 (2b)	=	268.9250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 86.7500						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	268.9250	(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	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) = 0.1116	(8)

Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3616	(18)
Number of sides sheltered	3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2802	(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	0.3573	0.3503	0.3433	0.3082	0.3012	0.2662	0.2662	0.2592	0.2802	0.3012	0.3152	0.3292	(22b)
Effective ac	0.5638	0.5613	0.5589	0.5475	0.5454	0.5354	0.5354	0.5336	0.5393	0.5454	0.5497	0.5542	(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			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			6.9800	1.1450	7.9924			(27)
RL			1.4500	2.0221	2.9320			(27a)
External Wall 1	40.6700	4.5500	36.1200	0.1800	6.5016			(29a)
dormer wall	20.6000	2.4300	18.1700	0.1800	3.2706			(29a)
sheltered 3rd floor only	16.4300	1.8900	14.5400	0.1800	2.6172			(29a)
main sloping roof	56.3000	1.4500	54.8500	0.1100	6.0335			(30)
flat roof rear	45.0000		45.0000	0.1100	4.9500			(30)
Total net area of external elements Aum(A, m2)			179.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1873			(33)
Party Wall 1			20.8300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 176.9062 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6100	0.0500	0.2805
E3 Sill	4.7100	0.0500	0.2355
E4 Jamb	19.0800	0.0500	0.9540
R11 Upstands or kerbs of rooflights	6.8000	0.0800	0.5440
E24 Eaves (insulation at ceiling level - inverted)	24.9000	0.2400	5.9760
E7 Party floor between dwellings (in blocks of flats)	6.8000	0.0700	0.4760
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.0000	0.0000	0.0000
E16 Corner (normal)	15.5000	0.0900	1.3950
R4 Ridge (vaulted ceiling)	11.0000	0.0800	0.8800
E15 Flat roof with parapet	14.2000	0.5600	7.9520
E11 Eaves (insulation at rafter level)	14.4000	0.0400	0.5760
P4 Party wall - Roof (insulation at ceiling level)	8.0000	0.1200	0.9600
P5 Party wall - Roof (insulation at rafter level)	12.8000	0.0800	1.0240
R4 Ridge (vaulted ceiling)	7.0000	0.0800	0.5600
R7 Flat ceiling (inverted)	12.0000	0.0400	0.4800

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	22.2930	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 58.4803	(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	50.0362	49.8162	49.6007	48.5882	48.3987	47.5169	47.5169	47.3536	47.8565	48.3987	48.7820	49.1826	(38)
Heat transfer coeff	108.5164	108.2965	108.0809	107.0684	106.8790	105.9971	105.9971	105.8338	106.3368	106.8790	107.2622	107.6629	(39)
Average = Sum(39)m / 12 =												107.0675	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2509	1.2484	1.2459	1.2342	1.2320	1.2219	1.2219	1.2200	1.2258	1.2320	1.2365	1.2411	(40)
HLP (average)												1.2342	
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	2.5786	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4539	66.4402	64.9630	62.1368	60.0510	57.7251	56.4030	57.8690	59.4759	61.9733	64.8603	67.1955	(42a)
Hot water usage for baths	29.1306	28.6980	28.0887	26.9654	26.1243	25.1916	24.6878	25.2928	25.9515	26.9495	28.0960	29.0321	(42b)
Hot water usage for other uses	41.0372	39.5449	38.0526	36.5604	35.0681	33.5759	33.5759	35.0681	36.5604	38.0526	39.5449	41.0372	(42c)
Average daily hot water use (litres/day)												126.5054	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.6217	134.6831	131.1044	125.6626	121.2435	116.4925	114.6667	118.2299	121.9878	126.9755	132.5012	137.2648	(44)
Energy conte	217.9591	191.7869	201.5026	172.0258	163.2170	143.2412	138.6794	146.3933	150.4232	172.3045	188.7722	214.9234	(45)
Energy content (annual)										Total = Sum(45)m =		2101.2287	
Distribution loss (46)m = 0.15 x (45)m	32.6939	28.7680	30.2254	25.8039	24.4825	21.4862	20.8019	21.9590	22.5635	25.8457	28.3158	32.2385	(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	264.5540	233.8726	248.0975	217.1176	209.8119	188.3330	185.2743	192.9882	195.5150	218.8994	233.8641	261.5183	(62)
WWHRS	-30.8371	-27.2726	-28.5583	-23.6474	-22.0385	-18.8585	-17.6769	-18.7976	-19.5117	-23.0022	-26.0587	-30.2661	(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	233.7169	206.6000	219.5392	193.4702	187.7734	169.4745	167.5974	174.1906	176.0033	195.8972	207.8054	231.2523	(64)

											Total per year (kWh/year) = Sum(64)m =	2363.3205	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
109.7473	97.4377	104.2755	93.2720	91.5456	83.7012	83.3868	85.9517	86.0892	94.5672	98.8402	108.7380	(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	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	128.9286	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	135.5171	150.0368	135.5171	140.0344	135.5171	140.0344	135.5171	135.5171	140.0344	135.5171	140.0344	135.5171	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	232.9699	235.3874	229.2954	216.3262	199.9550	184.5683	174.2890	171.8715	177.9635	190.9327	207.3040	222.6907	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	35.8929	(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)													
	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	-103.1429	(71)
Water heating gains (Table 5)													
	147.5098	144.9966	140.1553	129.5445	123.0451	116.2516	112.0791	115.5265	119.5683	127.1064	137.2781	146.1532	(72)
Total internal gains													
	580.6755	595.0994	569.6464	550.5837	523.1958	502.5328	483.5638	484.5937	499.2448	518.2349	549.2951	569.0396	(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	4.5500	10.6334	0.6300	0.7000	0.7700	14.7861	(74)
South	2.4300	46.7521	0.6300	0.7000	0.7700	34.7199	(78)
North	1.4500	26.0000	0.6300	0.7000	1.0000	14.9631	(82)

Solar gains	64.4692	116.1967	175.6967	245.3157	299.6999	308.4210	292.8251	250.6375	199.5778	132.9510	78.3872	54.4133	(83)
Total gains	645.1447	711.2961	745.3431	795.8994	822.8957	810.9538	776.3889	735.2312	698.8226	651.1859	627.6823	623.4529	(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	39.2839	39.3637	39.4422	39.8152	39.8857	40.2176	40.2176	40.2796	40.0891	39.8857	39.7432	39.5953	
alpha	3.6189	3.6242	3.6295	3.6543	3.6590	3.6812	3.6812	3.6853	3.6726	3.6590	3.6495	3.6397	
util living area													
	0.9845	0.9767	0.9635	0.9275	0.8527	0.7114	0.5602	0.6049	0.8047	0.9362	0.9749	0.9863	(86)
MIT	19.1524	19.3527	19.6658	20.1218	20.5391	20.8396	20.9503	20.9334	20.7294	20.2087	19.6156	19.1219	(87)
Th 2	19.8795	19.8815	19.8835	19.8927	19.8945	19.9025	19.9025	19.9040	19.8994	19.8945	19.8909	19.8873	(88)
util rest of house													
	0.9808	0.9711	0.9542	0.9075	0.8091	0.6258	0.4374	0.4835	0.7344	0.9146	0.9679	0.9831	(89)
MIT 2	17.7488	18.0038	18.4007	18.9734	19.4697	19.7919	19.8813	19.8728	19.6898	19.0897	18.3461	17.7150	(90)
Living area fraction										fLA = Living area / (4) =		0.4460	(91)
MIT	18.3748	18.6054	18.9649	19.4856	19.9466	20.2592	20.3581	20.3459	20.1534	19.5888	18.9123	18.3425	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3748	18.6054	18.9649	19.4856	19.9466	20.2592	20.3581	20.3459	20.1534	19.5888	18.9123	18.3425	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9740	0.9625	0.9443	0.8986	0.8115	0.6558	0.4907	0.5352	0.7526	0.9072	0.9596	0.9767	(94)
Useful gains	628.3575	684.6501	703.8165	715.2066	667.7581	531.8052	380.9515	393.4654	525.9256	590.7492	602.3121	608.9458	(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													
1527.3501	1484.2434	1347.2206	1133.3788	881.3925	599.8583	398.3447	417.6061	643.7036	960.7108	1267.0113	1522.6177	(97)	
Space heating kWh													
668.8505	537.3267	478.6927	301.0840	158.9440	0.0000	0.0000	0.0000	0.0000	275.2514	478.5834	679.7719	(98a)	
Space heating requirement - total per year (kWh/year)												3578.5046	
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													
668.8505	537.3267	478.6927	301.0840	158.9440	0.0000	0.0000	0.0000	0.0000	275.2514	478.5834	679.7719	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												3578.5046	
Space heating per m2											(98c) / (4) =	41.2508	(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													
668.8505	537.3267	478.6927	301.0840	158.9440	0.0000	0.0000	0.0000	0.0000	275.2514	478.5834	679.7719	(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)													
724.6484	582.1525	518.6269	326.2015	172.2037	0.0000	0.0000	0.0000	0.0000	298.2139	518.5086	736.4809	(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												
233.7169	206.6000	219.5392	193.4702	187.7734	169.4745	167.5974	174.1906	176.0033	195.8972	207.8054	231.2523	(64)
Efficiency of water heater											79.8000	(216)
(217)m 86.2802	86.1031	85.7589	85.0477	83.6883	79.8000	79.8000	79.8000	79.8000	84.8224	85.8680	86.3286	(217)
Fuel for water heating, kWh/month												
270.8812	239.9449	255.9959	227.4845	224.3722	212.3741	210.0219	218.2840	220.5555	230.9499	242.0055	267.8746	(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 28.1578	22.5892	20.3391	14.9013	11.5102	9.4039	10.5000	13.6483	17.7277	23.2598	26.2718	28.9404	(232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m -29.2407	-42.3985	-62.6402	-72.4322	-79.8037	-75.0848	-74.1683	-69.2035	-60.6935	-49.3985	-32.5650	-25.1452	(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 -13.0990	-27.8992	-56.1029	-85.2224	-113.6298	-114.5314	-113.1796	-95.3838	-69.3327	-40.2049	-17.5868	-10.3321	(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	3877.0364	(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	2820.7440	(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)	227.2494	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1429.2787	(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	5581.7511	(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	3877.0364	0.2100	814.1776	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2820.7440	0.2100	592.3562	(264)
Space and water heating			1406.5339	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	227.2494	0.1443	32.7991	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-672.7742	0.1340	-90.1583	
PV Unit electricity exported	-756.5045	0.1256	-94.9895	
Total			-185.1478	(269)
Total CO2, kg/year			1266.1144	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.5900	(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	3877.0364	1.1300	4381.0511	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2820.7440	1.1300	3187.4407	(278)
Space and water heating			7568.4918	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	227.2494	1.5338	348.5628	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-672.7742	1.4952	-1005.9622	
PV Unit electricity exported	-756.5045	0.4609	-348.6648	
Total			-1354.6270	(283)
Total Primary energy kWh/year			6692.5284	(286)
Target Primary Energy Rate (TPER)			77.1500	(287)

Full SAP Calculation Printout

Property Reference	House 1 Block C	**Issued on Date**	13/03/2024
Assessment Reference	Design stage for ES condition	**Prop Type Ref**	
Property	House 1 Block C, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	82 B	**DER**	4.45	**TER**	14.73
Environmental	96 A	**% DER < TER**			69.79
CO_2 Emissions (t/year)	0.31	**DFEE**	43.18	**TFEE**	51.57
Compliance Check	See BREL	**% DFEE < TFEE**			16.29
% DPER < TPER	39.94	**DPER**	46.47	**TPER**	77.37

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	38.2900 (1b)	x	2.5000 (2b)	=	95.7250	(1b) - (3b)
First floor	40.6300 (1c)	x	2.8000 (2c)	=	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	209.4890	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1909	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3409	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2898	(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	0.3695	0.3622	0.3550	0.3188	0.3115	0.2753	0.2753	0.2681	0.2898	0.3115	0.3260	0.3405	(22b)
Effective ac	0.5683	0.5656	0.5630	0.5508	0.5485	0.5379	0.5379	0.5359	0.5420	0.5485	0.5531	0.5580	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.4000	1.2000	2.8800			(26)
window (Uw = 1.20)			16.8300	1.1450	19.2710			(27)
rl			0.9600	1.2357	1.1863			(27a)
ground floor			38.2900	0.1000	3.8290	75.0000	2871.7500	(28a)
exposed upper			8.0000	0.1300	1.0400	20.0000	160.0000	(28b)
External Wall 1	106.0000	19.2300	86.7700	0.1300	11.2801	70.0000	6073.9000	(29a)
main flat roof	40.6300		40.6300	0.1100	4.4693	9.0000	365.6700	(30)
lower terrace	3.2000	0.9600	2.2400	0.1100	0.2464	9.0000	20.1600	(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.2021			(33)
Party Wall 1			34.9800	0.0000	0.0000	180.0000	6296.4000	(32)
Internal Wall 1			50.9600			9.0000	458.6400	(32c)
Internal Floor 1			32.6300			18.0000	587.3400	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	16833.8600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.3028 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	15.6000	0.0600	0.9360

E3 Sill	14.6000	0.0400	0.5840	
E4 Jamb	23.9600	0.0200	0.4792	
E5 Ground floor (normal)	20.0000	0.1300	2.6000	
E6 Intermediate floor within a dwelling	7.9400	0.0000	0.0000	
E24 Eaves (insulation at ceiling level - inverted)	5.0000	0.1500	0.7500	
E15 Flat roof with parapet	20.0000	0.3000	6.0000	
E21 Exposed floor (inverted)	6.8000	0.3200	2.1760	
E20 Exposed floor (normal)	7.5000	0.3200	2.4000	
E16 Corner (normal)	17.5000	0.0500	0.8750	
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0600	-0.4500	
E18 Party wall between dwellings	0.0000	0.2400	0.0000	
P1 Party wall - Ground floor	6.8000	0.3200	2.1760	
P2 Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	6.8000	0.4800	3.2640	
R11 Upstands or kerbs of rooflights	4.0000	0.2400	0.9600	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 22.7502 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 66.9523 (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	39.2848	39.1016	38.9219	38.0783	37.9204	37.1856	37.1856	37.0495	37.4686	37.9204	38.2397	38.5736	(38)
Heat transfer coeff	106.2371	106.0539	105.8742	105.0306	104.8727	104.1379	104.1379	104.0018	104.4209	104.8727	105.1920	105.5259	(39)
Average = Sum(39)m / 12 =												105.0298	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3461	1.3438	1.3415	1.3308	1.3288	1.3195	1.3195	1.3178	1.3231	1.3288	1.3329	1.3371	(40)
HLP (average)												1.3308	
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 2.4420 (42)
Hot water usage for mixer showers

97.7473	96.2783	94.1378	90.0422	87.0198	83.6492	81.7334	83.8577	86.1864	89.8054	93.9889	97.3728	(42a)

Hot water usage for baths

28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511	(42b)

Hot water usage for other uses

39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390	(42c)

Average daily hot water use (litres/day) 152.2512 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	165.5325	162.2042	158.0335	151.4112	146.1347	140.4215	138.0189	142.1692	146.5758	152.6004	159.3331	165.0629	(44)
Energy conte	262.1631	230.9766	242.8917	207.2744	196.7253	172.6646	166.9219	176.0352	180.7426	207.0773	226.9992	258.4486	(45)
Energy content (annual)											Total = Sum(45)m =	2528.9204	
Distribution loss (46)m = 0.15 x (45)m	39.3245	34.6465	36.4337	31.0912	29.5088	25.8997	25.0383	26.4053	27.1114	31.0616	34.0499	38.7673	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.0000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.5400 (55)
Total storage loss

16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(56)

If cylinder contains dedicated solar storage

16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(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

302.1655	267.1078	282.8941	245.9864	236.7277	211.3766	206.9243	216.0376	219.4546	247.0797	265.7112	298.4510	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
302.1655	267.1078	282.8941	245.9864	236.7277	211.3766	206.9243	216.0376	219.4546	247.0797	265.7112	298.4510	(64)
									Total per year (kWh/year) = Sum(64)m =		2999.9164	(64)
12Total per year (kWh/year)												3000	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)

Heat gains from water heating, kWh/month

119.1711	105.7047	112.7634	99.8883	97.4131	88.3806	87.5035	90.5336	91.0665	100.8551	106.4468	117.9361	(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	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.5142	121.2478	109.5142	113.1646	109.5142	113.1646	109.5142	109.5142	113.1646	109.5142	113.1646	109.5142	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.1685	219.4221	213.7433	201.6537	186.3928	172.0498	162.4677	160.2142	165.8930	177.9825	193.2434	207.5865	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	(71)
Water heating gains (Table 5)	160.1763	157.2986	151.5637	138.7338	130.9316	122.7508	117.6122	121.6850	126.4813	135.5580	147.8428	158.5162	(72)
Total internal gains	546.4897	557.5993	534.4519	513.1829	486.4693	467.5960	449.2248	451.0441	465.1697	482.6854	513.8816	535.2476	(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				4.5400	10.6334	0.7200	0.7000	0.7700				16.8613	(74)
South				8.3500	46.7521	0.7200	0.7000	0.7700				136.3487	(78)
West				3.9400	19.6403	0.7200	0.7000	0.7700				27.0276	(80)
South				0.9600	26.0000	0.7200	0.7000	1.0000				11.3219	(82)
Solar gains	191.5595	331.9132	468.0802	601.7477	692.7268	695.6430	667.3985	598.5163	514.3199	370.6883	230.4906	163.2450	(83)
Total gains	738.0492	889.5125	1002.5320	1114.9305	1179.1961	1163.2390	1116.6233	1049.5603	979.4896	853.3737	744.3722	698.4926	(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	44.0154	44.0915	44.1663	44.5211	44.5881	44.9027	44.9027	44.9614	44.7810	44.5881	44.4527	44.3121	
alpha	3.9344	3.9394	3.9444	3.9681	3.9725	3.9935	3.9935	3.9974	3.9854	3.9725	3.9635	3.9541	
util living area	0.9812	0.9618	0.9264	0.8474	0.7170	0.5447	0.4034	0.4449	0.6626	0.8835	0.9650	0.9846	(86)
Living	19.4493	19.7411	20.1036	20.5169	20.8076	20.9513	20.9884	20.9829	20.8939	20.5010	19.8985	19.3945	
Non living	18.4361	18.7217	19.0704	19.4556	19.6984	19.8044	19.8227	19.8222	19.7700	19.4548	18.8861	18.3875	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.2067	19.7411	20.1036	20.5169	20.8076	20.9513	20.9884	20.9829	20.8939	20.5010	19.8985	19.6191	(87)
Th 2	19.8049	19.8067	19.8084	19.8167	19.8183	19.8256	19.8256	19.8269	19.8228	19.8183	19.8152	19.8119	(88)
util rest of house	0.9761	0.9518	0.9075	0.8097	0.6534	0.4556	0.2991	0.3366	0.5738	0.8454	0.9540	0.9804	(89)
MIT 2	19.1046	18.7217	19.0704	19.4556	19.6984	19.8044	19.8227	19.8222	19.7700	19.4548	18.8861	18.5868	(90)
Living area fraction									fLA = Living area / (4) =			0.3833	(91)
MIT	19.5271	19.1125	19.4664	19.8624	20.1235	20.2440	20.2695	20.2671	20.2008	19.8558	19.2742	18.9825	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5271	19.1125	19.4664	19.8624	20.1235	20.2440	20.2695	20.2671	20.2008	19.8558	19.2742	18.9825	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9747	0.9446	0.9010	0.8114	0.6709	0.4883	0.3391	0.3780	0.6040	0.8468	0.9477	0.9765	(94)
Useful gains	719.3524	840.2147	903.2942	904.6040	791.0884	568.0654	378.6465	396.7812	591.6297	722.6491	705.4461	682.0982	(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	1617.6798	1507.2858	1372.8091	1151.3850	883.3987	587.7533	382.1347	402.1881	637.0535	970.6810	1280.6250	1559.9317	(97)
Space heating kWh	668.3556	448.2717	349.3191	177.6823	68.6789	0.0000	0.0000	0.0000	0.0000	184.5357	414.1288	653.1081	(98a)
Space heating requirement - total per year (kWh/year)												2964.0803	
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	668.3556	448.2717	349.3191	177.6823	68.6789	0.0000	0.0000	0.0000	0.0000	184.5357	414.1288	653.1081	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2964.0803	
Space heating per m2											(98c) / (4) =	37.5580	(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 %)	283.5598	(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	668.3556	448.2717	349.3191	177.6823	68.6789	0.0000	0.0000	0.0000	0.0000	184.5357	414.1288	653.1081	(98)
Space heating efficiency (main heating system 1)	283.5598	283.5598	283.5598	283.5598	283.5598	0.0000	0.0000	0.0000	0.0000	283.5598	283.5598	283.5598	(210)
Space heating fuel (main heating system)	235.7018	158.0872	123.1906	62.6613	24.2203	0.0000	0.0000	0.0000	0.0000	65.0782	146.0464	230.3246	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	302.1655	267.1078	282.8941	245.9864	236.7277	211.3766	206.9243	216.0376	219.4546	247.0797	265.7112	298.4510	(64)
Efficiency of water heater												275.7277	(216)
(217)m	275.7277	275.7277	275.7277	275.7277	275.7277	275.7277	275.7277	275.7277	275.7277	275.7277	275.7277	275.7277	(217)
Fuel for water heating, kWh/month	109.5884	96.8738	102.5991	89.2135	85.8556	76.6614	75.0466	78.3518	79.5911	89.6101	96.3672	108.2412	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	29.2809	23.4903	21.1504	15.4957	11.9693	9.7790	10.9188	14.1927	18.4349	24.1875	27.3198	30.0947	(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	1045.3105	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	275.7277	
Water heating fuel used	1087.9997	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	0.0000	(231)
Electricity for lighting (calculated in Appendix L)	236.3139	(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	2369.6241	(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	1045.3105	0.1561	163.1657	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1087.9997	0.1411	153.5476	(264)
Space and water heating			316.7133	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	236.3139	0.1443	34.1074	(268)
Total CO2, kg/year			350.8207	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.4500	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1045.3105	1.5778	1649.3361	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1087.9997	1.5219	1655.7757	(278)
Space and water heating			3305.1118	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	236.3139	1.5338	362.4662	(282)
Total Primary energy kWh/year			3667.5779	(286)
Dwelling Primary energy Rate (DPER)			46.4700	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	38.2900 (1b)	x	2.5000 (2b)	=	95.7250	(1b) - (3b)
First floor	40.6300 (1c)	x	2.8000 (2c)	=	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	209.4890	(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) =	0.1432 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3932 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3342 (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													

	0.4261	0.4178	0.4094	0.3676	0.3593	0.3175	0.3175	0.3092	0.3342	0.3593	0.3760	0.3927 (22b)
Effective ac	0.5908	0.5873	0.5838	0.5676	0.5645	0.5504	0.5504	0.5478	0.5559	0.5645	0.5707	0.5771 (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			2.4000	1.0000	2.4000			(26)
TER Opening Type (Uw = 1.20)			16.4000	1.1450	18.7786			(27)
rl			0.9400	2.0221	1.9007			(27a)
ground floor			38.2900	0.1300	4.9777			(28a)
exposed upper			8.0000	0.1300	1.0400			(28b)
External Wall 1	106.0000	18.8000	87.2000	0.1800	15.6960			(29a)
main flat roof	40.6300		40.6300	0.1100	4.4693			(30)
lower terrace	3.2000	0.9400	2.2600	0.1100	0.2486			(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	49.5110			(33)
Party Wall 1			34.9800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.3028 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	15.6000	0.0500	0.7800
E3 Sill	14.6000	0.0500	0.7300
E4 Jamb	23.9600	0.0500	1.1980
E5 Ground floor (normal)	20.0000	0.1600	3.2000
E6 Intermediate floor within a dwelling	7.9400	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	5.0000	0.2400	1.2000
E15 Flat roof with parapet	20.0000	0.5600	11.2000
E21 Exposed floor (inverted)	6.8000	0.3200	2.1760
E20 Exposed floor (normal)	7.5000	0.3200	2.4000
E16 Corner (normal)	17.5000	0.0900	1.5750
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0900	-0.6750
E18 Party wall between dwellings	0.0000	0.0600	0.0000
P1 Party wall - Ground floor	6.8000	0.0800	0.5440
P2 Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.8000	0.1200	0.8160
R11 Upstands or kerbs of rooflights	4.0000	0.0800	0.3200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 25.4640 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 74.9750 (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	40.8426	40.5988	40.3599	39.2377	39.0278	38.0504	38.0504	37.8694	38.4269	39.0278	39.4525	39.8966	(38)
Heat transfer coeff	115.8175	115.5738	115.3349	114.2127	114.0027	113.0254	113.0254	112.8444	113.4018	114.0027	114.4275	114.8715	(39)
Average = Sum(39)m / 12 =												114.2117	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4675	1.4644	1.4614	1.4472	1.4445	1.4322	1.4322	1.4299	1.4369	1.4445	1.4499	1.4555	(40)
HLP (average)												1.4472	
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 2.4420 (42)

Hot water usage for mixer showers

65.1648	64.1855	62.7585	60.0281	58.0132	55.7661	54.4889	55.9052	57.4576	59.8703	62.6593	64.9152	(42a)

Hot water usage for baths

28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511	(42b)

Hot water usage for other uses

39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390	(42c)

Average daily hot water use (litres/day) 122.2113 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.9501	130.1114	126.6543	121.3971	117.1281	112.5384	110.7745	114.2166	117.8470	122.6653	128.0034	132.6053	(44)
Energy conte	210.5605	185.2769	194.6629	166.1866	157.6769	138.3791	133.9721	141.4240	145.3171	166.4556	182.3644	207.6278	(45)
Energy content (annual)										Total = Sum(45)m =		2029.9040	
Distribution loss (46)m = 0.15 x (45)m	31.5841	27.7915	29.1994	24.9280	23.6515	20.7569	20.0958	21.2136	21.7976	24.9683	27.3547	31.1442	(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	257.1554	227.3626	241.2578	211.2784	204.2718	183.4710	180.5670	188.0190	190.4089	213.0505	227.4562	254.2227	(62)
WWHRS	-29.7906	-26.3471	-27.5892	-22.8449	-21.2906	-18.2185	-17.0770	-18.1597	-18.8496	-22.2216	-25.1744	-29.2390	(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	227.3647	201.0155	213.6687	188.4335	182.9812	165.2524	163.4900	169.8593	171.5593	190.8289	202.2818	224.9838	(64)
										Total per year (kWh/year) = Sum(64)m =		2301.7192	(64)
12Total per year (kWh/year)												2302	(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	107.2873	95.2731	102.0013	91.3305	89.7035	82.0845	81.8216	84.2994	84.3914	92.6224	96.7096	106.3122	(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	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	109.5450	121.2820	109.5450	113.1965	109.5450	113.1965	109.5450	109.5450	113.1965	109.5450	113.1965	109.5450	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	217.1685	219.4221	213.7433	201.6537	186.3928	172.0498	162.4677	160.2142	165.8930	177.9825	193.2434	207.5865	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	(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)													
	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	(71)
Water heating gains (Table 5)													
	144.2033	141.7755	137.0986	126.8479	120.5692	114.0063	109.9753	113.3057	117.2103	124.4925	134.3189	142.8927	(72)
Total internal gains													
	533.5476	545.1103	523.0176	504.3289	479.1378	458.8833	441.6188	442.6956	455.9305	474.6508	503.3896	522.6549	(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	4.4200	10.6334	0.6300	0.7000	0.7700	14.3637	(74)
South	8.1400	46.7521	0.6300	0.7000	0.7700	116.3046	(78)
West	3.8400	19.6403	0.6300	0.7000	0.7700	23.0489	(80)
South	0.9400	26.0000	0.6300	0.7000	1.0000	9.7002	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	163.4175	283.1620	399.3484	513.4095	591.0432	593.5338	569.4343	510.6573	438.8066	316.2477	196.6312	139.2613	(83)
Total gains	696.9651	828.2722	922.3660	1017.7384	1070.1810	1052.4171	1011.0531	953.3529	894.7372	790.8985	700.0208	661.9162	(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	40.3745	40.4596	40.5434	40.9418	41.0172	41.3719	41.3719	41.4382	41.2345	41.0172	40.8649	40.7070	
alpha	3.6916	3.6973	3.7029	3.7295	3.7345	3.7581	3.7581	3.7625	3.7490	3.7345	3.7243	3.7138	
util living area													
	0.9851	0.9715	0.9473	0.8899	0.7851	0.6242	0.4739	0.5178	0.7336	0.9139	0.9731	0.9876	(86)
MIT	19.2007	19.4760	19.8468	20.3103	20.6812	20.9035	20.9736	20.9631	20.8170	20.3295	19.6840	19.1552	(87)
Th 2	19.7119	19.7143	19.7166	19.7273	19.7294	19.7388	19.7388	19.7405	19.7351	19.7294	19.7253	19.7210	(88)
util rest of house													
	0.9808	0.9636	0.9321	0.8578	0.7233	0.5237	0.3464	0.3880	0.6418	0.8816	0.9641	0.9840	(89)
MIT 2	17.6737	18.0217	18.4852	19.0518	19.4667	19.6836	19.7303	19.7274	19.6145	19.0908	18.2958	17.6219	(90)
Living area fraction										fLA = Living area / (4) =		0.3833	(91)
MIT	18.2590	18.5791	19.0071	19.5342	19.9322	20.1512	20.2069	20.2010	20.0754	19.5656	18.8279	18.2096	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2590	18.5791	19.0071	19.5342	19.9322	20.1512	20.2069	20.2010	20.0754	19.5656	18.8279	18.2096	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9740	0.9542	0.9216	0.8521	0.7342	0.5585	0.3952	0.4374	0.6689	0.8765	0.9556	0.9779	(94)
Useful gains	678.8632	790.3208	850.0405	867.2047	785.7301	587.7663	399.5499	416.9732	598.4748	693.2380	668.9195	647.3140	(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													
	1616.6939	1580.9474	1442.5083	1214.5589	938.4932	627.4236	407.6684	428.9264	677.6229	1022.1045	1341.9953	1609.3060	(97)
Space heating kWh													
	697.7460	531.3011	440.7961	250.0950	113.6557	0.0000	0.0000	0.0000	0.0000	244.6767	484.6146	715.7221	(98a)
Space heating requirement - total per year (kWh/year)												3478.6073	
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													
	697.7460	531.3011	440.7961	250.0950	113.6557	0.0000	0.0000	0.0000	0.0000	244.6767	484.6146	715.7221	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3478.6073	
Space heating per m2											(98c) / (4) =	44.0776	(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													
	697.7460	531.3011	440.7961	250.0950	113.6557	0.0000	0.0000	0.0000	0.0000	244.6767	484.6146	715.7221	(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)													
	755.9545	575.6242	477.5689	270.9588	123.1373	0.0000	0.0000	0.0000	0.0000	265.0886	525.0429	775.4302	(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													
	227.3647	201.0155	213.6687	188.4335	182.9812	165.2524	163.4900	169.8593	171.5593	190.8289	202.2818	224.9838	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.4050	86.1335	85.6464	84.6955	83.0240	79.8000	79.8000	79.8000	79.8000	84.6183	85.9455	86.4677	(217)

Fuel for water heating, kWh/month

	263.1384	233.3767	249.4776	222.4835	220.3954	207.0832	204.8747	212.8563	214.9866	225.5174	235.3605	260.1941 (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	22.7613	18.2599	16.4411	12.0454	9.3042	7.6016	8.4876	11.0325	14.3302	18.8020	21.2368	23.3939 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-35.9441	-50.7401	-73.0350	-82.2424	-88.7930	-82.9175	-81.8821	-77.2349	-69.0675	-58.0584	-39.5348	-31.0672 (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	-20.1200	-42.3446	-84.1987	-126.5159	-167.3420	-168.1628	-166.1945	-140.7034	-103.1067	-60.5900	-26.8737	-15.9100 (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	3768.8053 (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	2749.7445 (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)	183.6966 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1892.5792 (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	4895.6673 (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	3768.8053	0.2100	791.4491	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2749.7445	0.2100	577.4463	(264)
Space and water heating			1368.8955	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	183.6966	0.1443	26.5131	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-770.5169	0.1346	-103.6782	
PV Unit electricity exported	-1122.0623	0.1259	-141.2475	
Total			-244.9257	(269)
Total CO2, kg/year			1162.4122	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.7300	(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	3768.8053	1.1300	4258.7500	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2749.7445	1.1300	3107.2113	(278)
Space and water heating			7365.9613	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	183.6966	1.5338	281.7600	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-770.5169	1.4973	-1153.6926	
PV Unit electricity exported	-1122.0623	0.4621	-518.4746	
Total			-1672.1672	(283)
Total Primary energy kWh/year			6105.6549	(286)
Target Primary Energy Rate (TPER)			77.3700	(287)

Full SAP Calculation Printout

Property Reference	House 1 Block C	**Issued on Date**	13/03/2024
Assessment Reference	Design stage for ES condition	**Prop Type Ref**	
Property	House 1 Block C, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	82 B	**DER**	4.45	**TER**	14.73
Environmental	96 A	**% DER < TER**			69.79
CO_2 Emissions (t/year)	0.31	**DFEE**	43.18	**TFEE**	51.57
Compliance Check	See BREL	**% DFEE < TFEE**			16.29
% DPER < TPER	39.94	**DPER**	46.47	**TPER**	77.37

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	38.2900 (1b)	x	2.5000 (2b)	=	95.7250	(1b) - (3b)
First floor	40.6300 (1c)	x	2.8000 (2c)	=	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	209.4890	(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) =	0.1432	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2932	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2492	(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	0.3178	0.3115	0.3053	0.2741	0.2679	0.2368	0.2368	0.2305	0.2492	0.2679	0.2804	0.2928	(22b)

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

Effective ac	0.5505	0.5485	0.5466	0.5376	0.5359	0.5280	0.5280	0.5266	0.5311	0.5359	0.5393	0.5429	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.4000	1.2000	2.8800			(26)
window (Uw = 1.20)			16.8300	1.1450	19.2710			(27)
rl			0.9600	1.2357	1.1863			(27a)
ground floor			38.2900	0.1000	3.8290	75.0000	2871.7500	(28a)
exposed upper			8.0000	0.1300	1.0400	20.0000	160.0000	(28b)
External Wall 1	106.0000	19.2300	86.7700	0.1300	11.2801	70.0000	6073.9000	(29a)
main flat roof	40.6300		40.6300	0.1100	4.4693	9.0000	365.6700	(30)
lower terrace	3.2000	0.9600	2.2400	0.1100	0.2464	9.0000	20.1600	(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.2021			(33)
Party Wall 1			34.9800	0.0000	0.0000	180.0000	6296.4000	(32)
Internal Wall 1			50.9600			9.0000	458.6400	(32c)
Internal Floor 1			32.6300			18.0000	587.3400	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	16833.8600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.3028 (35)
List of Thermal Bridges		

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	15.6000	0.0600	0.9360
E3 Sill	14.6000	0.0400	0.5840
E4 Jamb	23.9600	0.0200	0.4792
E5 Ground floor (normal)	20.0000	0.1300	2.6000
E6 Intermediate floor within a dwelling	7.9400	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	5.0000	0.1500	0.7500
E15 Flat roof with parapet	20.0000	0.3000	6.0000
E21 Exposed floor (inverted)	6.8000	0.3200	2.1760
E20 Exposed floor (normal)	7.5000	0.3200	2.4000
E16 Corner (normal)	17.5000	0.0500	0.8750
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0600	-0.4500
E18 Party wall between dwellings	0.0000	0.2400	0.0000
P1 Party wall - Ground floor	6.8000	0.3200	2.1760
P2 Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.8000	0.4800	3.2640
R11 Upstands or kerbs of rooflights	4.0000	0.2400	0.9600
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			22.7502 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	66.9523 (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	38.0559	37.9203	37.7875	37.1635	37.0468	36.5033	36.5033	36.4027	36.7127	37.0468	37.2830	37.5299	(38)
Heat transfer coeff	105.0082	104.8726	104.7398	104.1158	103.9991	103.4556	103.4556	103.3550	103.6650	103.9991	104.2353	104.4822	(39)
Average = Sum(39)m / 12 =												104.1153	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3306	1.3288	1.3272	1.3193	1.3178	1.3109	1.3109	1.3096	1.3135	1.3178	1.3208	1.3239	(40)
HLP (average)												1.3193	
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												2.4420 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511 (42b)
Hot water usage for other uses	39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390 (42c)
Average daily hot water use (litres/day)												62.1315 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	67.7853	65.9258	63.8958	61.3690	59.1149	56.7723	56.2855	58.3115	60.3893	62.7950	65.3442	67.6901	(44)
Energy conte	107.3553	93.8775	98.2054	84.0111	79.5800	69.8082	68.0725	72.2018	74.4661	85.2123	93.0947	105.9864	(45)
Energy content (annual)										Total = Sum(45)m =		1031.8712	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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	91.2520	79.7959	83.4746	71.4094	67.6430	59.3369	57.8616	61.3715	63.2962	72.4304	79.1305	90.0884	(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	91.2520	79.7959	83.4746	71.4094	67.6430	59.3369	57.8616	61.3715	63.2962	72.4304	79.1305	90.0884	(64)
									Total per year (kWh/year) = Sum(64)m =			877.0905	(64)
12Total per year (kWh/year)												877	(64)
Electric shower(s)	52.1862	46.4983	50.7744	48.4534	49.3626	47.0871	48.6567	49.3626	48.4534	50.7744	49.8196	52.1862	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							593.6147	(64a)
Heat gains from water heating, kWh/month	35.8595	31.5736	33.5622	29.9657	29.2514	26.6060	26.6296	27.6835	27.9374	30.8012	32.2375	35.5686	(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	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.5142	121.2478	109.5142	113.1646	109.5142	113.1646	109.5142	109.5142	113.1646	109.5142	113.1646	109.5142	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.1685	219.4221	213.7433	201.6537	186.3928	172.0498	162.4677	160.2142	165.8930	177.9825	193.2434	207.5865	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	(71)
Water heating gains (Table 5)	48.1983	46.9845	45.1105	41.6190	39.3164	36.9528	35.7924	37.2090	38.8019	41.3995	44.7744	47.8073	(72)
Total internal gains	434.5118	447.2851	427.9987	416.0681	394.8541	381.7979	367.4051	366.5681	377.4903	388.5269	410.8132	424.5387	(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	4.5400	10.6334	0.7200	0.7000	0.7700	16.8613	(74)
South	8.3500	46.7521	0.7200	0.7000	0.7700	136.3487	(78)

West			3.9400		19.6403		0.7200	0.7000		0.7700		27.0276	(80)
South			0.9600		26.0000		0.7200	0.7000		1.0000		11.3219	(82)
Solar gains	191.5595	331.9132	468.0802	601.7477	692.7268	695.6430	667.3985	598.5163	514.3199	370.6883	230.4906	163.2450	(83)
Total gains	626.0712	779.1983	896.0789	1017.8158	1087.5809	1077.4409	1034.8036	965.0844	891.8103	759.2152	641.3038	587.7837	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	44.5306	44.5881	44.6447	44.9122	44.9626	45.1988	45.1988	45.2428	45.1075	44.9626	44.8608	44.7547	
alpha	3.9687	3.9725	3.9763	3.9941	3.9975	4.0133	4.0133	4.0162	4.0072	3.9975	3.9907	3.9836	
util living area	0.9891	0.9745	0.9458	0.8750	0.7505	0.5778	0.4306	0.4777	0.7040	0.9127	0.9781	0.9914	(86)
MIT	19.3195	19.6231	20.0049	20.4517	20.7757	20.9411	20.9857	20.9785	20.8699	20.4227	19.7804	19.2606	(87)
Th 2	19.8170	19.8183	19.8196	19.8258	19.8269	19.8323	19.8323	19.8333	19.8302	19.8269	19.8246	19.8222	(88)
util rest of house	0.9861	0.9675	0.9308	0.8416	0.6889	0.4861	0.3208	0.3635	0.6159	0.8813	0.9708	0.9890	(89)
MIT 2	18.3176	18.6169	18.9880	19.4086	19.6844	19.8062	19.8287	19.8273	19.7637	19.3955	18.7799	18.2632	(90)
Living area fraction										fLA = Living area / (4) =		0.3833	(91)
MIT	18.7016	19.0026	19.3777	19.8084	20.1027	20.2412	20.2722	20.2685	20.1877	19.7892	19.1634	18.6455	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7016	19.0026	19.3777	19.8084	20.1027	20.2412	20.2722	20.2685	20.1877	19.7892	19.1634	18.6455	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9821	0.9613	0.9241	0.8410	0.7045	0.5194	0.3629	0.4072	0.6448	0.8801	0.9654	0.9856	(94)
Useful gains	614.8527	749.0432	828.0270	856.0328	766.1691	559.6652	375.5683	392.9473	575.0046	668.1964	619.1407	579.3235	(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	1512.2863	1478.9745	1348.8117	1135.7420	873.8736	583.6133	379.9072	399.8317	631.0808	955.6709	1257.4323	1509.2940	(97)
Space heating kWh	667.6907	490.5138	387.4638	201.3906	80.1321	0.0000	0.0000	0.0000	0.0000	213.8810	459.5700	691.8981	(98a)
Space heating requirement - total per year (kWh/year)												3192.5402	
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	667.6907	490.5138	387.4638	201.3906	80.1321	0.0000	0.0000	0.0000	0.0000	213.8810	459.5700	691.8981	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3192.5402	
Space heating per m2										(98c) / (4) =		40.4529	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	972.4830	765.5717	785.4980	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8755	0.9260	0.9045	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	851.3888	708.8951	710.5035	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1202.6464	1155.7518	1078.7503	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	252.9054	332.4614	273.9756	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	63.2264	83.1153	68.4939	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												214.8356	(107)
Energy for space heating												40.4529	(99)
Energy for space cooling												2.7222	(108)
Total												43.1751	(109)
Fabric Energy Efficiency (DFEE)												43.2	(109)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		38.2900 (1b)	x	2.5000 (2b)	=	95.7250	(1b) - (3b)
First floor		40.6300 (1c)	x	2.8000 (2c)	=	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9200						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		209.4890	(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) =	0.1432	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3932	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3342	(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	0.4261	0.4178	0.4094	0.3676	0.3593	0.3175	0.3175	0.3092	0.3342	0.3593	0.3760	0.3927	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5908	0.5873	0.5838	0.5676	0.5645	0.5504	0.5504	0.5478	0.5559	0.5645	0.5707	0.5771	(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			2.4000	1.0000	2.4000			(26)
TER Opening Type (Uw = 1.20)			16.4000	1.1450	18.7786			(27)
rl			0.9400	2.0221	1.9007			(27a)
ground floor			38.2900	0.1300	4.9777			(28a)
exposed upper			8.0000	0.1300	1.0400			(28b)
External Wall 1	106.0000	18.8000	87.2000	0.1800	15.6960			(29a)
main flat roof	40.6300		40.6300	0.1100	4.4693			(30)
lower terrace	3.2000	0.9400	2.2600	0.1100	0.2486			(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.5110			(33)
Party Wall 1			34.9800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	213.3028 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	15.6000	0.0500	0.7800
E3 Sill	14.6000	0.0500	0.7300
E4 Jamb	23.9600	0.0500	1.1980
E5 Ground floor (normal)	20.0000	0.1600	3.2000
E6 Intermediate floor within a dwelling	7.9400	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	5.0000	0.2400	1.2000
E15 Flat roof with parapet	20.0000	0.5600	11.2000
E21 Exposed floor (inverted)	6.8000	0.3200	2.1760
E20 Exposed floor (normal)	7.5000	0.3200	2.4000
E16 Corner (normal)	17.5000	0.0900	1.5750
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0900	-0.6750
E18 Party wall between dwellings	0.0000	0.0600	0.0000
P1 Party wall - Ground floor	6.8000	0.0800	0.5440
P2 Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.8000	0.1200	0.8160
R11 Upstands or kerbs of rooflights	4.0000	0.0800	0.3200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		25.4640 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	74.9750 (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	40.8426	40.5988	40.3599	39.2377	39.0278	38.0504	38.0504	37.8694	38.4269	39.0278	39.4525	39.8966	(38)
Heat transfer coeff	115.8175	115.5738	115.3349	114.2127	114.0027	113.0254	113.0254	112.8444	113.4018	114.0027	114.4275	114.8715	(39)

Average = Sum(39)m / 12 =	114.2117

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4675	1.4644	1.4614	1.4472	1.4445	1.4322	1.4322	1.4299	1.4369	1.4445	1.4499	1.4555	(40)
HLP (average)												1.4472	
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	2.4420 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511	(42b)

Hot water usage for other uses

39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390	(42c)

Average daily hot water use (litres/day)	62.1315 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	67.7853	65.9258	63.8958	61.3690	59.1149	56.7723	56.2855	58.3115	60.3893	62.7950	65.3442	67.6901	(44)
Energy conte	107.3553	93.8775	98.2054	84.0111	79.5800	69.8082	68.0725	72.2018	74.4661	85.2123	93.0947	105.9864	(45)

Energy content (annual)	Total = Sum(45)m = 1031.8712

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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													
	91.2520	79.7959	83.4746	71.4094	67.6430	59.3369	57.8616	61.3715	63.2962	72.4304	79.1305	90.0884	(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													
	91.2520	79.7959	83.4746	71.4094	67.6430	59.3369	57.8616	61.3715	63.2962	72.4304	79.1305	90.0884	(64)
										Total per year (kWh/year) = Sum(64)m =		877.0905	(64)
12Total per year (kWh/year)												877	(64)
Electric shower(s)													
	52.1862	46.4983	50.7744	48.4534	49.3626	47.0871	48.6567	49.3626	48.4534	50.7744	49.8196	52.1862	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					593.6147	(64a)
Heat gains from water heating, kWh/month													
	35.8595	31.5736	33.5622	29.9657	29.2514	26.6060	26.6296	27.6835	27.9374	30.8012	32.2375	35.5686	(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	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	109.5450	121.2820	109.5450	113.1965	109.5450	113.1965	109.5450	109.5450	113.1965	109.5450	113.1965	109.5450	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	217.1685	219.4221	213.7433	201.6537	186.3928	172.0498	162.4677	160.2142	165.8930	177.9825	193.2434	207.5865	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	(71)
Water heating gains (Table 5)													
	48.1983	46.9845	45.1105	41.6190	39.3164	36.9528	35.7924	37.2090	38.8019	41.3995	44.7744	47.8073	(72)
Total internal gains													
	434.5426	447.3192	428.0295	416.1000	394.8850	381.8298	367.4359	366.5990	377.5222	388.5578	410.8450	424.5696	(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	4.4200	10.6334	0.6300	0.7000	0.7700	14.3637	(74)
South	8.1400	46.7521	0.6300	0.7000	0.7700	116.3046	(78)
West	3.8400	19.6403	0.6300	0.7000	0.7700	23.0489	(80)
South	0.9400	26.0000	0.6300	0.7000	1.0000	9.7002	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	163.4175	283.1620	399.3484	513.4095	591.0432	593.5338	569.4343	510.6573	438.8066	316.2477	196.6312	139.2613	(83)
Total gains	597.9601	730.4812	827.3780	929.5095	985.9282	975.3636	936.8702	877.2562	816.3288	704.8055	607.4763	563.8309	(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	40.3745	40.4596	40.5434	40.9418	41.0172	41.3719	41.3719	41.4382	41.2345	41.0172	40.8649	40.7070	
alpha	3.6916	3.6973	3.7029	3.7295	3.7345	3.7581	3.7581	3.7625	3.7490	3.7345	3.7243	3.7138	
util living area													
	0.9909	0.9806	0.9613	0.9119	0.8164	0.6595	0.5066	0.5552	0.7724	0.9364	0.9827	0.9926	(86)
MIT	19.0650	19.3485	19.7336	20.2263	20.6302	20.8837	20.9670	20.9534	20.7796	20.2385	19.5621	19.0193	(87)
Th 2	19.7119	19.7143	19.7166	19.7273	19.7294	19.7388	19.7388	19.7405	19.7351	19.7294	19.7253	19.7210	(88)
util rest of house													
	0.9882	0.9750	0.9496	0.8844	0.7586	0.5580	0.3725	0.4193	0.6840	0.9106	0.9766	0.9905	(89)
MIT 2	17.9898	18.2712	18.6499	19.1271	19.4867	19.6856	19.7304	19.7273	19.6182	19.1513	18.4931	17.9509	(90)
Living area fraction										fLA = Living area / (4) =		0.3833	(91)
MIT	18.4019	18.6841	19.0653	19.5484	19.9250	20.1448	20.2044	20.1972	20.0633	19.5681	18.9029	18.3604	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4019	18.6841	19.0653	19.5484	19.9250	20.1448	20.2044	20.1972	20.0633	19.5681	18.9029	18.3604	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9843	0.9689	0.9420	0.8798	0.7686	0.5929	0.4239	0.4710	0.7096	0.9065	0.9713	0.9871	(94)
Useful gains	588.5923	707.7588	779.3894	817.7748	757.7411	578.3125	397.1222	413.2026	579.3056	638.9009	590.0245	556.5798	(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													
	1633.2504	1593.0848	1449.2190	1216.1828	937.6742	626.7080	407.3859	428.4983	676.2519	1022.3843	1350.5713	1626.6289	(97)
Space heating kWh													
	777.2256	594.9391	498.3532	286.8537	133.8702	0.0000	0.0000	0.0000	0.0000	285.3116	547.5937	796.1165	(98a)
Space heating requirement - total per year (kWh/year)												3920.2637	
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													
	777.2256	594.9391	498.3532	286.8537	133.8702	0.0000	0.0000	0.0000	0.0000	285.3116	547.5937	796.1165	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3920.2637	
Space heating per m2											(98c) / (4) =	49.6739	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1062.4386	836.3878	857.6173	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7982	0.8672	0.8384	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	848.0336	725.2962	719.0510	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1085.4066	1043.2413	977.7150	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	170.9086	236.5511	192.4460	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	42.7272	59.1378	48.1115	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												149.9764	(107)
Energy for space heating												49.6739	(99)
Energy for space cooling												1.9004	(108)
Total												51.5743	(109)
Fabric Energy Efficiency (TFEE)												51.6	(109)

Full SAP Calculation Printout

Property Reference	House 1 Block C	**Issued on Date**	13/03/2024
Assessment Reference	Design stage for ES condition	**Prop Type Ref**	
Property	House 1 Block C, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	82 B	**DER**	4.45	**TER**	14.73
Environmental	96 A	**% DER < TER**			69.79
CO_2 Emissions (t/year)	0.31	**DFEE**	43.18	**TFEE**	51.57
Compliance Check	See BREL	**% DFEE < TFEE**			16.29
% DPER < TPER	39.94	**DPER**	46.47	**TPER**	77.37

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	38.2900 (1b)	x	2.5000 (2b)	=	95.7250	(1b) - (3b)
First floor	40.6300 (1c)	x	2.8000 (2c)	=	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	209.4890	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1909	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3409	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2898	(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	0.3695	0.3622	0.3550	0.3188	0.3115	0.2753	0.2753	0.2681	0.2898	0.3115	0.3260	0.3405	(22b)
Effective ac	0.5683	0.5656	0.5630	0.5508	0.5485	0.5379	0.5379	0.5359	0.5420	0.5485	0.5531	0.5580	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.4000	1.2000	2.8800			(26)
window (Uw = 1.20)			16.8300	1.1450	19.2710			(27)
rl			0.9600	1.2357	1.1863			(27a)
ground floor			38.2900	0.1000	3.8290	75.0000	2871.7500	(28a)
exposed upper			8.0000	0.1300	1.0400	20.0000	160.0000	(28b)
External Wall 1	106.0000	19.2300	86.7700	0.1300	11.2801	70.0000	6073.9000	(29a)
main flat roof	40.6300		40.6300	0.1100	4.4693	9.0000	365.6700	(30)
lower terrace	3.2000	0.9600	2.2400	0.1100	0.2464	9.0000	20.1600	(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.2021			(33)
Party Wall 1			34.9800	0.0000	0.0000	180.0000	6296.4000	(32)
Internal Wall 1			50.9600			9.0000	458.6400	(32c)
Internal Floor 1			32.6300			18.0000	587.3400	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	16833.8600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.3028 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	15.6000	0.0600	0.9360

E3 Sill	14.6000	0.0400	0.5840	
E4 Jamb	23.9600	0.0200	0.4792	
E5 Ground floor (normal)	20.0000	0.1300	2.6000	
E6 Intermediate floor within a dwelling	7.9400	0.0000	0.0000	
E24 Eaves (insulation at ceiling level - inverted)	5.0000	0.1500	0.7500	
E15 Flat roof with parapet	20.0000	0.3000	6.0000	
E21 Exposed floor (inverted)	6.8000	0.3200	2.1760	
E20 Exposed floor (normal)	7.5000	0.3200	2.4000	
E16 Corner (normal)	17.5000	0.0500	0.8750	
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0600	-0.4500	
E18 Party wall between dwellings	0.0000	0.2400	0.0000	
P1 Party wall - Ground floor	6.8000	0.3200	2.1760	
P2 Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	6.8000	0.4800	3.2640	
R11 Upstands or kerbs of rooflights	4.0000	0.2400	0.9600	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 22.7502 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 66.9523 (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	39.2848	39.1016	38.9219	38.0783	37.9204	37.1856	37.1856	37.0495	37.4686	37.9204	38.2397	38.5736	(38)
Heat transfer coeff	106.2371	106.0539	105.8742	105.0306	104.8727	104.1379	104.1379	104.0018	104.4209	104.8727	105.1920	105.5259	(39)
Average = Sum(39)m / 12 =												105.0298	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3461	1.3438	1.3415	1.3308	1.3288	1.3195	1.3195	1.3178	1.3231	1.3288	1.3329	1.3371	(40)
HLP (average)												1.3308	
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 2.4420 (42)
Hot water usage for mixer showers

97.7473	96.2783	94.1378	90.0422	87.0198	83.6492	81.7334	83.8577	86.1864	89.8054	93.9889	97.3728	(42a)

Hot water usage for baths

28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511	(42b)

Hot water usage for other uses

39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390	(42c)

Average daily hot water use (litres/day) 152.2512 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	165.5325	162.2042	158.0335	151.4112	146.1347	140.4215	138.0189	142.1692	146.5758	152.6004	159.3331	165.0629	(44)
Energy conte	262.1631	230.9766	242.8917	207.2744	196.7253	172.6646	166.9219	176.0352	180.7426	207.0773	226.9992	258.4486	(45)
Energy content (annual)											Total = Sum(45)m =	2528.9204	
Distribution loss (46)m = 0.15 x (45)m	39.3245	34.6465	36.4337	31.0912	29.5088	25.8997	25.0383	26.4053	27.1114	31.0616	34.0499	38.7673	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.0000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.5400 (55)
Total storage loss

16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(56)

If cylinder contains dedicated solar storage

16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(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

302.1655	267.1078	282.8941	245.9864	236.7277	211.3766	206.9243	216.0376	219.4546	247.0797	265.7112	298.4510	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
302.1655	267.1078	282.8941	245.9864	236.7277	211.3766	206.9243	216.0376	219.4546	247.0797	265.7112	298.4510	(64)
									Total per year (kWh/year) = Sum(64)m =		2999.9164	(64)
12Total per year (kWh/year)												3000	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)

Heat gains from water heating, kWh/month

119.1711	105.7047	112.7634	99.8883	97.4131	88.3806	87.5035	90.5336	91.0665	100.8551	106.4468	117.9361	(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	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.5142	121.2478	109.5142	113.1646	109.5142	113.1646	109.5142	109.5142	113.1646	109.5142	113.1646	109.5142	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.1685	219.4221	213.7433	201.6537	186.3928	172.0498	162.4677	160.2142	165.8930	177.9825	193.2434	207.5865	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	(71)
Water heating gains (Table 5)	160.1763	157.2986	151.5637	138.7338	130.9316	122.7508	117.6122	121.6850	126.4813	135.5580	147.8428	158.5162	(72)
Total internal gains	546.4897	557.5993	534.4519	513.1829	486.4693	467.5960	449.2248	451.0441	465.1697	482.6854	513.8816	535.2476	(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				4.5400	10.6334	0.7200	0.7000	0.7700				16.8613	(74)
South				8.3500	46.7521	0.7200	0.7000	0.7700				136.3487	(78)
West				3.9400	19.6403	0.7200	0.7000	0.7700				27.0276	(80)
South				0.9600	26.0000	0.7200	0.7000	1.0000				11.3219	(82)
Solar gains	191.5595	331.9132	468.0802	601.7477	692.7268	695.6430	667.3985	598.5163	514.3199	370.6883	230.4906	163.2450	(83)
Total gains	738.0492	889.5125	1002.5320	1114.9305	1179.1961	1163.2390	1116.6233	1049.5603	979.4896	853.3737	744.3722	698.4926	(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	44.0154	44.0915	44.1663	44.5211	44.5881	44.9027	44.9027	44.9614	44.7810	44.5881	44.4527	44.3121	
alpha	3.9344	3.9394	3.9444	3.9681	3.9725	3.9935	3.9935	3.9974	3.9854	3.9725	3.9635	3.9541	
util living area	0.9812	0.9618	0.9264	0.8474	0.7170	0.5447	0.4034	0.4449	0.6626	0.8835	0.9650	0.9846	(86)
Living	19.4493	19.7411	20.1036	20.5169	20.8076	20.9513	20.9884	20.9829	20.8939	20.5010	19.8985	19.3945	
Non living	18.4361	18.7217	19.0704	19.4556	19.6984	19.8044	19.8227	19.8222	19.7700	19.4548	18.8861	18.3875	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.2067	19.7411	20.1036	20.5169	20.8076	20.9513	20.9884	20.9829	20.8939	20.5010	19.8985	19.6191	(87)
Th 2	19.8049	19.8067	19.8084	19.8167	19.8183	19.8256	19.8256	19.8269	19.8228	19.8183	19.8152	19.8119	(88)
util rest of house	0.9761	0.9518	0.9075	0.8097	0.6534	0.4556	0.2991	0.3366	0.5738	0.8454	0.9540	0.9804	(89)
MIT 2	19.1046	18.7217	19.0704	19.4556	19.6984	19.8044	19.8227	19.8222	19.7700	19.4548	18.8861	18.5868	(90)
Living area fraction									fLA = Living area / (4) =			0.3833	(91)
MIT	19.5271	19.1125	19.4664	19.8624	20.1235	20.2440	20.2695	20.2671	20.2008	19.8558	19.2742	18.9825	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5271	19.1125	19.4664	19.8624	20.1235	20.2440	20.2695	20.2671	20.2008	19.8558	19.2742	18.9825	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9747	0.9446	0.9010	0.8114	0.6709	0.4883	0.3391	0.3780	0.6040	0.8468	0.9477	0.9765	(94)
Useful gains	719.3524	840.2147	903.2942	904.6040	791.0884	568.0654	378.6465	396.7812	591.6297	722.6491	705.4461	682.0982	(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	1617.6798	1507.2858	1372.8091	1151.3850	883.3987	587.7533	382.1347	402.1881	637.0535	970.6810	1280.6250	1559.9317	(97)
Space heating kWh	668.3556	448.2717	349.3191	177.6823	68.6789	0.0000	0.0000	0.0000	0.0000	184.5357	414.1288	653.1081	(98a)
Space heating requirement - total per year (kWh/year)												2964.0803	
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	668.3556	448.2717	349.3191	177.6823	68.6789	0.0000	0.0000	0.0000	0.0000	184.5357	414.1288	653.1081	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2964.0803	
Space heating per m2											(98c) / (4) =	37.5580	(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 %)	283.5598	(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	668.3556	448.2717	349.3191	177.6823	68.6789	0.0000	0.0000	0.0000	0.0000	184.5357	414.1288	653.1081	(98)
Space heating efficiency (main heating system 1)	283.5598	283.5598	283.5598	283.5598	283.5598	0.0000	0.0000	0.0000	0.0000	283.5598	283.5598	283.5598	(210)
Space heating fuel (main heating system)	235.7018	158.0872	123.1906	62.6613	24.2203	0.0000	0.0000	0.0000	0.0000	65.0782	146.0464	230.3246	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	302.1655	267.1078	282.8941	245.9864	236.7277	211.3766	206.9243	216.0376	219.4546	247.0797	265.7112	298.4510	(64)
Efficiency of water heater												275.7277	(216)
(217)m	275.7277	275.7277	275.7277	275.7277	275.7277	275.7277	275.7277	275.7277	275.7277	275.7277	275.7277	275.7277	(217)
Fuel for water heating, kWh/month	109.5884	96.8738	102.5991	89.2135	85.8556	76.6614	75.0466	78.3518	79.5911	89.6101	96.3672	108.2412	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	29.2809	23.4903	21.1504	15.4957	11.9693	9.7790	10.9188	14.1927	18.4349	24.1875	27.3198	30.0947	(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	1045.3105	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	275.7277	
Water heating fuel used	1087.9997	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	0.0000	(231)
Electricity for lighting (calculated in Appendix L)	236.3139	(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	2369.6241	(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	1045.3105	0.1561	163.1657	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1087.9997	0.1411	153.5476	(264)
Space and water heating			316.7133	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	236.3139	0.1443	34.1074	(268)
Total CO2, kg/year			350.8207	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.4500	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1045.3105	1.5778	1649.3361	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1087.9997	1.5219	1655.7757	(278)
Space and water heating			3305.1118	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	236.3139	1.5338	362.4662	(282)
Total Primary energy kWh/year			3667.5779	(286)
Dwelling Primary energy Rate (DPER)			46.4700	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	38.2900 (1b)	x	2.5000 (2b)	=	95.7250	(1b) - (3b)
First floor	40.6300 (1c)	x	2.8000 (2c)	=	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	209.4890	(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) =	0.1432 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3932 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3342 (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													

	0.4261	0.4178	0.4094	0.3676	0.3593	0.3175	0.3175	0.3092	0.3342	0.3593	0.3760	0.3927 (22b)
Effective ac	0.5908	0.5873	0.5838	0.5676	0.5645	0.5504	0.5504	0.5478	0.5559	0.5645	0.5707	0.5771 (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			2.4000	1.0000	2.4000			(26)
TER Opening Type (Uw = 1.20)			16.4000	1.1450	18.7786			(27)
rl			0.9400	2.0221	1.9007			(27a)
ground floor			38.2900	0.1300	4.9777			(28a)
exposed upper			8.0000	0.1300	1.0400			(28b)
External Wall 1	106.0000	18.8000	87.2000	0.1800	15.6960			(29a)
main flat roof	40.6300		40.6300	0.1100	4.4693			(30)
lower terrace	3.2000	0.9400	2.2600	0.1100	0.2486			(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	49.5110			(33)
Party Wall 1			34.9800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.3028 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	15.6000	0.0500	0.7800
E3 Sill	14.6000	0.0500	0.7300
E4 Jamb	23.9600	0.0500	1.1980
E5 Ground floor (normal)	20.0000	0.1600	3.2000
E6 Intermediate floor within a dwelling	7.9400	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	5.0000	0.2400	1.2000
E15 Flat roof with parapet	20.0000	0.5600	11.2000
E21 Exposed floor (inverted)	6.8000	0.3200	2.1760
E20 Exposed floor (normal)	7.5000	0.3200	2.4000
E16 Corner (normal)	17.5000	0.0900	1.5750
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0900	-0.6750
E18 Party wall between dwellings	0.0000	0.0600	0.0000
P1 Party wall - Ground floor	6.8000	0.0800	0.5440
P2 Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.8000	0.1200	0.8160
R11 Upstands or kerbs of rooflights	4.0000	0.0800	0.3200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 25.4640 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 74.9750 (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	40.8426	40.5988	40.3599	39.2377	39.0278	38.0504	38.0504	37.8694	38.4269	39.0278	39.4525	39.8966	(38)
Heat transfer coeff	115.8175	115.5738	115.3349	114.2127	114.0027	113.0254	113.0254	112.8444	113.4018	114.0027	114.4275	114.8715	(39)
Average = Sum(39)m / 12 =												114.2117	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4675	1.4644	1.4614	1.4472	1.4445	1.4322	1.4322	1.4299	1.4369	1.4445	1.4499	1.4555	(40)
HLP (average)												1.4472	
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 2.4420 (42)

Hot water usage for mixer showers

65.1648	64.1855	62.7585	60.0281	58.0132	55.7661	54.4889	55.9052	57.4576	59.8703	62.6593	64.9152	(42a)

Hot water usage for baths

28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511	(42b)

Hot water usage for other uses

39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390	(42c)

Average daily hot water use (litres/day) 122.2113 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.9501	130.1114	126.6543	121.3971	117.1281	112.5384	110.7745	114.2166	117.8470	122.6653	128.0034	132.6053	(44)
Energy conte	210.5605	185.2769	194.6629	166.1866	157.6769	138.3791	133.9721	141.4240	145.3171	166.4556	182.3644	207.6278	(45)
Energy content (annual)										Total = Sum(45)m =		2029.9040	
Distribution loss (46)m = 0.15 x (45)m	31.5841	27.7915	29.1994	24.9280	23.6515	20.7569	20.0958	21.2136	21.7976	24.9683	27.3547	31.1442	(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	257.1554	227.3626	241.2578	211.2784	204.2718	183.4710	180.5670	188.0190	190.4089	213.0505	227.4562	254.2227	(62)
WWHRS	-29.7906	-26.3471	-27.5892	-22.8449	-21.2906	-18.2185	-17.0770	-18.1597	-18.8496	-22.2216	-25.1744	-29.2390	(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	227.3647	201.0155	213.6687	188.4335	182.9812	165.2524	163.4900	169.8593	171.5593	190.8289	202.2818	224.9838	(64)
										Total per year (kWh/year) = Sum(64)m =		2301.7192	(64)
12Total per year (kWh/year)												2302	(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	107.2873	95.2731	102.0013	91.3305	89.7035	82.0845	81.8216	84.2994	84.3914	92.6224	96.7096	106.3122	(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	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	109.5450	121.2820	109.5450	113.1965	109.5450	113.1965	109.5450	109.5450	113.1965	109.5450	113.1965	109.5450	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	217.1685	219.4221	213.7433	201.6537	186.3928	172.0498	162.4677	160.2142	165.8930	177.9825	193.2434	207.5865	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	(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)													
	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	(71)
Water heating gains (Table 5)													
	144.2033	141.7755	137.0986	126.8479	120.5692	114.0063	109.9753	113.3057	117.2103	124.4925	134.3189	142.8927	(72)
Total internal gains													
	533.5476	545.1103	523.0176	504.3289	479.1378	458.8833	441.6188	442.6956	455.9305	474.6508	503.3896	522.6549	(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	4.4200	10.6334	0.6300	0.7000	0.7700	14.3637	(74)
South	8.1400	46.7521	0.6300	0.7000	0.7700	116.3046	(78)
West	3.8400	19.6403	0.6300	0.7000	0.7700	23.0489	(80)
South	0.9400	26.0000	0.6300	0.7000	1.0000	9.7002	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	163.4175	283.1620	399.3484	513.4095	591.0432	593.5338	569.4343	510.6573	438.8066	316.2477	196.6312	139.2613	(83)
Total gains	696.9651	828.2722	922.3660	1017.7384	1070.1810	1052.4171	1011.0531	953.3529	894.7372	790.8985	700.0208	661.9162	(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	40.3745	40.4596	40.5434	40.9418	41.0172	41.3719	41.3719	41.4382	41.2345	41.0172	40.8649	40.7070	
alpha	3.6916	3.6973	3.7029	3.7295	3.7345	3.7581	3.7581	3.7625	3.7490	3.7345	3.7243	3.7138	
util living area													
	0.9851	0.9715	0.9473	0.8899	0.7851	0.6242	0.4739	0.5178	0.7336	0.9139	0.9731	0.9876	(86)
MIT	19.2007	19.4760	19.8468	20.3103	20.6812	20.9035	20.9736	20.9631	20.8170	20.3295	19.6840	19.1552	(87)
Th 2	19.7119	19.7143	19.7166	19.7273	19.7294	19.7388	19.7388	19.7405	19.7351	19.7294	19.7253	19.7210	(88)
util rest of house													
	0.9808	0.9636	0.9321	0.8578	0.7233	0.5237	0.3464	0.3880	0.6418	0.8816	0.9641	0.9840	(89)
MIT 2	17.6737	18.0217	18.4852	19.0518	19.4667	19.6836	19.7303	19.7274	19.6145	19.0908	18.2958	17.6219	(90)
Living area fraction										fLA = Living area / (4) =		0.3833	(91)
MIT	18.2590	18.5791	19.0071	19.5342	19.9322	20.1512	20.2069	20.2010	20.0754	19.5656	18.8279	18.2096	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2590	18.5791	19.0071	19.5342	19.9322	20.1512	20.2069	20.2010	20.0754	19.5656	18.8279	18.2096	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9740	0.9542	0.9216	0.8521	0.7342	0.5585	0.3952	0.4374	0.6689	0.8765	0.9556	0.9779	(94)
Useful gains	678.8632	790.3208	850.0405	867.2047	785.7301	587.7663	399.5499	416.9732	598.4748	693.2380	668.9195	647.3140	(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													
	1616.6939	1580.9474	1442.5083	1214.5589	938.4932	627.4236	407.6684	428.9264	677.6229	1022.1045	1341.9953	1609.3060	(97)
Space heating kWh													
	697.7460	531.3011	440.7961	250.0950	113.6557	0.0000	0.0000	0.0000	0.0000	244.6767	484.6146	715.7221	(98a)
Space heating requirement - total per year (kWh/year)												3478.6073	
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													
	697.7460	531.3011	440.7961	250.0950	113.6557	0.0000	0.0000	0.0000	0.0000	244.6767	484.6146	715.7221	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3478.6073	
Space heating per m2											(98c) / (4) =	44.0776	(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													
	697.7460	531.3011	440.7961	250.0950	113.6557	0.0000	0.0000	0.0000	0.0000	244.6767	484.6146	715.7221	(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)													
	755.9545	575.6242	477.5689	270.9588	123.1373	0.0000	0.0000	0.0000	0.0000	265.0886	525.0429	775.4302	(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													
	227.3647	201.0155	213.6687	188.4335	182.9812	165.2524	163.4900	169.8593	171.5593	190.8289	202.2818	224.9838	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.4050	86.1335	85.6464	84.6955	83.0240	79.8000	79.8000	79.8000	79.8000	84.6183	85.9455	86.4677	(217)

Fuel for water heating, kWh/month

	263.1384	233.3767	249.4776	222.4835	220.3954	207.0832	204.8747	212.8563	214.9866	225.5174	235.3605	260.1941 (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	22.7613	18.2599	16.4411	12.0454	9.3042	7.6016	8.4876	11.0325	14.3302	18.8020	21.2368	23.3939 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-35.9441	-50.7401	-73.0350	-82.2424	-88.7930	-82.9175	-81.8821	-77.2349	-69.0675	-58.0584	-39.5348	-31.0672 (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	-20.1200	-42.3446	-84.1987	-126.5159	-167.3420	-168.1628	-166.1945	-140.7034	-103.1067	-60.5900	-26.8737	-15.9100 (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	3768.8053 (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	2749.7445 (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)	183.6966 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1892.5792 (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	4895.6673 (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	3768.8053	0.2100	791.4491	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2749.7445	0.2100	577.4463	(264)
Space and water heating			1368.8955	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	183.6966	0.1443	26.5131	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-770.5169	0.1346	-103.6782	
PV Unit electricity exported	-1122.0623	0.1259	-141.2475	
Total			-244.9257	(269)
Total CO2, kg/year			1162.4122	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.7300	(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	3768.8053	1.1300	4258.7500	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2749.7445	1.1300	3107.2113	(278)
Space and water heating			7365.9613	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	183.6966	1.5338	281.7600	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-770.5169	1.4973	-1153.6926	
PV Unit electricity exported	-1122.0623	0.4621	-518.4746	
Total			-1672.1672	(283)
Total Primary energy kWh/year			6105.6549	(286)
Target Primary Energy Rate (TPER)			77.3700	(287)

Full SAP Calculation Printout

Property Reference	House 2 Block C	**Issued on Date**	13/03/2024
Assessment Reference	Design stage for ES condition	**Prop Type Ref**	
Property	House 2 Block C, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	82 B	**DER**	4.51	**TER**	14.73
Environmental	96 A	**% DER < TER**			69.38
CO_2 Emissions (t/year)	0.32	**DFEE**	43.86	**TFEE**	51.30
Compliance Check	See BREL	**% DFEE < TFEE**			14.50
% DPER < TPER	39.11	**DPER**	47.11	**TPER**	77.36

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	38.2900 (1b)	x	2.5000 (2b)	=	95.7250	(1b) - (3b)
First floor	40.6300 (1c)	x	2.8000 (2c)	=	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	209.4890	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1909	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3409	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2898	(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	0.3695	0.3622	0.3550	0.3188	0.3115	0.2753	0.2753	0.2681	0.2898	0.3115	0.3260	0.3405	(22b)
Effective ac	0.5683	0.5656	0.5630	0.5508	0.5485	0.5379	0.5379	0.5359	0.5420	0.5485	0.5531	0.5580	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.4000	1.2000	2.8800			(26)
window (Uw = 1.20)			14.3500	1.1450	16.4313			(27)
rl			0.9600	1.2357	1.1863			(27a)
ground floor			38.2900	0.1000	3.8290	75.0000	2871.7500	(28a)
exposed upper			8.0000	0.1300	1.0400	20.0000	160.0000	(28b)
External Wall 1	106.0000	16.7500	89.2500	0.1300	11.6025	70.0000	6247.5000	(29a)
main flat roof	40.6300		40.6300	0.1100	4.4693	9.0000	365.6700	(30)
lower terrace	3.2000	0.9600	2.2400	0.1100	0.2464	9.0000	20.1600	(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.6848			(33)
Party Wall 1			34.9800	0.0000	0.0000	180.0000	6296.4000	(32)
Internal Wall 1			50.9600			9.0000	458.6400	(32c)
Internal Floor 1			32.6300			18.0000	587.3400	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17007.4600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		215.5025 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.6000	0.0600	0.6960

E3 Sill	10.6000	0.0400	0.4240	
E4 Jamb	23.9600	0.0200	0.4792	
R11 Upstands or kerbs of rooflights	4.0000	0.2400	0.9600	
E5 Ground floor (normal)	20.0000	0.1300	2.6000	
E6 Intermediate floor within a dwelling	7.9400	0.0000	0.0000	
E24 Eaves (insulation at ceiling level - inverted)	5.0000	0.1500	0.7500	
E15 Flat roof with parapet	20.0000	0.3000	6.0000	
E21 Exposed floor (inverted)	6.8000	0.3200	2.1760	
E20 Exposed floor (normal)	7.5000	0.3200	2.4000	
E16 Corner (normal)	17.5000	0.0500	0.8750	
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0600	-0.4500	
E18 Party wall between dwellings	10.0000	0.2400	2.4000	
P1 Party wall - Ground floor	6.8000	0.3200	2.1760	
P2 Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	6.8000	0.4800	3.2640	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 24.7502 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 66.4350 (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	39.2848	39.1016	38.9219	38.0783	37.9204	37.1856	37.1856	37.0495	37.4686	37.9204	38.2397	38.5736	(38)
Heat transfer coeff	105.7198	105.5366	105.3569	104.5133	104.3554	103.6206	103.6206	103.4845	103.9037	104.3554	104.6748	105.0086	(39)
Average = Sum(39)m / 12 =												104.5125	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3396	1.3373	1.3350	1.3243	1.3223	1.3130	1.3130	1.3113	1.3166	1.3223	1.3263	1.3306	(40)
HLP (average)												1.3243	
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 2.4420 (42)
Hot water usage for mixer showers

97.7473	96.2783	94.1378	90.0422	87.0198	83.6492	81.7334	83.8577	86.1864	89.8054	93.9889	97.3728	(42a)

Hot water usage for baths

28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511	(42b)

Hot water usage for other uses

39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390	(42c)

Average daily hot water use (litres/day) 152.2512 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	165.5325	162.2042	158.0335	151.4112	146.1347	140.4215	138.0189	142.1692	146.5758	152.6004	159.3331	165.0629	(44)
Energy conte	262.1631	230.9766	242.8917	207.2744	196.7253	172.6646	166.9219	176.0352	180.7426	207.0773	226.9992	258.4486	(45)
Energy content (annual)											Total = Sum(45)m =	2528.9204	

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

39.3245	34.6465	36.4337	31.0912	29.5088	25.8997	25.0383	26.4053	27.1114	31.0616	34.0499	38.7673	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.0000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.5400 (55)
Total storage loss

16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(56)

If cylinder contains dedicated solar storage

16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(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

302.1655	267.1078	282.8941	245.9864	236.7277	211.3766	206.9243	216.0376	219.4546	247.0797	265.7112	298.4510	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

302.1655	267.1078	282.8941	245.9864	236.7277	211.3766	206.9243	216.0376	219.4546	247.0797	265.7112	298.4510	(64)
										Total per year (kWh/year) = Sum(64)m =	2999.9164	(64)
12Total per year (kWh/year)											3000	(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

119.1711	105.7047	112.7634	99.8883	97.4131	88.3806	87.5035	90.5336	91.0665	100.8551	106.4468	117.9361	(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	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.5233	122.3651	110.5233	114.2074	110.5233	114.2074	110.5233	110.5233	114.2074	110.5233	114.2074	110.5233	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.1685	219.4221	213.7433	201.6537	186.3928	172.0498	162.4677	160.2142	165.8930	177.9825	193.2434	207.5865	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	(71)
Water heating gains (Table 5)	160.1763	157.2986	151.5637	138.7338	130.9316	122.7508	117.6122	121.6850	126.4813	135.5580	147.8428	158.5162	(72)
Total internal gains	547.4988	558.7165	535.4610	514.2256	487.4784	468.6387	450.2339	452.0532	466.2124	483.6945	514.9244	536.2567	(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				4.5400	10.6334	0.7200	0.7000	0.7700				16.8613	(74)
East				1.4600	19.6403	0.7200	0.7000	0.7700				10.0153	(76)
South				8.3500	46.7521	0.7200	0.7000	0.7700				136.3487	(78)
South				0.9600	26.0000	0.7200	0.7000	1.0000				11.3219	(82)
Solar gains	174.5472	298.6336	413.2733	521.8151	594.7665	595.3632	571.9281	516.5086	450.5773	331.1992	209.2783	149.2549	(83)
Total gains	722.0460	857.3501	948.7343	1036.0408	1082.2449	1064.0019	1022.1620	968.5617	916.7897	814.8937	724.2026	685.5117	(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	44.6869	44.7645	44.8408	45.2028	45.2712	45.5922	45.5922	45.6522	45.4680	45.2712	45.1331	44.9896	
alpha	3.9791	3.9843	3.9894	4.0135	4.0181	4.0395	4.0395	4.0435	4.0312	4.0181	4.0089	3.9993	
util living area	0.9830	0.9664	0.9375	0.8715	0.7549	0.5850	0.4364	0.4769	0.6929	0.8967	0.9684	0.9859	(86)
Living	19.4504	19.7217	20.0625	20.4675	20.7739	20.9398	20.9855	20.9792	20.8795	20.4778	19.8909	19.3999	
Non living	18.4400	18.7063	19.0362	19.4185	19.6799	19.8041	19.8270	19.8262	19.7670	19.4395	18.8822	18.3955	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.2073	19.7217	20.0625	20.4675	20.7739	20.9398	20.9855	20.9792	20.8795	20.4778	19.8909	19.6237	(87)
Th 2	19.8100	19.8118	19.8135	19.8219	19.8234	19.8307	19.8307	19.8320	19.8279	19.8234	19.8203	19.8170	(88)
util rest of house	0.9782	0.9575	0.9207	0.8373	0.6932	0.4925	0.3251	0.3626	0.6041	0.8613	0.9583	0.9820	(89)
MIT 2	19.1091	18.7063	19.0362	19.4185	19.6799	19.8041	19.8270	19.8262	19.7670	19.4395	18.8822	18.5943	(90)
Living area fraction										fLA = Living area / (4) =		0.3833	(91)
MIT	19.5301	19.0955	19.4295	19.8206	20.0992	20.2394	20.2710	20.2682	20.1934	19.8375	19.2688	18.9889	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5301	19.0955	19.4295	19.8206	20.0992	20.2394	20.2710	20.2682	20.1934	19.8375	19.2688	18.9889	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9769	0.9507	0.9142	0.8373	0.7088	0.5261	0.3678	0.4064	0.6337	0.8618	0.9523	0.9784	(94)
Useful gains	705.3606	815.0530	867.3262	867.4699	767.1136	559.7521	375.9597	393.6249	580.9890	702.2542	689.6762	670.7170	(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	1610.1191	1498.1404	1362.2172	1141.3485	876.5030	584.3590	380.3957	400.2962	633.1303	963.9821	1273.7704	1552.9610	(97)
Space heating kWh	673.1403	459.0347	368.1989	197.1926	81.3857	0.0000	0.0000	0.0000	0.0000	194.7256	420.5479	656.3896	(98a)
Space heating requirement - total per year (kWh/year)												3050.6152	
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	673.1403	459.0347	368.1989	197.1926	81.3857	0.0000	0.0000	0.0000	0.0000	194.7256	420.5479	656.3896	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3050.6152	
Space heating per m2											(98c) / (4) =	38.6545	(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 %)												283.5898	(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	673.1403	459.0347	368.1989	197.1926	81.3857	0.0000	0.0000	0.0000	0.0000	194.7256	420.5479	656.3896	(98)
Space heating efficiency (main heating system 1)	283.5898	283.5898	283.5898	283.5898	283.5898	0.0000	0.0000	0.0000	0.0000	283.5898	283.5898	283.5898	(210)
Space heating fuel (main heating system)	237.3641	161.8658	129.8351	69.5344	28.6984	0.0000	0.0000	0.0000	0.0000	68.6645	148.2944	231.4574	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	302.1655	267.1078	282.8941	245.9864	236.7277	211.3766	206.9243	216.0376	219.4546	247.0797	265.7112	298.4510	(64)
Efficiency of water heater												275.7855	(216)
(217)m	275.7855	275.7855	275.7855	275.7855	275.7855	275.7855	275.7855	275.7855	275.7855	275.7855	275.7855	275.7855	(217)
Fuel for water heating, kWh/month	109.5654	96.8535	102.5776	89.1948	85.8376	76.6453	75.0309	78.3354	79.5744	89.5913	96.3471	108.2185	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	29.5507	23.7067	21.3453	15.6384	12.0796	9.8691	11.0194	14.3234	18.6047	24.4104	27.5715	30.3720	(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	1075.7142	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	275.7855	
Water heating fuel used	1087.7717	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	0.0000	(231)
Electricity for lighting (calculated in Appendix L)	238.4914	(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	2401.9773	(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	1075.7142	0.1558	167.6436	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1087.7717	0.1411	153.5155	(264)
Space and water heating			321.1591	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	238.4914	0.1443	34.4217	(268)
Total CO2, kg/year			355.5808	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.5100	(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	1075.7142	1.5769	1696.3250	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1087.7717	1.5219	1655.4288	(278)
Space and water heating			3351.7538	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	238.4914	1.5338	365.8061	(282)
Total Primary energy kWh/year			3717.5598	(286)
Dwelling Primary energy Rate (DPER)			47.1100	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	38.2900 (1b)	x	2.5000 (2b)	=	95.7250	(1b) - (3b)
First floor	40.6300 (1c)	x	2.8000 (2c)	=	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	209.4890	(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) =	0.1432	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3932	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3342	(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													

	0.4261	0.4178	0.4094	0.3676	0.3593	0.3175	0.3175	0.3092	0.3342	0.3593	0.3760	0.3927	(22b)
Effective ac	0.5908	0.5873	0.5838	0.5676	0.5645	0.5504	0.5504	0.5478	0.5559	0.5645	0.5707	0.5771	(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			2.4000	1.0000	2.4000			(26)
TER Opening Type (Uw = 1.20)			14.3500	1.1450	16.4313			(27)
rl			0.9600	2.0221	1.9412			(27a)
ground floor			38.2900	0.1300	4.9777			(28a)
exposed upper			8.0000	0.1300	1.0400			(28b)
External Wall 1	106.0000	16.7500	89.2500	0.1800	16.0650			(29a)
main flat roof	40.6300		40.6300	0.1100	4.4693			(30)
lower terrace	3.2000	0.9600	2.2400	0.1100	0.2464			(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.5709			(33)
Party Wall 1			34.9800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 215.5025 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.6000	0.0500	0.5800
E3 Sill	10.6000	0.0500	0.5300
E4 Jamb	23.9600	0.0500	1.1980
R11 Upstands or kerbs of rooflights	4.0000	0.0800	0.3200
E5 Ground floor (normal)	20.0000	0.1600	3.2000
E6 Intermediate floor within a dwelling	7.9400	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	5.0000	0.2400	1.2000
E15 Flat roof with parapet	20.0000	0.5600	11.2000
E21 Exposed floor (inverted)	6.8000	0.3200	2.1760
E20 Exposed floor (normal)	7.5000	0.3200	2.4000
E16 Corner (normal)	17.5000	0.0900	1.5750
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0900	-0.6750
E18 Party wall between dwellings	10.0000	0.0600	0.6000
P1 Party wall - Ground floor	6.8000	0.0800	0.5440
P2 Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.8000	0.1200	0.8160

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 25.6640 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 73.2349 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.8426	40.5988	40.3599	39.2377	39.0278	38.0504	38.0504	37.8694	38.4269	39.0278	39.4525	39.8966	(38)
Heat transfer coeff	114.0774	113.8337	113.5948	112.4726	112.2627	111.2853	111.2853	111.1043	111.6618	112.2627	112.6874	113.1314	(39)
Average = Sum(39)m / 12 =												112.4716	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4455	1.4424	1.4394	1.4251	1.4225	1.4101	1.4101	1.4078	1.4149	1.4225	1.4279	1.4335	(40)
HLP (average)												1.4251	
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 2.4420 (42)

Hot water usage for mixer showers

65.1648	64.1855	62.7585	60.0281	58.0132	55.7661	54.4889	55.9052	57.4576	59.8703	62.6593	64.9152	(42a)

Hot water usage for baths

28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511	(42b)

Hot water usage for other uses

39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390	(42c)

Average daily hot water use (litres/day) 122.2113 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.9501	130.1114	126.6543	121.3971	117.1281	112.5384	110.7745	114.2166	117.8470	122.6653	128.0034	132.6053	(44)
Energy conte	210.5605	185.2769	194.6629	166.1866	157.6769	138.3791	133.9721	141.4240	145.3171	166.4556	182.3644	207.6278	(45)
Energy content (annual)										Total = Sum(45)m =		2029.9040	
Distribution loss (46)m = 0.15 x (45)m	31.5841	27.7915	29.1994	24.9280	23.6515	20.7569	20.0958	21.2136	21.7976	24.9683	27.3547	31.1442	(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

257.1554	227.3626	241.2578	211.2784	204.2718	183.4710	180.5670	188.0190	190.4089	213.0505	227.4562	254.2227	(62)
WWHRS -29.7906	-26.3471	-27.5892	-22.8449	-21.2906	-18.2185	-17.0770	-18.1597	-18.8496	-22.2216	-25.1744	-29.2390	(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

227.3647	201.0155	213.6687	188.4335	182.9812	165.2524	163.4900	169.8593	171.5593	190.8289	202.2818	224.9838	(64)

Total per year (kWh/year) = Sum(64)m = 2301.7192 (64)

12Total per year (kWh/year) 2302 (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

107.2873	95.2731	102.0013	91.3305	89.7035	82.0845	81.8216	84.2994	84.3914	92.6224	96.7096	106.3122	(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	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	110.5233	122.3651	110.5233	114.2074	110.5233	114.2074	110.5233	110.5233	114.2074	110.5233	114.2074	110.5233	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	217.1685	219.4221	213.7433	201.6537	186.3928	172.0498	162.4677	160.2142	165.8930	177.9825	193.2434	207.5865	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	(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)													
	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	(71)
Water heating gains (Table 5)													
	144.2033	141.7755	137.0986	126.8479	120.5692	114.0063	109.9753	113.3057	117.2103	124.4925	134.3189	142.8927	(72)
Total internal gains													
	534.5259	546.1934	523.9958	505.3398	480.1161	459.8942	442.5971	443.6739	456.9414	475.6291	504.4005	523.6332	(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	4.5400	10.6334	0.6300	0.7000	0.7700	14.7537	(74)
East	1.4600	19.6403	0.6300	0.7000	0.7700	8.7634	(76)
South	8.3500	46.7521	0.6300	0.7000	0.7700	119.3051	(78)
South	0.9600	26.0000	0.6300	0.7000	1.0000	9.9066	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	152.7288	261.3044	361.6142	456.5883	520.4207	520.9428	500.4371	451.9450	394.2552	289.7993	183.1185	130.5981	(83)
Total gains	687.2547	807.4977	885.6100	961.9280	1000.5367	980.8370	943.0341	895.6189	851.1966	765.4283	687.5190	654.2313	(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	41.4131	41.5017	41.5890	42.0040	42.0825	42.4521	42.4521	42.5213	42.3090	42.0825	41.9239	41.7593	
alpha	3.7609	3.7668	3.7726	3.8003	3.8055	3.8301	3.8301	3.8348	3.8206	3.8055	3.7949	3.7840	
util living area													
	0.9861	0.9740	0.9531	0.9033	0.8084	0.6519	0.4981	0.5401	0.7514	0.9205	0.9749	0.9883	(86)
MIT	19.2353	19.4948	19.8440	20.2898	20.6603	20.8947	20.9711	20.9604	20.8107	20.3314	19.7072	19.1929	(87)
Th 2	19.7286	19.7310	19.7333	19.7441	19.7461	19.7556	19.7556	19.7574	19.7519	19.7461	19.7420	19.7377	(88)
util rest of house													
	0.9821	0.9666	0.9393	0.8739	0.7496	0.5513	0.3670	0.4079	0.6614	0.8899	0.9664	0.9850	(89)
MIT 2	17.7266	18.0553	18.4932	19.0421	19.4621	19.6943	19.7462	19.7431	19.6255	19.1057	18.3348	17.6788	(90)
Living area fraction									fLA = Living area / (4) =			0.3833	(91)
MIT	18.3049	18.6070	19.0110	19.5204	19.9214	20.1544	20.2157	20.2097	20.0798	19.5755	18.8608	18.2592	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3049	18.6070	19.0110	19.5204	19.9214	20.1544	20.2157	20.2097	20.0798	19.5755	18.8608	18.2592	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9757	0.9578	0.9293	0.8677	0.7588	0.5857	0.4172	0.4581	0.6875	0.8848	0.9583	0.9793	(94)
Useful gains	670.5468	773.4363	823.0220	834.6797	759.2197	574.4280	393.3916	410.3212	585.1795	677.2771	658.8732	640.6809	(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													
	1597.6436	1560.3233	1421.1816	1194.4994	922.9571	618.1203	402.3747	423.2714	667.7107	1007.6162	1325.2966	1590.5320	(97)
Space heating kWh													
	689.7601	528.7881	445.0308	259.0701	121.8206	0.0000	0.0000	0.0000	0.0000	245.7723	479.8248	706.6892	(98a)
Space heating requirement - total per year (kWh/year)												3476.7560	
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													
	689.7601	528.7881	445.0308	259.0701	121.8206	0.0000	0.0000	0.0000	0.0000	245.7723	479.8248	706.6892	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3476.7560	
Space heating per m2											(98c) / (4) =	44.0542	(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													
	689.7601	528.7881	445.0308	259.0701	121.8206	0.0000	0.0000	0.0000	0.0000	245.7723	479.8248	706.6892	(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)													
	747.3023	572.9015	482.1568	280.6827	131.9833	0.0000	0.0000	0.0000	0.0000	266.2755	519.8536	765.6438	(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													
	227.3647	201.0155	213.6687	188.4335	182.9812	165.2524	163.4900	169.8593	171.5593	190.8289	202.2818	224.9838	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.3847	86.1246	85.6660	84.7741	83.1689	79.8000	79.8000	79.8000	79.8000	84.6283	85.9261	86.4457	(217)

Fuel for water heating, kWh/month

	263.2002	233.4008	249.4207	222.2773	220.0114	207.0832	204.8747	212.8563	214.9866	225.4907	235.4137	260.2604 (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	22.9646	18.4230	16.5879	12.1530	9.3873	7.6695	8.5634	11.1311	14.4582	18.9699	21.4264	23.6028 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-35.9499	-50.7499	-73.0501	-82.2590	-88.8095	-82.9322	-81.8986	-77.2537	-69.0866	-58.0731	-39.5426	-31.0721 (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	-20.1142	-42.3348	-84.1836	-126.4992	-167.3255	-168.1481	-166.1781	-140.6845	-103.0877	-60.5752	-26.8659	-15.9051 (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	3766.7995 (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	2749.2760 (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)	185.3371 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1892.5792 (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	4894.8334 (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	3766.7995	0.2100	791.0279	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2749.2760	0.2100	577.3479	(264)
Space and water heating			1368.3759	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	185.3371	0.1443	26.7499	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-770.6773	0.1346	-103.6996	
PV Unit electricity exported	-1121.9019	0.1259	-141.2259	
Total			-244.9255	(269)
Total CO2, kg/year			1162.1295	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.7300	(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	3766.7995	1.1300	4256.4835	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2749.2760	1.1300	3106.6818	(278)
Space and water heating			7363.1653	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	185.3371	1.5338	284.2762	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-770.6773	1.4973	-1153.9322	
PV Unit electricity exported	-1121.9019	0.4621	-518.3953	
Total			-1672.3275	(283)
Total Primary energy kWh/year			6105.2148	(286)
Target Primary Energy Rate (TPER)			77.3600	(287)

Full SAP Calculation Printout

Property Reference	House 2 Block C	**Issued on Date**	13/03/2024
Assessment Reference	Design stage for ES condition	**Prop Type Ref**	
Property	House 2 Block C, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	82 B	**DER**	4.51	**TER**	14.73
Environmental	96 A	**% DER < TER**			69.38
CO_2 Emissions (t/year)	0.32	**DFEE**	43.86	**TFEE**	51.30
Compliance Check	See BREL	**% DFEE < TFEE**			14.50
% DPER < TPER	39.11	**DPER**	47.11	**TPER**	77.36

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	38.2900 (1b)	x	2.5000 (2b)	=	95.7250	(1b) - (3b)
First floor	40.6300 (1c)	x	2.8000 (2c)	=	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	209.4890	(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) =	0.1432	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2932	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2492	(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	0.3178	0.3115	0.3053	0.2741	0.2679	0.2368	0.2368	0.2305	0.2492	0.2679	0.2804	0.2928	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5505	0.5485	0.5466	0.5376	0.5359	0.5280	0.5280	0.5266	0.5311	0.5359	0.5393	0.5429	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.4000	1.2000	2.8800			(26)
window (Uw = 1.20)			14.3500	1.1450	16.4313			(27)
rl			0.9600	1.2357	1.1863			(27a)
ground floor			38.2900	0.1000	3.8290	75.0000	2871.7500	(28a)
exposed upper			8.0000	0.1300	1.0400	20.0000	160.0000	(28b)
External Wall 1	106.0000	16.7500	89.2500	0.1300	11.6025	70.0000	6247.5000	(29a)
main flat roof	40.6300		40.6300	0.1100	4.4693	9.0000	365.6700	(30)
lower terrace	3.2000	0.9600	2.2400	0.1100	0.2464	9.0000	20.1600	(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.6848			(33)
Party Wall 1			34.9800	0.0000	0.0000	180.0000	6296.4000	(32)
Internal Wall 1			50.9600			9.0000	458.6400	(32c)
Internal Floor 1			32.6300			18.0000	587.3400	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17007.4600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		215.5025 (35)
List of Thermal Bridges		

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.6000	0.0600	0.6960
E3 Sill	10.6000	0.0400	0.4240
E4 Jamb	23.9600	0.0200	0.4792
R11 Upstands or kerbs of rooflights	4.0000	0.2400	0.9600
E5 Ground floor (normal)	20.0000	0.1300	2.6000
E6 Intermediate floor within a dwelling	7.9400	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	5.0000	0.1500	0.7500
E15 Flat roof with parapet	20.0000	0.3000	6.0000
E21 Exposed floor (inverted)	6.8000	0.3200	2.1760
E20 Exposed floor (normal)	7.5000	0.3200	2.4000
E16 Corner (normal)	17.5000	0.0500	0.8750
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0600	-0.4500
E18 Party wall between dwellings	10.0000	0.2400	2.4000
P1 Party wall - Ground floor	6.8000	0.3200	2.1760
P2 Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.8000	0.4800	3.2640

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 24.7502 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 66.4350 (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	38.0559	37.9203	37.7875	37.1635	37.0468	36.5033	36.5033	36.4027	36.7127	37.0468	37.2830	37.5299	(38)
Heat transfer coeff	104.4909	104.3553	104.2225	103.5985	103.4818	102.9383	102.9383	102.8377	103.1477	103.4818	103.7180	103.9649	(39)

Average = Sum(39)m / 12 = 103.5980

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3240	1.3223	1.3206	1.3127	1.3112	1.3043	1.3043	1.3031	1.3070	1.3112	1.3142	1.3173	(40)
HLP (average)												1.3127	
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 2.4420 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511	(42b)

Hot water usage for other uses

39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390	(42c)

Average daily hot water use (litres/day) 62.1315 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	67.7853	65.9258	63.8958	61.3690	59.1149	56.7723	56.2855	58.3115	60.3893	62.7950	65.3442	67.6901	(44)
Energy conte	107.3553	93.8775	98.2054	84.0111	79.5800	69.8082	68.0725	72.2018	74.4661	85.2123	93.0947	105.9864	(45)

Energy content (annual) Total = Sum(45)m = 1031.8712

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

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 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

91.2520	79.7959	83.4746	71.4094	67.6430	59.3369	57.8616	61.3715	63.2962	72.4304	79.1305	90.0884	(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

91.2520	79.7959	83.4746	71.4094	67.6430	59.3369	57.8616	61.3715	63.2962	72.4304	79.1305	90.0884	(64)

Total per year (kWh/year) = Sum(64)m = 877.0905 (64)

12Total per year (kWh/year) 877 (64)

Electric shower(s)

52.1862	46.4983	50.7744	48.4534	49.3626	47.0871	48.6567	49.3626	48.4534	50.7744	49.8196	52.1862	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 593.6147 (64a)

Heat gains from water heating, kWh/month

35.8595	31.5736	33.5622	29.9657	29.2514	26.6060	26.6296	27.6835	27.9374	30.8012	32.2375	35.5686	(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	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.5233	122.3651	110.5233	114.2074	110.5233	114.2074	110.5233	110.5233	114.2074	110.5233	114.2074	110.5233	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.1685	219.4221	213.7433	201.6537	186.3928	172.0498	162.4677	160.2142	165.8930	177.9825	193.2434	207.5865	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	(71)
Water heating gains (Table 5)	48.1983	46.9845	45.1105	41.6190	39.3164	36.9528	35.7924	37.2090	38.8019	41.3995	44.7744	47.8073	(72)
Total internal gains	435.5209	448.4023	429.0078	417.1109	395.8632	382.8407	368.4142	367.5772	378.5331	389.5360	411.8559	425.5478	(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	4.5400	10.6334	0.7200	0.7000	0.7700	16.8613	(74)
East	1.4600	19.6403	0.7200	0.7000	0.7700	10.0153	(76)

South			8.3500		46.7521		0.7200	0.7000		0.7700		136.3487	(78)
South			0.9600		26.0000		0.7200	0.7000		1.0000		11.3219	(82)
Solar gains	174.5472	298.6336	413.2733	521.8151	594.7665	595.3632	571.9281	516.5086	450.5773	331.1992	209.2783	149.2549	(83)
Total gains	610.0681	747.0359	842.2811	938.9260	990.6297	978.2039	940.3422	884.0858	829.1104	720.7352	621.1342	574.8028	(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	45.2125	45.2712	45.3289	45.6019	45.6534	45.8944	45.8944	45.9393	45.8013	45.6534	45.5494	45.4413	
alpha	4.0142	4.0181	4.0219	4.0401	4.0436	4.0596	4.0596	4.0626	4.0534	4.0436	4.0366	4.0294	
util living area	0.9904	0.9782	0.9555	0.8982	0.7900	0.6224	0.4685	0.5146	0.7367	0.9247	0.9807	0.9924	(86)
MIT	19.3205	19.6019	19.9592	20.3947	20.7346	20.9261	20.9817	20.9732	20.8509	20.3953	19.7719	19.2661	(87)
Th 2	19.8221	19.8234	19.8247	19.8309	19.8321	19.8374	19.8374	19.8384	19.8354	19.8321	19.8297	19.8273	(88)
util rest of house	0.9876	0.9721	0.9427	0.8688	0.7316	0.5280	0.3510	0.3941	0.6499	0.8964	0.9742	0.9901	(89)
MIT 2	18.3212	18.5994	18.9485	19.3637	19.6597	19.8039	19.8327	19.8308	19.7575	19.3756	18.7747	18.2712	(90)
Living area fraction										fLA = Living area / (4) =		0.3833	(91)
MIT	18.7042	18.9836	19.3359	19.7589	20.0717	20.2341	20.2731	20.2687	20.1766	19.7664	19.1570	18.6525	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7042	18.9836	19.3359	19.7589	20.0717	20.2341	20.2731	20.2687	20.1766	19.7664	19.1570	18.6525	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9840	0.9665	0.9361	0.8668	0.7447	0.5618	0.3961	0.4402	0.6775	0.8945	0.9692	0.9870	(94)
Useful gains	600.2945	721.9754	788.4852	813.8216	737.7051	549.5216	372.4492	389.1586	561.7524	644.6956	602.0249	567.3542	(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	1505.1125	1469.7017	1337.7939	1124.9637	866.3179	579.9619	378.1024	397.8468	626.7860	948.5585	1250.5235	1502.5548	(97)
Space heating kWh	673.1846	502.4721	408.6857	224.0223	95.6879	0.0000	0.0000	0.0000	0.0000	226.0739	466.9190	695.7892	(98a)
Space heating requirement - total per year (kWh/year)												3292.8347	
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	673.1846	502.4721	408.6857	224.0223	95.6879	0.0000	0.0000	0.0000	0.0000	226.0739	466.9190	695.7892	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3292.8347	
Space heating per m2											(98c) / (4) =	41.7237	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	967.6204	761.7437	781.5665	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8456	0.9057	0.8825	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	818.2169	689.9229	689.7109	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1085.5245	1044.2584	983.0211	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	192.4615	263.6256	218.2228	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	48.1154	65.9064	54.5557	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												168.5775	(107)
Energy for space heating												41.7237	(99)
Energy for space cooling												2.1361	(108)
Total												43.8598	(109)
Fabric Energy Efficiency (DFEE)												43.9	(109)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	38.2900	(1b)	x 2.5000	(2b) =	95.7250	(1b) - (3b)
First floor	40.6300	(1c)	x 2.8000	(2c) =	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		209.4890	(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) =	0.1432	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3932	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3342	(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	0.4261	0.4178	0.4094	0.3676	0.3593	0.3175	0.3175	0.3092	0.3342	0.3593	0.3760	0.3927	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5908	0.5873	0.5838	0.5676	0.5645	0.5504	0.5504	0.5478	0.5559	0.5645	0.5707	0.5771	(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			2.4000	1.0000	2.4000			(26)
TER Opening Type (Uw = 1.20)			14.3500	1.1450	16.4313			(27)
rl			0.9600	2.0221	1.9412			(27a)
ground floor			38.2900	0.1300	4.9777			(28a)
exposed upper			8.0000	0.1300	1.0400			(28b)
External Wall 1	106.0000	16.7500	89.2500	0.1800	16.0650			(29a)
main flat roof	40.6300		40.6300	0.1100	4.4693			(30)
lower terrace	3.2000	0.9600	2.2400	0.1100	0.2464			(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.5709			(33)
Party Wall 1			34.9800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	215.5025 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.6000	0.0500	0.5800
E3 Sill	10.6000	0.0500	0.5300
E4 Jamb	23.9600	0.0500	1.1980
R11 Upstands or kerbs of rooflights	4.0000	0.0800	0.3200
E5 Ground floor (normal)	20.0000	0.1600	3.2000
E6 Intermediate floor within a dwelling	7.9400	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	5.0000	0.2400	1.2000
E15 Flat roof with parapet	20.0000	0.5600	11.2000
E21 Exposed floor (inverted)	6.8000	0.3200	2.1760
E20 Exposed floor (normal)	7.5000	0.3200	2.4000
E16 Corner (normal)	17.5000	0.0900	1.5750
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0900	-0.6750
E18 Party wall between dwellings	10.0000	0.0600	0.6000
P1 Party wall - Ground floor	6.8000	0.0800	0.5440
P2 Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.8000	0.1200	0.8160

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	25.6640	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 73.2349	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.8426	40.5988	40.3599	39.2377	39.0278	38.0504	38.0504	37.8694	38.4269	39.0278	39.4525	39.8966	(38)
Heat transfer coeff	114.0774	113.8337	113.5948	112.4726	112.2627	111.2853	111.2853	111.1043	111.6618	112.2627	112.6874	113.1314	(39)

Average = Sum(39)m / 12 =	112.4716

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4455	1.4424	1.4394	1.4251	1.4225	1.4101	1.4101	1.4078	1.4149	1.4225	1.4279	1.4335	(40)
HLP (average)												1.4251	
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	2.4420 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511	(42b)
Hot water usage for other uses	39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390	(42c)

Average daily hot water use (litres/day)	62.1315 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	67.7853	65.9258	63.8958	61.3690	59.1149	56.7723	56.2855	58.3115	60.3893	62.7950	65.3442	67.6901	(44)
Energy conte	107.3553	93.8775	98.2054	84.0111	79.5800	69.8082	68.0725	72.2018	74.4661	85.2123	93.0947	105.9864	(45)

Energy content (annual)	Total = Sum(45)m =	1031.8712

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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													
	91.2520	79.7959	83.4746	71.4094	67.6430	59.3369	57.8616	61.3715	63.2962	72.4304	79.1305	90.0884	(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													
	91.2520	79.7959	83.4746	71.4094	67.6430	59.3369	57.8616	61.3715	63.2962	72.4304	79.1305	90.0884	(64)
										Total per year (kWh/year) = Sum(64)m =		877.0905	(64)
12Total per year (kWh/year)												877	(64)
Electric shower(s)													
	52.1862	46.4983	50.7744	48.4534	49.3626	47.0871	48.6567	49.3626	48.4534	50.7744	49.8196	52.1862	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		593.6147	(64a)
Heat gains from water heating, kWh/month													
	35.8595	31.5736	33.5622	29.9657	29.2514	26.6060	26.6296	27.6835	27.9374	30.8012	32.2375	35.5686	(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	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	110.5233	122.3651	110.5233	114.2074	110.5233	114.2074	110.5233	110.5233	114.2074	110.5233	114.2074	110.5233	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	217.1685	219.4221	213.7433	201.6537	186.3928	172.0498	162.4677	160.2142	165.8930	177.9825	193.2434	207.5865	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	(71)
Water heating gains (Table 5)													
	48.1983	46.9845	45.1105	41.6190	39.3164	36.9528	35.7924	37.2090	38.8019	41.3995	44.7744	47.8073	(72)
Total internal gains													
	435.5209	448.4023	429.0078	417.1109	395.8632	382.8407	368.4142	367.5772	378.5331	389.5360	411.8559	425.5478	(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	4.5400	10.6334	0.6300	0.7000	0.7700	14.7537	(74)
East	1.4600	19.6403	0.6300	0.7000	0.7700	8.7634	(76)
South	8.3500	46.7521	0.6300	0.7000	0.7700	119.3051	(78)
South	0.9600	26.0000	0.6300	0.7000	1.0000	9.9066	(82)

Solar gains	152.7288	261.3044	361.6142	456.5883	520.4207	520.9428	500.4371	451.9450	394.2552	289.7993	183.1185	130.5981	(83)
Total gains	588.2497	709.7067	790.6220	873.6991	916.2839	903.7835	868.8512	819.5222	772.7882	679.3353	594.9744	556.1459	(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	41.4131	41.5017	41.5890	42.0040	42.0825	42.4521	42.4521	42.5213	42.3090	42.0825	41.9239	41.7593	
alpha	3.7609	3.7668	3.7726	3.8003	3.8055	3.8301	3.8301	3.8348	3.8206	3.8055	3.7949	3.7840	
util living area													
	0.9916	0.9826	0.9664	0.9246	0.8402	0.6899	0.5344	0.5809	0.7914	0.9425	0.9841	0.9932	(86)
MIT	19.0996	19.3667	19.7288	20.2016	20.6040	20.8716	20.9633	20.9493	20.7702	20.2385	19.5850	19.0571	(87)
Th 2	19.7286	19.7310	19.7333	19.7441	19.7461	19.7556	19.7556	19.7574	19.7519	19.7461	19.7420	19.7377	(88)
util rest of house													
	0.9891	0.9775	0.9560	0.9000	0.7862	0.5891	0.3966	0.4428	0.7059	0.9185	0.9785	0.9912	(89)
MIT 2	18.0347	18.3002	18.6574	19.1186	19.4820	19.6957	19.7460	19.7426	19.6281	19.1645	18.5267	17.9990	(90)
Living area fraction										fLA = Living area / (4) =		0.3833	(91)
MIT	18.4429	18.7090	19.0681	19.5337	19.9121	20.1464	20.2126	20.2051	20.0659	19.5762	18.9323	18.4045	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4429	18.7090	19.0681	19.5337	19.9121	20.1464	20.2126	20.2051	20.0659	19.5762	18.9323	18.4045	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9856	0.9719	0.9490	0.8950	0.7943	0.6232	0.4494	0.4953	0.7301	0.9145	0.9735	0.9881	(94)
Useful gains	579.7723	689.7856	750.2649	781.9934	727.8243	563.2586	390.4651	405.9095	564.1907	621.2326	579.2320	549.5435	(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													
	1613.3822	1571.9279	1427.6678	1196.0032	921.9097	617.2365	402.0316	422.7672	666.1584	1007.6877	1333.3552	1606.9802	(97)
Space heating kWh													
	769.0057	592.7996	503.9877	298.0871	144.3995	0.0000	0.0000	0.0000	0.0000	287.5226	542.9687	786.7329	(98a)
Space heating requirement - total per year (kWh/year)												3925.5039	
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													
	769.0057	592.7996	503.9877	298.0871	144.3995	0.0000	0.0000	0.0000	0.0000	287.5226	542.9687	786.7329	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3925.5039	
Space heating per m2											(98c) / (4) =	49.7403	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

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

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	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1046.0818	823.5112	844.3927	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7749	0.8498	0.8213	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	810.6011	699.8354	693.5311	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1000.3776	962.4344	909.0000	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	136.6391	195.3736	160.3089	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	34.1598	48.8434	40.0772	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												123.0804	(107)
Energy for space heating												49.7403	(99)
Energy for space cooling												1.5596	(108)
Total												51.2999	(109)
Fabric Energy Efficiency (TFEE)												51.3	(109)

Full SAP Calculation Printout

Property Reference	House 2 Block C	**Issued on Date**	13/03/2024
Assessment Reference	Design stage for ES condition	**Prop Type Ref**	
Property	House 2 Block C, 23 & 23A High Street, Hornsey, London, N8 7QB		

SAP Rating	82 B	**DER**	4.51	**TER**	14.73
Environmental	96 A	**% DER < TER**			69.38
CO_2 Emissions (t/year)	0.32	**DFEE**	43.86	**TFEE**	51.30
Compliance Check	See BREL	**% DFEE < TFEE**			14.50
% DPER < TPER	39.11	**DPER**	47.11	**TPER**	77.36

Assessor Details	Mr. Neil Rothon	**Assessor ID**	L759-0001
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	38.2900 (1b)	x	2.5000 (2b)	=	95.7250	(1b) - (3b)
First floor	40.6300 (1c)	x	2.8000 (2c)	=	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	209.4890	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1909	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3409	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2898	(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	0.3695	0.3622	0.3550	0.3188	0.3115	0.2753	0.2753	0.2681	0.2898	0.3115	0.3260	0.3405	(22b)
Effective ac	0.5683	0.5656	0.5630	0.5508	0.5485	0.5379	0.5379	0.5359	0.5420	0.5485	0.5531	0.5580	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
front door			2.4000	1.2000	2.8800			(26)
window (Uw = 1.20)			14.3500	1.1450	16.4313			(27)
rl			0.9600	1.2357	1.1863			(27a)
ground floor			38.2900	0.1000	3.8290	75.0000	2871.7500	(28a)
exposed upper			8.0000	0.1300	1.0400	20.0000	160.0000	(28b)
External Wall 1	106.0000	16.7500	89.2500	0.1300	11.6025	70.0000	6247.5000	(29a)
main flat roof	40.6300		40.6300	0.1100	4.4693	9.0000	365.6700	(30)
lower terrace	3.2000	0.9600	2.2400	0.1100	0.2464	9.0000	20.1600	(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.6848			(33)
Party Wall 1			34.9800	0.0000	0.0000	180.0000	6296.4000	(32)
Internal Wall 1			50.9600			9.0000	458.6400	(32c)
Internal Floor 1			32.6300			18.0000	587.3400	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17007.4600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		215.5025 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.6000	0.0600	0.6960

E3 Sill	10.6000	0.0400	0.4240	
E4 Jamb	23.9600	0.0200	0.4792	
R11 Upstands or kerbs of rooflights	4.0000	0.2400	0.9600	
E5 Ground floor (normal)	20.0000	0.1300	2.6000	
E6 Intermediate floor within a dwelling	7.9400	0.0000	0.0000	
E24 Eaves (insulation at ceiling level - inverted)	5.0000	0.1500	0.7500	
E15 Flat roof with parapet	20.0000	0.3000	6.0000	
E21 Exposed floor (inverted)	6.8000	0.3200	2.1760	
E20 Exposed floor (normal)	7.5000	0.3200	2.4000	
E16 Corner (normal)	17.5000	0.0500	0.8750	
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0600	-0.4500	
E18 Party wall between dwellings	10.0000	0.2400	2.4000	
P1 Party wall - Ground floor	6.8000	0.3200	2.1760	
P2 Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	6.8000	0.4800	3.2640	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 24.7502 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 66.4350 (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	39.2848	39.1016	38.9219	38.0783	37.9204	37.1856	37.1856	37.0495	37.4686	37.9204	38.2397	38.5736	(38)
Heat transfer coeff	105.7198	105.5366	105.3569	104.5133	104.3554	103.6206	103.6206	103.4845	103.9037	104.3554	104.6748	105.0086	(39)
Average = Sum(39)m / 12 =												104.5125	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3396	1.3373	1.3350	1.3243	1.3223	1.3130	1.3130	1.3113	1.3166	1.3223	1.3263	1.3306	(40)
HLP (average)												1.3243	
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 2.4420 (42)
Hot water usage for mixer showers

97.7473	96.2783	94.1378	90.0422	87.0198	83.6492	81.7334	83.8577	86.1864	89.8054	93.9889	97.3728	(42a)

Hot water usage for baths

28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511	(42b)

Hot water usage for other uses

39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390	(42c)

Average daily hot water use (litres/day) 152.2512 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	165.5325	162.2042	158.0335	151.4112	146.1347	140.4215	138.0189	142.1692	146.5758	152.6004	159.3331	165.0629	(44)
Energy conte	262.1631	230.9766	242.8917	207.2744	196.7253	172.6646	166.9219	176.0352	180.7426	207.0773	226.9992	258.4486	(45)
Energy content (annual)											Total = Sum(45)m =	2528.9204	

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

39.3245	34.6465	36.4337	31.0912	29.5088	25.8997	25.0383	26.4053	27.1114	31.0616	34.0499	38.7673	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.0000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.5400 (55)
Total storage loss

16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(56)

If cylinder contains dedicated solar storage

16.7400	15.1200	16.7400	16.2000	16.7400	16.2000	16.7400	16.7400	16.2000	16.7400	16.2000	16.7400	(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

302.1655	267.1078	282.8941	245.9864	236.7277	211.3766	206.9243	216.0376	219.4546	247.0797	265.7112	298.4510	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

302.1655	267.1078	282.8941	245.9864	236.7277	211.3766	206.9243	216.0376	219.4546	247.0797	265.7112	298.4510	(64)
										Total per year (kWh/year) = Sum(64)m =	2999.9164	(64)
12Total per year (kWh/year)											3000	(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

119.1711	105.7047	112.7634	99.8883	97.4131	88.3806	87.5035	90.5336	91.0665	100.8551	106.4468	117.9361	(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	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.5233	122.3651	110.5233	114.2074	110.5233	114.2074	110.5233	110.5233	114.2074	110.5233	114.2074	110.5233	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.1685	219.4221	213.7433	201.6537	186.3928	172.0498	162.4677	160.2142	165.8930	177.9825	193.2434	207.5865	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	(71)
Water heating gains (Table 5)	160.1763	157.2986	151.5637	138.7338	130.9316	122.7508	117.6122	121.6850	126.4813	135.5580	147.8428	158.5162	(72)
Total internal gains	547.4988	558.7165	535.4610	514.2256	487.4784	468.6387	450.2339	452.0532	466.2124	483.6945	514.9244	536.2567	(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				4.5400	10.6334	0.7200	0.7000	0.7700				16.8613	(74)
East				1.4600	19.6403	0.7200	0.7000	0.7700				10.0153	(76)
South				8.3500	46.7521	0.7200	0.7000	0.7700				136.3487	(78)
South				0.9600	26.0000	0.7200	0.7000	1.0000				11.3219	(82)
Solar gains	174.5472	298.6336	413.2733	521.8151	594.7665	595.3632	571.9281	516.5086	450.5773	331.1992	209.2783	149.2549	(83)
Total gains	722.0460	857.3501	948.7343	1036.0408	1082.2449	1064.0019	1022.1620	968.5617	916.7897	814.8937	724.2026	685.5117	(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	44.6869	44.7645	44.8408	45.2028	45.2712	45.5922	45.5922	45.6522	45.4680	45.2712	45.1331	44.9896	
alpha	3.9791	3.9843	3.9894	4.0135	4.0181	4.0395	4.0395	4.0435	4.0312	4.0181	4.0089	3.9993	
util living area	0.9830	0.9664	0.9375	0.8715	0.7549	0.5850	0.4364	0.4769	0.6929	0.8967	0.9684	0.9859	(86)
Living	19.4504	19.7217	20.0625	20.4675	20.7739	20.9398	20.9855	20.9792	20.8795	20.4778	19.8909	19.3999	
Non living	18.4400	18.7063	19.0362	19.4185	19.6799	19.8041	19.8270	19.8262	19.7670	19.4395	18.8822	18.3955	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.2073	19.7217	20.0625	20.4675	20.7739	20.9398	20.9855	20.9792	20.8795	20.4778	19.8909	19.6237	(87)
Th 2	19.8100	19.8118	19.8135	19.8219	19.8234	19.8307	19.8307	19.8320	19.8279	19.8234	19.8203	19.8170	(88)
util rest of house	0.9782	0.9575	0.9207	0.8373	0.6932	0.4925	0.3251	0.3626	0.6041	0.8613	0.9583	0.9820	(89)
MIT 2	19.1091	18.7063	19.0362	19.4185	19.6799	19.8041	19.8270	19.8262	19.7670	19.4395	18.8822	18.5943	(90)
Living area fraction										fLA = Living area / (4) =		0.3833	(91)
MIT	19.5301	19.0955	19.4295	19.8206	20.0992	20.2394	20.2710	20.2682	20.1934	19.8375	19.2688	18.9889	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5301	19.0955	19.4295	19.8206	20.0992	20.2394	20.2710	20.2682	20.1934	19.8375	19.2688	18.9889	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9769	0.9507	0.9142	0.8373	0.7088	0.5261	0.3678	0.4064	0.6337	0.8618	0.9523	0.9784	(94)
Useful gains	705.3606	815.0530	867.3262	867.4699	767.1136	559.7521	375.9597	393.6249	580.9890	702.2542	689.6762	670.7170	(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	1610.1191	1498.1404	1362.2172	1141.3485	876.5030	584.3590	380.3957	400.2962	633.1303	963.9821	1273.7704	1552.9610	(97)
Space heating kWh	673.1403	459.0347	368.1989	197.1926	81.3857	0.0000	0.0000	0.0000	0.0000	194.7256	420.5479	656.3896	(98a)
Space heating requirement - total per year (kWh/year)												3050.6152	
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	673.1403	459.0347	368.1989	197.1926	81.3857	0.0000	0.0000	0.0000	0.0000	194.7256	420.5479	656.3896	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3050.6152	
Space heating per m2											(98c) / (4) =	38.6545	(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 %)												283.5898	(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	673.1403	459.0347	368.1989	197.1926	81.3857	0.0000	0.0000	0.0000	0.0000	194.7256	420.5479	656.3896	(98)
Space heating efficiency (main heating system 1)	283.5898	283.5898	283.5898	283.5898	283.5898	0.0000	0.0000	0.0000	0.0000	283.5898	283.5898	283.5898	(210)
Space heating fuel (main heating system)	237.3641	161.8658	129.8351	69.5344	28.6984	0.0000	0.0000	0.0000	0.0000	68.6645	148.2944	231.4574	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	302.1655	267.1078	282.8941	245.9864	236.7277	211.3766	206.9243	216.0376	219.4546	247.0797	265.7112	298.4510	(64)
Efficiency of water heater												275.7855	(216)
(217)m	275.7855	275.7855	275.7855	275.7855	275.7855	275.7855	275.7855	275.7855	275.7855	275.7855	275.7855	275.7855	(217)
Fuel for water heating, kWh/month	109.5654	96.8535	102.5776	89.1948	85.8376	76.6453	75.0309	78.3354	79.5744	89.5913	96.3471	108.2185	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	29.5507	23.7067	21.3453	15.6384	12.0796	9.8691	11.0194	14.3234	18.6047	24.4104	27.5715	30.3720	(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	1075.7142	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	275.7855	
Water heating fuel used	1087.7717	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	0.0000	(231)
Electricity for lighting (calculated in Appendix L)	238.4914	(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	2401.9773	(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	1075.7142	0.1558	167.6436	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1087.7717	0.1411	153.5155	(264)
Space and water heating			321.1591	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	238.4914	0.1443	34.4217	(268)
Total CO2, kg/year			355.5808	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.5100	(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	1075.7142	1.5769	1696.3250	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1087.7717	1.5219	1655.4288	(278)
Space and water heating			3351.7538	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	238.4914	1.5338	365.8061	(282)
Total Primary energy kWh/year			3717.5598	(286)
Dwelling Primary energy Rate (DPER)			47.1100	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	38.2900 (1b)	x	2.5000 (2b)	=	95.7250	(1b) - (3b)
First floor	40.6300 (1c)	x	2.8000 (2c)	=	113.7640	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	209.4890	(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) =	0.1432	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3932	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3342	(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													

	0.4261	0.4178	0.4094	0.3676	0.3593	0.3175	0.3175	0.3092	0.3342	0.3593	0.3760	0.3927	(22b)
Effective ac	0.5908	0.5873	0.5838	0.5676	0.5645	0.5504	0.5504	0.5478	0.5559	0.5645	0.5707	0.5771	(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			2.4000	1.0000	2.4000			(26)
TER Opening Type (Uw = 1.20)			14.3500	1.1450	16.4313			(27)
rl			0.9600	2.0221	1.9412			(27a)
ground floor			38.2900	0.1300	4.9777			(28a)
exposed upper			8.0000	0.1300	1.0400			(28b)
External Wall 1	106.0000	16.7500	89.2500	0.1800	16.0650			(29a)
main flat roof	40.6300		40.6300	0.1100	4.4693			(30)
lower terrace	3.2000	0.9600	2.2400	0.1100	0.2464			(30)
Total net area of external elements Aum(A, m2)			196.1200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.5709			(33)
Party Wall 1			34.9800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 215.5025 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.6000	0.0500	0.5800
E3 Sill	10.6000	0.0500	0.5300
E4 Jamb	23.9600	0.0500	1.1980
R11 Upstands or kerbs of rooflights	4.0000	0.0800	0.3200
E5 Ground floor (normal)	20.0000	0.1600	3.2000
E6 Intermediate floor within a dwelling	7.9400	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	5.0000	0.2400	1.2000
E15 Flat roof with parapet	20.0000	0.5600	11.2000
E21 Exposed floor (inverted)	6.8000	0.3200	2.1760
E20 Exposed floor (normal)	7.5000	0.3200	2.4000
E16 Corner (normal)	17.5000	0.0900	1.5750
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0900	-0.6750
E18 Party wall between dwellings	10.0000	0.0600	0.6000
P1 Party wall - Ground floor	6.8000	0.0800	0.5440
P2 Party wall - Intermediate floor within a dwelling	6.8000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.8000	0.1200	0.8160

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 25.6640 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 73.2349 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.8426	40.5988	40.3599	39.2377	39.0278	38.0504	38.0504	37.8694	38.4269	39.0278	39.4525	39.8966	(38)
Heat transfer coeff	114.0774	113.8337	113.5948	112.4726	112.2627	111.2853	111.2853	111.1043	111.6618	112.2627	112.6874	113.1314	(39)
Average = Sum(39)m / 12 =												112.4716	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4455	1.4424	1.4394	1.4251	1.4225	1.4101	1.4101	1.4078	1.4149	1.4225	1.4279	1.4335	(40)
HLP (average)												1.4251	
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 2.4420 (42)

Hot water usage for mixer showers

65.1648	64.1855	62.7585	60.0281	58.0132	55.7661	54.4889	55.9052	57.4576	59.8703	62.6593	64.9152	(42a)

Hot water usage for baths

28.1462	27.7282	27.1396	26.0542	25.2415	24.3404	23.8536	24.4381	25.0746	26.0388	27.1466	28.0511	(42b)

Hot water usage for other uses

39.6390	38.1976	36.7562	35.3148	33.8734	32.4319	32.4319	33.8734	35.3148	36.7562	38.1976	39.6390	(42c)

Average daily hot water use (litres/day) 122.2113 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.9501	130.1114	126.6543	121.3971	117.1281	112.5384	110.7745	114.2166	117.8470	122.6653	128.0034	132.6053	(44)
Energy conte	210.5605	185.2769	194.6629	166.1866	157.6769	138.3791	133.9721	141.4240	145.3171	166.4556	182.3644	207.6278	(45)
Energy content (annual)										Total = Sum(45)m =		2029.9040	
Distribution loss (46)m = 0.15 x (45)m	31.5841	27.7915	29.1994	24.9280	23.6515	20.7569	20.0958	21.2136	21.7976	24.9683	27.3547	31.1442	(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

257.1554	227.3626	241.2578	211.2784	204.2718	183.4710	180.5670	188.0190	190.4089	213.0505	227.4562	254.2227	(62)
WWHRS -29.7906	-26.3471	-27.5892	-22.8449	-21.2906	-18.2185	-17.0770	-18.1597	-18.8496	-22.2216	-25.1744	-29.2390	(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

227.3647	201.0155	213.6687	188.4335	182.9812	165.2524	163.4900	169.8593	171.5593	190.8289	202.2818	224.9838	(64)

Total per year (kWh/year) = Sum(64)m = 2301.7192 (64)

12Total per year (kWh/year) 2302 (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

107.2873	95.2731	102.0013	91.3305	89.7035	82.0845	81.8216	84.2994	84.3914	92.6224	96.7096	106.3122	(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	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	122.1025	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	110.5233	122.3651	110.5233	114.2074	110.5233	114.2074	110.5233	110.5233	114.2074	110.5233	114.2074	110.5233	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	217.1685	219.4221	213.7433	201.6537	186.3928	172.0498	162.4677	160.2142	165.8930	177.9825	193.2434	207.5865	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	35.2102	(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)													
	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	-97.6820	(71)
Water heating gains (Table 5)													
	144.2033	141.7755	137.0986	126.8479	120.5692	114.0063	109.9753	113.3057	117.2103	124.4925	134.3189	142.8927	(72)
Total internal gains													
	534.5259	546.1934	523.9958	505.3398	480.1161	459.8942	442.5971	443.6739	456.9414	475.6291	504.4005	523.6332	(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	4.5400	10.6334	0.6300	0.7000	0.7700	14.7537	(74)
East	1.4600	19.6403	0.6300	0.7000	0.7700	8.7634	(76)
South	8.3500	46.7521	0.6300	0.7000	0.7700	119.3051	(78)
South	0.9600	26.0000	0.6300	0.7000	1.0000	9.9066	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	152.7288	261.3044	361.6142	456.5883	520.4207	520.9428	500.4371	451.9450	394.2552	289.7993	183.1185	130.5981	(83)
Total gains	687.2547	807.4977	885.6100	961.9280	1000.5367	980.8370	943.0341	895.6189	851.1966	765.4283	687.5190	654.2313	(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	41.4131	41.5017	41.5890	42.0040	42.0825	42.4521	42.4521	42.5213	42.3090	42.0825	41.9239	41.7593	
alpha	3.7609	3.7668	3.7726	3.8003	3.8055	3.8301	3.8301	3.8348	3.8206	3.8055	3.7949	3.7840	
util living area													
	0.9861	0.9740	0.9531	0.9033	0.8084	0.6519	0.4981	0.5401	0.7514	0.9205	0.9749	0.9883	(86)
MIT	19.2353	19.4948	19.8440	20.2898	20.6603	20.8947	20.9711	20.9604	20.8107	20.3314	19.7072	19.1929	(87)
Th 2	19.7286	19.7310	19.7333	19.7441	19.7461	19.7556	19.7556	19.7574	19.7519	19.7461	19.7420	19.7377	(88)
util rest of house													
	0.9821	0.9666	0.9393	0.8739	0.7496	0.5513	0.3670	0.4079	0.6614	0.8899	0.9664	0.9850	(89)
MIT 2	17.7266	18.0553	18.4932	19.0421	19.4621	19.6943	19.7462	19.7431	19.6255	19.1057	18.3348	17.6788	(90)
Living area fraction									fLA = Living area / (4) =			0.3833	(91)
MIT	18.3049	18.6070	19.0110	19.5204	19.9214	20.1544	20.2157	20.2097	20.0798	19.5755	18.8608	18.2592	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3049	18.6070	19.0110	19.5204	19.9214	20.1544	20.2157	20.2097	20.0798	19.5755	18.8608	18.2592	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9757	0.9578	0.9293	0.8677	0.7588	0.5857	0.4172	0.4581	0.6875	0.8848	0.9583	0.9793	(94)
Useful gains	670.5468	773.4363	823.0220	834.6797	759.2197	574.4280	393.3916	410.3212	585.1795	677.2771	658.8732	640.6809	(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													
	1597.6436	1560.3233	1421.1816	1194.4994	922.9571	618.1203	402.3747	423.2714	667.7107	1007.6162	1325.2966	1590.5320	(97)
Space heating kWh													
	689.7601	528.7881	445.0308	259.0701	121.8206	0.0000	0.0000	0.0000	0.0000	245.7723	479.8248	706.6892	(98a)
Space heating requirement - total per year (kWh/year)												3476.7560	
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													
	689.7601	528.7881	445.0308	259.0701	121.8206	0.0000	0.0000	0.0000	0.0000	245.7723	479.8248	706.6892	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3476.7560	
Space heating per m2											(98c) / (4) =	44.0542	(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													
	689.7601	528.7881	445.0308	259.0701	121.8206	0.0000	0.0000	0.0000	0.0000	245.7723	479.8248	706.6892	(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)													
	747.3023	572.9015	482.1568	280.6827	131.9833	0.0000	0.0000	0.0000	0.0000	266.2755	519.8536	765.6438	(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													
	227.3647	201.0155	213.6687	188.4335	182.9812	165.2524	163.4900	169.8593	171.5593	190.8289	202.2818	224.9838	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.3847	86.1246	85.6660	84.7741	83.1689	79.8000	79.8000	79.8000	79.8000	84.6283	85.9261	86.4457	(217)

Fuel for water heating, kWh/month

	263.2002	233.4008	249.4207	222.2773	220.0114	207.0832	204.8747	212.8563	214.9866	225.4907	235.4137	260.2604 (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	22.9646	18.4230	16.5879	12.1530	9.3873	7.6695	8.5634	11.1311	14.4582	18.9699	21.4264	23.6028 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-35.9499	-50.7499	-73.0501	-82.2590	-88.8095	-82.9322	-81.8986	-77.2537	-69.0866	-58.0731	-39.5426	-31.0721 (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	-20.1142	-42.3348	-84.1836	-126.4992	-167.3255	-168.1481	-166.1781	-140.6845	-103.0877	-60.5752	-26.8659	-15.9051 (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	3766.7995 (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	2749.2760 (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)	185.3371 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1892.5792 (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	4894.8334 (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	3766.7995	0.2100	791.0279	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2749.2760	0.2100	577.3479	(264)
Space and water heating			1368.3759	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	185.3371	0.1443	26.7499	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-770.6773	0.1346	-103.6996	
PV Unit electricity exported	-1121.9019	0.1259	-141.2259	
Total			-244.9255	(269)
Total CO2, kg/year			1162.1295	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.7300	(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	3766.7995	1.1300	4256.4835	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2749.2760	1.1300	3106.6818	(278)
Space and water heating			7363.1653	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	185.3371	1.5338	284.2762	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-770.6773	1.4973	-1153.9322	
PV Unit electricity exported	-1121.9019	0.4621	-518.3953	
Total			-1672.3275	(283)
Total Primary energy kWh/year			6105.2148	(286)
Target Primary Energy Rate (TPER)			77.3600	(287)

Appendix 4

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

High Street Hornsey - BE LEAN

As designed

Date: Mon Apr 24 11:51:41 2023

Administrative information

Building Details

Address: Commercial Areas, London, N8

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.20

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.20

BRUKL compliance module version: v6.1.e.1

Certifier details

Name: NRG Consulting Ltd

Telephone number:

Address: , ,

Foundation area [m^2]: 100.81

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	3.85	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	3.55	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	40.81	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	38.3	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.17	0.17	01000000:Surf[1]
Floors	0.18	0.1	0.1	01000000:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	-	-	No flat roofs in building
Windows** and roof windows	1.6	1.23	1.23	01000000:Surf[3]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	-	-	No personnel doors in building
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]

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

** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m^2K

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

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

Building services

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

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

1- VRF Heating and Cooling

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	2.64	5.5	0	-	0.85
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

"No HWS in project, or hot water is provided by HVAC system"

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

Shell and core configuration

Zone	**Assumed shell?**
0/1 commercial unit 1	NO
0/2 commercial unit 2	NO

General lighting and display lighting	**General luminaire**	**Display light source**	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
0/1 commercial unit 1	105	-	-
0/2 commercial unit 2	105	-	-

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

Zone	**Solar gain limit exceeded? (%)**	**Internal blinds used?**
0/1 commercial unit 1	NO (-19.6%)	NO
0/2 commercial unit 2	NO (-38.4%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	100.8	100.8
External area [m^2]	183.9	183.9
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	47.98	70.78
Average U-value [W/m^2K]	0.26	0.38
Alpha value* [%]	25	10

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

Building Use

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

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	7.79	12.13
Cooling	6.81	2.72
Auxiliary	0	0
Lighting	7.53	9.67
Hot water	3.04	2.74
Equipment*	42.19	42.19
TOTAL**	**25.17**	**27.26**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	164.77	166.7
Primary energy [kWh_{PE}/m^2]	38.3	40.81
Total emissions [kg/m^2]	3.55	3.85

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	69	95.8	7.8	6.8	0	2.46	3.91	2.64	5.5
	Notional	121.3	45.4	12.1	2.7	0	2.78	4.63	----	----

Key to terms

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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

High Street Hornsey - Be Green

As designed

Date: Mon Apr 24 12:03:47 2023

Administrative information

Building Details

Address: Commercial Areas, London, N8

Certifier details

Name: NRG Consulting Ltd

Telephone number:

Address: , ,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.20

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.20

BRUKL compliance module version: v6.1.e.1

Foundation area [m^2]: 100.81

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	3.85	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	3.04	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	40.81	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	33.2	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.17	0.17	01000000:Surf[1]
Floors	0.18	0.1	0.1	01000000:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	-	-	No flat roofs in building
Windows** and roof windows	1.6	1.23	1.23	01000000:Surf[3]
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NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

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

Building services

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

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

1- VRF Heating and Cooling

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	4.5	5.5	0	-	0.85
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

"No HWS in project, or hot water is provided by HVAC system"

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

Shell and core configuration

Zone	**Assumed shell?**
0/1 commercial unit 1	NO
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General lighting and display lighting	**General luminaire**	**Display light source**	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
0/1 commercial unit 1	105	-	-
0/2 commercial unit 2	105	-	-

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

Zone	**Solar gain limit exceeded? (%)**	**Internal blinds used?**
0/1 commercial unit 1	NO (-19.6%)	NO
0/2 commercial unit 2	NO (-38.4%)	NO

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Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
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	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
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Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	4.57	12.13
Cooling	6.81	2.72
Auxiliary	0	0
Lighting	7.53	9.67
Hot water	3.04	2.74
Equipment*	42.19	42.19
TOTAL**	**21.95**	**27.26**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	164.77	166.7
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Total emissions [kg/m^2]	3.04	3.85

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
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	Actual	69	95.8	4.6	6.8	0	4.19	3.91	4.5	5.5
	Notional	121.3	45.4	12.1	2.7	0	2.78	4.63	----	----

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