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Project:	Tebby & Son Garage, Highland Square
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1. Executive Summary

This Sustainability and Energy Statement demonstrates how the proposed development of 5 apartments and one 4-bedroom house of multiple occupation (HMO) on land at Tebby and Son Garage, Highland Square, Bristol will comply with the following Bristol City Council (BCC) Policies:

- BCS13 Climate Change
- BCS14 Sustainable Energy (from the Development Framework Core Strategy)
- BCS15 Sustainable Design and Construction
- BCS16 Flood Risk and Water Management

This statement contains the results of the energy modelling, showing how the proposed development will meet BCC policy requirements to reduce carbon emissions by at least 20% over the building regulation requirements. This is achieved through the use of renewable energy. The energy strategy in this statement has been produced in line with the Energy Hierarchy:

- Be "Lean" reduce energy demand.
- Be "Clean" supply energy efficiently.
- Be "Green" use renewable energy.

The SAP calculations have been completed in line with Part L (Volume 1, 2021) of the Building Regulations and the requirements of the SGC to demonstrate a 20% reduction in regulated carbon emissions using the above energy hierarchy.

SAP calculations were conducted to adhere to the requirements of Part L (Volume 1, 2021) utilizing SAP10, which established baseline values for energy demand, primary energy rate, and emissions. Then, additional measures were applied to provide 'residual' energy demand, primary energy rate and emissions. Finally, appropriate decentralised renewables were included in the calculations to provide the final energy demand and emissions figures for comparison. More detail is provided in the following sections.

The baseline calculation uses a Gas Combi Boiler for heating and hot water in the baseline building - this is an appropriate selection for a baseline calculation as it represents a common heating method for domestic buildings in the area and is included in the notional building specification.

To summarise the results, the total reduction in carbon emissions for the proposed development is as follows:

Summary of total reduction in carbon emissions

	Before Renewables	After Renewables (PV)
Baseline Target Emission Rate (TER)	5,030.90	
Residual Building Emission Rate (DER)	1,946	1,291.44
Total CO ₂ Saving on residual energy	61.32%	74.34%
Result	PA	SS



2. Planning Policy Context

National Policy Context

National Planning Policy Framework – Encourages the adoption of sustainable development through encouraging local authorities to adopt strategies, policies and targets that mitigate and adapt to climate change. It also recommends the move to low carbon technologies by planning new development in ways to reduce greenhouse gas emissions and adhere to standards established in the Government's zero carbon buildings policy.

The government energy policy sets targets for the UK to cut carbon dioxide emissions and become net zero by 2050, as well as setting national targets for the generation of electricity from clean and renewable sources.

Regional & Local Policy Context

Local Policy requirements are set out in both South Gloucestershire Local Plan and Core Strategy.

Policy BCS13

Development should contribute to both mitigating and adapting to climate change, and to meeting targets to reduce carbon dioxide emissions.

Developments should mitigate climate change through measures including:

- High standards of energy efficiency, including optimal levels of thermal insulation, passive ventilation and cooling, passive solar design, and the efficient use of natural resources in new buildings.
- The use of decentralised, renewable and low-carbon energy supply systems.
- Patterns of development which encourage walking, cycling and the use of public transport instead of
 journeys by private car.

Development should adapt to climate change through measures including:

- Site layouts and approaches to design and construction that provide resilience to climate change.
- Measures to conserve water supplies and minimise the risk and impact of flooding.
- · The use of green infrastructure to minimise and mitigate the heating of the urban environment.
- Avoiding responses to climate impacts which lead to increases in energy use and carbon dioxide emissions.

These measures should be integrated into the design of new development.

The new development should demonstrate through this sustainability statement how it would contribute to mitigating and adapting to climate change, and to meeting targets to reduce carbon dioxide emissions by means of the above measures.

Policy BCS14

Proposals for the utilisation, distribution, and development of renewable and low carbon sources of energy, including large-scale freestanding installations, will be encouraged. In assessing such proposals, the environmental and economic benefits of the proposed development will be afforded significant weight, alongside considerations of public health and safety and impacts on biodiversity, landscape character, the historic environment and the residential amenity of the surrounding area.



The development in Bristol should include measures to reduce carbon dioxide emissions arising from energy usage in accordance with the following energy hierarchy:

- 1. Minimising energy requirements.
- Incorporating renewable energy sources.
- 3. Incorporating low-carbon energy sources.

Consistent with stage two of the above energy hierarchy, the development will be expected to use sufficient renewable energy sources to reduce carbon dioxide emissions arising from residual energy use by at least 20%. An exception will only be made in the case where a development is necessary, but where it is demonstrated that meeting the required standard would not be feasible.

The use of combined heat and power (CHP), combined cooling, heat and power (CCHP), and district heating will be encouraged. Within heat priority areas, major developments will be expected to incorporate, where feasible, infrastructure for district heating, and will be expected to connect to existing systems where available.

The new development will be expected to demonstrate that the heating and cooling systems have been selected according to the following heat hierarchy:

- 1. Connection to existing CHP/CCHP distribution networks
- 2. Site-wide renewable CHP/CCHP
- 3. Site-wide gas-fired CHP/CCHP
- 4. Site-wide renewable community heating/cooling
- 5. Site-wide gas-fired community heating

Policy BCS15

Sustainable design and construction will be integral to the new development in Bristol. In delivering sustainable design and construction, developments should address the following key issues:

- · Maximising energy efficiency and integrating the use of renewable and low carbon energy
- Waste and recycling during construction and in operation
- · Conserving water resources and minimising vulnerability to flooding
- The type, life cycle and source of materials used during construction
- Flexibility and adaptability, allowing future modification of use or layout to facilitate future refurbishment and retrofitting
- Opportunities to incorporate measures which enhance the biodiversity value of the development, such as green roofs.

The new development will be required to demonstrate (as part of the sustainability statement submitted with the planning application) how the above issues have been addressed. For major developments and developments used in healthcare or education, the sustainability statement should include a BREEAM and/or Code for Sustainable Homes assessment. Additionally, in the case of a super-major development, a BREEAM for Communities assessment will be required.

From 2016, residential development will be expected to meet Level 6 of the Code for Sustainable Homes. For non-residential development, also from 2016, a BREEAM "Excellent" rating will be expected.



All new development will be required to provide satisfactory arrangements for the storage of refuse and recyclable materials as an integral part of its design. Major developments should include communal facilities for waste collection and recycling where appropriate.

New homes and workplaces should allow for high-speed broadband access and facilitate access to Next Generation broadband.

Developments in Bristol follow a sequential approach to flood risk management, giving priority to the development of sites with the lowest risk of flooding. The development of sites with a greater risk of flooding will be considered where essential for regeneration, or where necessary to meet the development requirements of the city.

Development in areas at risk of flooding will be expected to:

- Be resilient to flooding through design and layout, and/or;
- Incorporate sensitively designed mitigation measures, which may take the form of on-site flood defence works and a commitment to undertaking off-site measures (where they are necessary) to ensure that the development remains safe from flooding over its lifetime.

All developments will also be expected to incorporate water management measures to reduce surface water run-off and ensure that it does not increase flood risks elsewhere. This should include the use of sustainable drainage systems (SUDS).

3. Design Principles to Reduce Energy Consumption and Carbon Emissions

The energy strategy for the proposed development has been formulated in line with the energy hierarchy. It uses the following approaches to optimise energy usage, supply clean and renewable energy, and reduce embedded carbon emissions while meeting local requirements (figure 1).

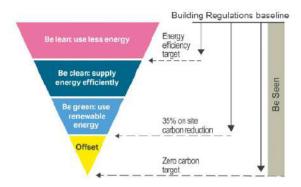


Figure 1: The Energy Hierarchy

Be "Lean" - Use less energy

The proposed development has been designed with the use of efficient fabric specifications, integrating efficiency into the thermal envelope of the building. The proposed thermal elements meet or go beyond the minimum requirements set out in Approved Document L Volume 1 (2021) for new fabric elements.

Target U-values have been specified to achieve or go beyond the U-values found in the national dwelling specification. When possible, the national dwelling values are much lower than the limiting factors (maximum allowed U-values) to create the target rates used in the SAP calculation.

The fabric elements and fenestration have been specified using calculated U-values for the intended construction specification for the building. This includes:

- External walls that achieve a U-value of at least 0.18 W/m²k.
- A ground floor that achieves a U-value of at least 0.13 W/m²k.
- An exposed floor that achieves a U-value of at least 0.18 W/m²k.
- A flat roof that achieves a U-value of at least 0.11 W/m²k.

Careful consideration will be given to the fenestration. Double glazing with low window U-values of 1.31 W/m²k will be utilised to limit heat loss through openings. The glazing design also allows for passive heating into the building. However, to minimise the risk of overheating, the glazing will be openable where practical.

Good detailing will help to limit heat losses through the fabric of the proposed development. Where available, all non-repeating thermal bridges (e.g. between the external walls and the roofs) will be specified to enhanced construction details that represent the best practice for the proposed construction. Alternatively, some details will be calculated with target values for the thermal bridging set. This will ensure that heat losses through these junctions are minimised, and the psi values can be utilised in the SAP calculations.

The studio flats will be naturally ventilated, with intermittent extractor fans in the bathrooms and a cooker hood in the kitchens. This will reduce the energy demand of active ventilation systems. The proposed building layout has been determined by several factors, such as ownership and site boundaries, relationship to adjacent



buildings and site access, as well as internal walls arrangements. The internal room layouts within the resultant footprint have been designed with consideration of recommended zoning and room orientations.

The dwellings will have designed air permeability of below $4.5 \text{ m}^3/\text{hr/m}^2$. This is below the requirements of the building regulations $8 \text{ m}^3/\text{hr/m}^2$ and notional value of $5 \text{ m}^3/\text{hr/m}^2$.

The design of the dwelling optimises the use of natural lighting, and it is proposed that only energy efficient lighting is installed at the property. This means that all light fittings should have bulbs with a luminous efficacy of greater than 80 lamp lumens per circuit-watt.

The proposed building has been designed to allow for cross ventilation where possible, in order to minimise the need for additional mechanical methods of cooling. Windows have been sized and positioned to allow for good internal natural light and allow for solar gains during winter months. Windows will also have a large free opening area to help ensure that the risk of summer overheating is reduced.

Be "Clean" - Supply energy efficiently

The energy that is used in the development has been considered for its efficiency. Local policy supports the connection of proposed developments to heat networks. Local heat and power sources minimise distribution losses and achieve greater efficiency when compared to separate localised energy systems.

This section shows the consideration given to the connection of the dwelling to any existing or planned district heating networks in the proximity of the site. There are no existing district heating systems near the development site. The development is not major (under 100 dwellings). This means the use of district heating networks, or a CHP system, would not be selected due to the unnecessary added complexity. This project is also aiming to use very efficient fabric in order to reduce the heating demand and use efficient services to reduce water demand. Therefore, the expected demand for heating and hot water would potentially not be significant enough for CHP systems.

Be "Green" - Renewable energy

Low carbon energy generation and renewable technologies have been assessed for the proposed development, with some considered appropriate. See section 6 for further details regarding the feasibility of each assessed technologies.

Based upon the feasibility matrix an air source heat pump (ASHP) and solar PV are deemed appropriate. The solar PV will be used to achieve the 20% reduction over Part L requirements.



4. Sustainable Design and Construction

Energy Efficiency

The proposed building fabric makes use of high-performance insulation materials. The U-values of the building fabric have been calculated and used in the assessment of the dwelling. The achieved U-values are lower than the limiting factors permitted by Part L, and are substantially less or equal to the U-values used in the notional building.

The proposed dwellings would have the potential to achieve a 69.66% total reduction in CO₂ over the baseline Building Regulation measures if low carbon technologies and energy efficiency improvements are used.

Decentralised, Renewable and Low-Carbon Energy Supply Systems

The proposal for the dwelling makes use of two low carbon systems, including an electric air source heat pump for heating and water heating. Solar PV is also proposed to be added to the building to provide onsite renewable generation. This reduces the associated carbon emissions of the development, with solar used to offset the increase in electricity consumption on site.

Avoiding Responses to Climate Impacts that Lead to Increases in Energy Use and CO₂ Emissions

There are no proposals to include artificial cooling. The proposed building has been designed to allow for cross ventilation where possible. Windows have been sized and positioned to allow for good internal natural light, and allow for solar gains during winter months. The building will also include appropriate internal shading, such as blinds and curtains, will be used to mitigate overheating from the sun. The design of the building also includes some external features to provide shading.

Encouraging Greener Transport Use

The proposal will include provision for secure cycle storage of 9 bikes. The nearest bus stops are located on Whiteladies Road with buses towards the City Centre, Temple Meads, Long Ashton, Cribbs Causeway and Southmead. The nearest train station is Clifton Down.

The nearest supermarket and many more local services, shops and restaurants can be found along Whiteladies Road. The area also has excellent leisure and exercise facilities nearby, with the Downs being a short walk from the proposed site.

Waste and Recycling - During Construction

A site waste management plan (SWMP) will be developed for this project. Waste groups to be monitored will be identified, and targets will be set to identify how waste can be reduced, reused, recycled, or diverted from landfills. Unavoidable waste will be disposed of responsibly.

Waste and Recycling - In Operation

Adequate waste and recycling storage will be provided in the blocks of studio flats. The internal provisions will comply with the local councils recycling and waste collection requirements, so recyclables and waste can be separated before collection.



Building Materials - Type, Life Cycle and Source

Where feasible, local suppliers of materials will be selected to minimise the environmental impact of transportation. Materials will be purchased from sources that minimise carbon emissions and utilise sustainable sources in line with the developers' Environmental policy.

Only suppliers with a certified chain of custody from the Forest Stewardship Council (FSC) or the Programme for the Endorsement of Forest Certification (PEFC) will be used to supply materials. 100% of the timber used will be legally sourced. Material will be sourced from suppliers with an EMS certificate or equivalent.

Pollution

An appropriate construction management plan will be prepared to address issues regarding water, waste, noise, vibration, dust, emissions, odours, and ground contamination. The development makes use of natural building materials for the structure of the dwelling. It will also include renewable technologies and nontoxic paints, producing limited impact on air pollution in the local area. The development will also incorporate lighting measures to prevent light pollution.

5. Water Management

Water Conservation Measures

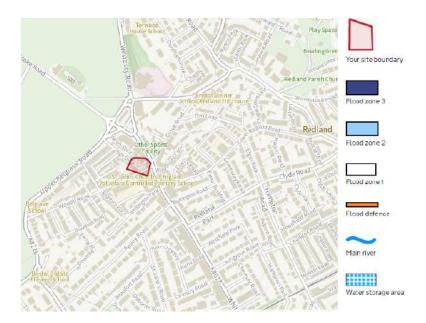
Internal portable water will be conserved by installing flow restrictors to taps, showers and dual flush toilets. The following schedule provides a suggested specification which has been proven to exceed building regulations requirements for water conservation (Regulation 36 Compliance).

Table 1 - Water Consumption

Area	Flow Rate/Capacity	
Toilet	Dual Flush 6 and 2.6 Liters	
Basin Taps	1.7 Litres / Minute	
Shower	8 Litres / Minute	
Kitchen Taps 4 Litres / Minute		
Total Water Consumption Litres/person/day		

Surface Water Management

The site lies within Flood Zone 1 according to the Bristol City Strategic Flood Risk Assessment.



Surface water runoff will be managed through a sustainable urban drainage system (SUDs).

6. Selecting Renewables

Table 1 – Feasibility Matrix of Appropriate Renewables

Showing the considerations in choosing a renewable technology for this site.

Solar PV	Water Source Heat Pump
The available installation area and the orientation around the dwelling make Solar PV a suitable renewable option for the scheme.	Not possible in this location.
Solar Thermal	Biomass
The hot water demand and installation area would make it possible to use solar thermal. However, to reach the 20% reduction in carbon emissions, a significant number of panels would be required. Therefore, it is more space efficient to use solar PV to reach the 20% reduction.	The proximity of residential dwellings could have an impact on the local air quality. There is not a suitable area for storage to the building.
Air Source Heat Pump	Combined Heat & Power (CHP)
An air source heat pump has been deemed appropriate based on the requirement for space for individual heat pumps on the flat roof/terrace of the buildings.	CHP requires a significant electricity demand, which this development does not provide. This makes CHP unviable, unless a site-wide community heating system is proposed.

 The development is within proximity to residential properties, so wind is not suitable for this site.

District Heating

The property is not within an existing district heat network, or in proximity to any planned heat network.



Table 2 – Feasibility Matrix of Appropriate Renewables

Showing the considerations in choosing a renewable technology for this site.

Technology	Requirements	Requirements Met?	Appropriate?	
	Roof facing east to west (through south)	Yes		
Photovoltaic panels	Little/no or modest over shading	Yes	Yes – Selected	
Photovoitaic paneis	Flat roof or pitched roof not greater than 45°	Yes	res – Selecteu	
	Any size development	Yes		
Solar thermal	All requirements for photovoltaic panels	Yes	No – Area used for	
	Hot water tank	Yes	water heating	
	Suitable external wall or other location on-site for equipment	Yes		
Air source heat pumps	Aesthetic considerations	Yes	Yes – Selected	
	Noise impact	Yes		
	Any size development	Yes		
	External space for horizontal trench or vertical borehole	Yes		
Ground source heat pumps	Medium to large sized development	Yes	Would require further investigation	
	Archaeology	Unknown	_	
	Best suited to underfloor heating	No		
	Space needed for plant, fuel storage and deliveries	Yes	No - Air pollution,	
Biomass	Medium to large sized development	No	storage size and delivery location	
	Minimal impact on residents (air quality, deliveries)	No	insufficient	
Combined heat and	Space need for plant access and servicing	Yes	No (development	
power	Large sized development (large heat demand)	No	intended to have low heat demand)	
	Available network	No		
District heating	Very large sized development (Substantial heat demand)	No	No	

Heat Hierarchy

Table 3 – Following the Heat Hierarchy

Showing how the heat hierarchy can be applied to this site.

Stage	Feasible	Notes
 Connection to existing CHP/CCHP distribution networks 	No	No network available
2. Site-wide renewable CHP/CCHP	No	No network available
3. Site-wide gas-fired CHP/CCHP	No	No network available
4. Site-wide renewable community heating/cooling	Yes	No network available
5. Site-wide gas-fired community heating/cooling	Yes	No network available
6. Individual building renewable heating	Yes	Air Source Heat Pumps

Feasibility of Appropriate Renewables – Conclusion

The location, size, and type of this development render some renewable technologies appropriate.

Table 4 – Proposed Renewables

Showing renewables added to the specification to further reduce carbon emissions. This includes the use of an air source heat pump and solar PV. The table below shows the array size of the proposed solar PV installation.

Total Array Size	Direct/Landlord's Supply	Orientation	Inclination	Overshading
6.27 kWp	Landlords Supply	Southwest/South east/south	30	None or little

7. Baseline 'Threshold Values' Fabric and Services Specification

Table 5 – Baseline Compliance

Showing the minimum specification required to achieve compliance with Part L

Category	ltem	Reference/Source	Value/Details
	New Walls	L1	0.26
Building Fabric (W/m2K)	New Roofs	L1	0.16
	New Floor	L1	0.18
	Solid Door	L1	1.4
Fenestration (W/m²K)	Glazed Doors/Windows	L1	1.6
	Roof Lights	L1	2.2
Thermal Bridging (y-value)	Accredited and Enhanced Construction Details	Default	Default
Ventilation	Air Permeability (m³/hm²)	Assumed	8
	Mechanical Ventilation	Assumed	n/a
	Primary Heating	Assumed	n/a
	Controls	Assumed	n/a
Heating	Heat Distribution	Assumed	n/a
	Water Heating	Assumed	n/a
	Secondary Heating	Assumed	None
	Low Energy Lighting (%)	Assumed	n/a
	SAP Appendix Q	Assumed	None
Additional Features	Renewables	Assumed	None
Additional Features	Regulation 36 Compliance (litres/person/day)	Assumed	125

8. Proposed Fabric and Services Specification

Table 6 – Baseline Compliance (Domestic)

Showing the proposed specification that goes above compliance with Part L

Category	ltem	Reference/Source	Value/Details
	New Walls	L1	0.18
Building Fabric (W/m2K)	New Roofs	L1	0.11
	New Floor	L1	0.13/0.20
F	Solid Door	L1	1.31
Fenestration (W/m²K)	Glazed Doors/Windows	L1	1.31
Thermal Bridging (y-value)	Accredited and Enhanced Construction Details	Assumed	Enhanced & Calculated Targets
Ventilation	Air Permeability (m³/hm²)	Assumed	4.5
	Mechanical Ventilation	Assumed	n/a
	Primary Heating	Assumed	ASHP
	Controls	Assumed	Time & Temperature Zonal Control
Heating	Heat Distribution	Assumed	n/a
	Water Heating	Assumed	From Main Heating
	Secondary Heating	Assumed	None
	Low Energy Lighting (%)	Assumed	100
	SAP Appendix Q	Assumed	None
	Renewables	Assumed	Solar PV
Additional Features	Waste Water Heat recovery	Assumed	None
	Regulation 36 Compliance (litres/person/day)	Assumed	125

9. Conclusion

Table 7 – Summary Table Domestic

	Building Regulations Part L1b compliance ("Baseline" energy demand and emissions)		Be 'Green' Proposed scheme after on-site renewables	Total savings on residual emissions
Energy demand (kWh pa)	15,130.77	14,394.21		
Energy saving achieved (%)		4.87%		
Regulated CO2 emissions (kg pa)	5,030.901	1,946	1,291.44	
Saving achieved on residual CO2 emissions (%)		61.32%	33.64%	74.34%
Dwelling Primary Energy Rate (kWh pa)	26,495.19	20,396.04	15,028.05	
Energy saving achieved (%)		26.32%	43.28%	



Summary

This report demonstrates that the proposal will result in carbon emissions being reduced by up to 61.62% against Building Regulations Part L1, prior to taking account of the use of energy generation sources. With the renewable energy generation sources proposed within this development (photovoltaic panels) the carbon emissions will be reduced by up to a further 20.95%, culminating in a carbon emission reduction against building regulations of up to 69.66% across the site in total.

BCC Policy requires that all residential development will be required to reduce CO2 emissions over and above building regulations requirements by at least 20% via the use of renewable and/or low carbon energy generation sources. As demonstrated, these proposals will achieve at least 20% in accordance with this policy.



Appendix A – SAP Outputs

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Tue 05 Mar 2024 08:41:58

Project Information			
Assessed By		Building Type	Flat, Semi-detached
OCDEA Registration	EES/025661	Assessment Date	2024-03-05

Dwelling Details			
Assessment Type	As designed	Total Floor Area	43 m ²
Site Reference	Unit 1	Plot Reference	Residual
Address	Unit 1 Highland Square, Bristo	ol	

Client Details	
Name	Tebby & Son
Company	SF Tebby & Son
Address	Unit 11 Avon Gorge Industrial Estate , Bristol, BS2 9XX

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission	rate	
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	15.43 kgCO ₂ /m ²	
Dwelling carbon dioxide emission rate	5.54 kgCO ₂ /m ²	OK
1b Target primary energy rate and dwelling pri	mary energy	
Target primary energy	81.89 kWh _{PE} /m ²	
Dwelling primary energy	58.43 kWh _{PE} /m ²	OK
1c Target fabric energy efficiency and dwelling	fabric energy efficiency	
Target fabric energy efficiency	40.8 kWh/m ²	
Dwelling fabric energy efficiency	35.6 kWh/m ²	OK

2a Fabric U-values	2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m²K]	Dwelling average U-Value [W/m²K]	Element with highest individual U-Value		
External walls	0.26	0.18	Walls (1) (0.18)	OK	
Party walls	0.2	0	Party Wall (1) (0)	N/A	
Curtain walls	1.6	0	N/A	N/A	
Floors	0.18	0.12	Heatloss Floor 1 (0.12)	OK	
Roofs	0.16	N/A	N/A	N/A	
Windows, doors, and roof windows	1.6	1.31	W01 (1.31)	OK	
Rooflights	2.2	N/A	N/A	N/A	

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	Net area [m ²]	U-Value [W/m ² K]
Exposed wall: Walls (1)	32.13	0.18
Exposed wall: Walls (2)	5.27	0.18
Party wall: Party Wall (1)	32.92	0 (!)
Ground floor: Heatloss Floor 1, Heatloss Floor 1	43.39	0.12

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
W01, Windows	2.24	North East	0.7	1.31
W02, Windows	2.35	North East	0.7	1.31
W03, Windows	1.53	North East	0.7	1.31
W04, Windows	2.26	North East	0.7	1.31

		ed values are flagged with a subs		
Building part 1 -	Main Dwelling: Thermal bridging ca	alculated from linear thermal transmit	tances for eac	h junction
Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Not government-approved scheme	0.023 (!)	
External wall	E3: Sill	Calculated by person with suitable expertise	0.021 (!)	

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E4: Jamb	Calculated by person with suitable expertise	0.016 (!)	
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.047	Marmox Spec
External wall	E7: Party floor between dwellings (in blocks of flats)	Calculated by person with suitable expertise	0.038 (!)	
External wall	E22: Basement floor	Calculated by person with suitable expertise	-0.08	Marmox Spec
External wall	E19: Ground floor (inverted)	SAP table default	0.1	
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.093	
Party wall	P3: Intermediate floor between dwellings (in blocks of flats)	SAP table default	0 (!)	
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.043	
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.073	
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.046	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	$8 \text{ m}^3/\text{hm}^2$	
Dwelling air permeability at 50Pa	4.5 m ³ /hm ² , Design value	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Heat pump with	radiators or underfloor heating - Electricity
Efficiency	219.9%
Emitter type	Radiators
Flow temperature	55°C
System type	Heat Pump
Manufacturer	Atlantic
Model	Logic Air 8kW
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	150 litres
Declared heat loss	2.09 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 -	type: N/A
Efficiency	
Manufacturer	
Model	

6 Controls										
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services										
Function										
Ecodesign class										
Manufacturer										
Model										
Water heating - type: Cylinder thermosta	at and HW separately timed									
Manufacturer										
Model										

7 Lighting			
Minimum permitted light source efficacy	75 lm/W		
Lowest light source efficacy	80 lm/W		OK
External lights control	N/A		
8 Mechanical ventilation			
System type: N/A			
Maximum permitted specific fan power	N/A		
Specific fan power	N/A		N/A
Minimum permitted heat recovery	N/A		14/74
efficiency			
Heat recovery efficiency	N/A		N/A
Manufacturer/Model	1471		1471
Commissioning			
9 Local generation			
N/A			
10 Heat networks			
N/A			
11 Supporting documentary evidence			
N/A			
12 Declarations			
a. Assessor Declaration			
	enfirmation that the ac	Intents of this BREL Compliance Report	
		Interns of this BREE Compliance Report	
the purpose of carrying out the "As de			
evidence (SAP Conventions, Appendi			
documentary evidence required) has		•	
Compliance Report.	been reviewed in the	course or preparing this bitch	
Острианос Кероп.			
Signed:		Assessor ID:	
Name:		Date:	

b. Client Declaration

N/A



Property Reference	Uni	t 1								Issue	d on Date	05/	05/03/2024		
Assessment Reference	Re	sidual					Pro	р Туре	Ref	Tebby a	and Son G	on Garage			
Property	Uni	t 1, Highla	nd Square	, Bristol											
SAP Rating				83 B		DER		5.54	1		TER		15.43		
Environmental				97 A		% DER	≀ < TER						64.10		
CO ₂ Emissions (t/year)				0.22		DFEE 35.63				TFEE		40.78			
Compliance Check				See BREL		% DFE	E < TFE	E					12.64		
% DPER < TPER				28.65		DPER		58.4	43		TPER		81.89		
Assessor Details			<u> </u>								Assesso	r ID	U367-(0001	
Client															
SUMMARY FOR INPU	IT DATA F	OR: Nev	v Build (<i>l</i>	As Designe	ed)										
Orientation				Southwest											
Property Tenture				1											
Transaction Type				6											
Terrain Type				Urban											
1.0 Property Type				Flat, Semi-D	Detached										
Position of Flat				Ground-floo											
Which Floor				0											
2.0 Number of Storeys				1											
3.0 Date Built				2024											
3.0 Property Age Band				L											
4.0 Sheltered Sides				3											
5.0 Sunlight/Shade				Average or u	unknown										
6.0 Thermal Mass Parame	ter			Precise calc											
Thermal Mass				N/A							kJ/m²K				
7.0 Electricity Tariff				Standard											
Smart electricity meter f	itted			No											
Smart gas meter fitted				No											
7.0 Measurements					Basemen	t:	t Loss P o 0.00 n 21.33	n	er Ir	nternal FI 0.00 43.39	m²	Avera	0.00 2.50		
				1 2r 3 4 5 6	st Storey nd Storey rd Storey th Storey ith Storey ith Storey ith Storey ith Storey	r: r: r: r: r:	0.00 n 0.00 n 0.00 n 0.00 n 0.00 n 0.00 n	n n n n n		0.00 0.00 0.00 0.00 0.00 0.00 0.00	m ² m ² m ² m ² m ² m ²		0.00 0.00 0.00 0.00 0.00 0.00	m m m m m	
8.0 Living Area				20.51							m²				
9.0 External Walls Description	Туре	Constr	ruction				Kappa (kJ/m²K)		Nett Area	Shelter Res	Shelter	Open	ings Are	a Calculatio	
Cavity Wall	Cavity Wall		wall : plasterb avity, any outsi	oard on dabs, der	nse block,	0.18	150.00	40.51	32.13	0.00	None	8.3	8 En	er Gross Are	
Basement Wall	Cavity Wall	Cavity		oard on dabs, dei	nse block,	0.18	150.00	5.27	5.27	0.00	None	0.0	0 En	er Gross Are	
9.1 Party Walls															
Description	Type		Construc	tion						e Kappa () (kJ/m²K		Shelter Res	,	helter	
Party Wall 1	Filled C Edge S	avity with ealing	Single pla cavity	sterboard on	both side	s, dense	cellular	blocks,	0.00	70.00	32.92	0.00		None	
9.2 Internal Walls Description			Constructi	ion									(appa	Area (m	
Internal Wall 1			Dense bloo	k, dense plas	ter								J/m²K) 00.00	102.55	

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10.1 Party Ceilings Description		Constr								Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1		Precas	t cor	crete planks floor, scre	ed, carpeted					30.00	43.39
11.0 Heat Loss Floors Description	Туре	Storey Index		Construction	U- V a	lue	Shelter Code	Sh	elter Kap	pa Area (m²)	
Heatloss Floor 1	Ground Floor - Solid	•		Suspended concrete floor,	(W/m 0.1	²K)	None	Fa	ctor (kJ/r .00 75.	n²K)	
12.0 Opening Types											
Description	Data Source	Туре		Glazing	Glazing	Filling	G-value	Frame	Frame	U Value	
Windows	Manufacturer	Window		Double Low-E S	oft 0.05	Gap	Type Air Filled	0.63	Type Wood	Factor 0.70	(W/m²K) 1.31
13.0 Openings											
Name W01 W02 W03	Opening Ty Windows Windows Windows		Location Cavity Wall Cavity Wall Cavity Wall	Orient North North North	East East East	Area (2.2 2.3 1.5	4 5 3	P	itch 0 0 0		
W04	Windows			Cavity Wall		North	East	2.2	ь		0
14.0 Conservatory				None							
15.0 Draught Proofing				100				%			
16.0 Draught Lobby			No								
17.0 Thermal Bridging				Calculate Bridges							
17.1 List of Bridges			_	_							
E2 Other lintels (including other steel lintels) E3 Sill E4 Jamb E5 Ground floor (normal) E7 Party floor between dwellings (in blocks of flats) E22 Basement floor E19 Ground floor (inverted) P1 Party wall - Ground floor P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				Irce Type I Gov Approved Scheme pendently assessed ependently assessed ependently assessed ependently assessed ependently assessed ependently assessed le K1 - Default ependently assessed le K1 - Default ependently assessed	Length 4.43 4.43 15.18 16.05 16.05 5.27 5.27 15.07 15.07	Psi 0.02 0.02 0.05 0.04 -0.08 0.10 0.09 0.00	0.02 0.02 0.02 0.05 0.04 -0.08 0.10 0.09 0.00	Marmox Sp	ec		Imported No
E17 Corner (inverted – i external area)	internal area great	er than	Inde	ependently assessed	-0.07	-0.07				No	
E18 Party wall between	dwellings		Inde	ependently assessed	5.00	0.05	0.05				No
Y-value				0.04				W/m²K			
18.0 Pressure Testing				Yes							
Designed AP ₅₀				4.50				m³/(h.m	²) @ 50 Pa	a	
Property Tested?				Yes							
Test Method				Blower Door							
19.0 Mechanical Ventilation	on .										
Mechanical Ventilation											
Mechanical Ventila	ation System Pres	ent		No							
20.0 Fans, Open Fireplace	s, Flues										
21.0 Fixed Cooling System	n			No							
22.0 Lighting No Fixed Lighting				No Name Lighting 1	Efficacy 80.00		wer	Capa 12		С	ount 5
24.0 Main Heating 1				Database			_				-
_								<u></u> %			
Percentage of Heat				100.00				70			
	Database Ref. No.			106764							
	Fuel Type				Electricity 0						
	SAP Code										
In Winter				219.89							
In Summer				192.25							
Model Name				Logic Air 8kW							

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Manufacturer	Atlantic	7
		_ ¬
System Type	Heat Pump	_
Controls SAP Code	2207	=
Delayed Start Stat	No	_
HETAS approved System	No	=
Oil Pump Inside	No	_
FI Case	0.00	
Flue Type	None or Unknown	
Fan Assisted Flue	No	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	_
Flow Temperature	Enter value	_
Flow Temperature Value	55.00	
Boiler Interlock	No]
25.0 Main Heating 2	None	
26.0 Heat Networks	None	
Heat Source Fuel Type Heating U	Jse Efficiency Percentage Of Heat Heat Ele	ectrical Fuel Factor Efficiency typ
	Heat Power Ratio	
Heat source 1 None	1440	
Heat source 2 None Heat source 3 None		
Heat source 4 None		
Heat source 5 None		
28.0 Water Heating	Main Hanting 4	
Water Heating SAP Code	Main Heating 1 901	_ _
		_
Flue Gas Heat Recovery System	No	╡
Waste Water Heat Recovery Instantaneous System 1	No	_
Waste Water Heat Recovery Instantaneous System 2	No	_
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	_
Summer Immersion	No	
Cold Water Source	From header tank	
Bath Count	0	
Supplementary Immersion	No	
Immersion Only Heating Hot Water	No	
28.1 Showers		
Description Shower Typ		Connected Connected To
1 Combi boile	r or unvented hot water system 7.00 [kW]	No
28.3 Waste Water Heat Recovery System		
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	Ī
Insulation Type	Measured Loss	Ī
Cylinder Volume	150.00	_ │ L
Loop	2.00	1300-74

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kWh/day

2.09

Loss



Pipes insulation In Airing Cupboard	Fully insulated primary pipework No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	
Jan Feb Mar Apr	May Jun Jul Aug Sep	Oct Nov Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

Typical Cost Typical savings per year Solar water heating

Typical Cost Typical savings per year SAP rating Environmental Impact

0 0
0
0
0
0
0
0
0

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Property Reference		Un	it 1							Issued on Dat	te	05/03/2024	05/03/2024	
Assessment Refe	rence		sidual					Prop Type Ref	Te	ebby and Son	Garage			
Property		Un	it 1, Highland	Square , Bristol										
SAP Rating					83 B		DER	5.54		TER		15.43		
Environmental					97 A		% DER < TEF	₹				64.10		
CO ₂ Emissions (t/	year)				0.22		DFEE	35.63	3	TFEE		40.78		
Compliance Chec	k				See BREL		% DFEE < TF	EE				12.64		
% DPER < TPER					28.65		DPER	58.43	3	TPER		81.89		
Assessor Details										Asses	sor ID	U367-000	11	
Client										710000	301 15	0307-000		
SAP 10 WORKSHEET CALCULATION OF I						2022)								
1. Overall dwell	ing charac	cteristics						 Area	Store	ey height		Volume		
Ground floor Total floor area Dwelling volume	a TFA = (la	a)+(lb)+(lc)+(ld)+(le)(ln)	4	3.3900		(m2) 43.3900 ((lb) x (1)+(3b)+(3c)	(m) 2.5000 (+(3d)+(3e).	-	(m3) 108.4750 108.4750	(4)	
2. Ventilation r	ate													
Number of open of Number of open f Number of chimme Number of flues Number of flues Number of blocke Number of intern Number of fluest Number of fluest	Tlues ys / flues attached t attached t cd chimneys ittent ext ve vents	to solid fu to other he s tract fans	el boiler	fire							0 * 20 = 0 * 35 = 0 * 20 =	0.0000 0.0000 0.0000 0.0000 0.0000 20.0000 0.0000	(6b) (6c) (6d) (6e) (6f) (7a) (7b)	
Infiltration due Pressure test Pressure Test Me Measured/design Infiltration rat Number of sides	thod AP50		and fans	= (6a)+(6b)	+ (6c) + (6d) + (6e)+(6f)+	(6g)+(7a)+(7b)+(7c) =			/ (5) =	0.1844 Yes 31ower Door 4.5000 0.4094	(17)	
Shelter factor Infiltration rat	e adjusted	d to includ	e shelter	factor				((20) = 1 -	[0.075 x 1) = (18) x				
Wind speed Wind factor Adj infilt rate	Jan 5.1000 1.2750	Feb 5.0000 1.2500	Mar 4.9000 1.2250		May 4.3000 1.0750	Jun 3.8000 0.9500					Nov 4.5000 1.1250			
Effective ac	0.4045				0.3411 0.5582			0.2935 0.5431		0.3411 0.5582				
3. Heat losses a	and heat lo	oss paramet	er											
Element				Gross	Openings	Ne	tArea	U-value	Ax	J K-	value	AxK		
Windows (Uw = 1. Heatloss Floor 1 Cavity Wall Basement Wall		1 -1	/2	m2 40.5100 5.2700	m2 8.3800	8 43 32 5	m2 .3800 .3900 .1300 .2700	W/m2K 1.2448 0.1200 0.1800 0.1800	W/I 10.431	K k 2	:J/m2K	kJ/K 3254.2500 4819.5000 790.5000	(27) (28a) (29a) (29a)	
Total net area of Fabric heat loss Party Wall 1 Party Ceiling 1 Internal Wall 1			Mum(A, MZ)			32 43	.1700 (26)(.9200 .3900 .5500	30) + (32) = 0.0000	22.370 0.000	0 70 30		2304.4000 1301.7000 10255.0000	(32b)	
Heat capacity Cm Thermal mass par List of Thermal	cameter (Th		FA) in kJ/	m2K				(28)	.(30) + (32)	+ (32a)	.(32e) =	22725.3500 523.7463		
K1 Eleme E2 Other E3 Sill E4 Jamb E5 Groun E7 Party	ent c lintels nd floor (r	tween dwell		l lintels) locks of fla	ts)			4. 4. 15. 16.	4300 4300 1800 0500 0500	0.0230 0.0230 0.0210 0.0160 0.0470 0.0380 -0.0800	0.75	019 930 429 544 099		

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P1 Part P3 Part E16 Con E17 Con	ty wall - I rner (norma rner (inver rty wall be	Fround floor intermediate (1) ted - inter tween dwell	e floor betw rnal area gr lings	reater than	3)	15 15 9 5	.2700 .0750 .0750 .5000 .0000	0.1000 0.0930 0.0000 0.0430 -0.0730 0.0460	0.52 1.40 0.00 0.40 -0.36 0.23	20 000 85 50	(36)		
Point Thermal h Total fabric he	oridges eat loss								(33) + (36)	(36a) = + (36a) =	0.0000 25.9529	
Ventilation hea	Jan 20.8271	culated mor. Feb 20.7134	nthly (38)m Mar 20.6019	= 0.33 x (Apr 20.0783	25)m x (5) May 19.9803	Jun 19.5243	Jul 19.5243	Aug 19.4399	Sep 19.7000	Oct 19.9803	Nov 20.1785	Dec 20.3857	(38)
Heat transfer of Average = Sum(3	46.7800	46.6663	46.5548	46.0312	45.9333	45.4772	45.4772	45.3928	45.6529	45.9333	46.1315	46.3386 46.0308	(39)
HLP HLP (average)	Jan 1.0781	Feb 1.0755	Mar 1.0729	Apr 1.0609	May 1.0586	Jun 1.0481	Jul 1.0481	Aug 1.0462	Sep 1.0522	Oct 1.0586	Nov 1.0632	Dec 1.0680 1.0609	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
4. Water heatin	ng energy r	equirements	g (kWh/year))									
Assumed occupar	псу											1.4991	(42)
Hot water usage	61.7220	60.7771	59.3845	57.2421	55.3227	52.6374	50.5135	52.9964	54.2453	56.9049	59.6748	61.6664	(42a)
Hot water usage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage Average daily h	29.9819	28.8917	27.8014 /day)	26.7112	25.6209	24.5307	24.5307	25.6209	26.7112	27.8014	28.8917	29.9819 84.1592	
Daily hot water	Jan r use	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte Energy content	91.7040 135.0041 (annual)	89.6688 118.6499	87.1859 124.5869	83.9533 109.6640	80.9436 104.3040	77.1680 89.2423	75.0441 82.9260	78.6174 92.5341	80.9564 93.9054	84.7064 109.1528 Total = S	88.5665 119.7005 um(45)m =	91.6483 134.5923 1314.2622	
Distribution lo	20.2506	= 0.15 x (4 17.7975		16.4496	15.6456	13.3863	12.4389	13.8801	14.0858	16.3729	17.9551	20.1888	(46)
Store volume a) If manufact Temperature f Enter (49) or	turer decla factor from	ı Table 2b	actor is kno	own (kWh/d	lay):							150.0000 2.0900 0.5400 1.1286	(48) (49)
Total storage 1		31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	
If cylinder con	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	
Primary loss Combi loss	23.2624 0.0000	21.0112 0.0000	23.2624	22.5120 0.0000	23.2624 0.0000	22.5120 0.0000	23.2624 0.0000	23.2624 0.0000	22.5120 0.0000	23.2624 0.0000	22.5120 0.0000	23.2624 0.0000	
	193.2531	171.2619	182.8359	166.0340	162.5530	145.6123	141.1750	150.7831	150.2754	167.4018	176.0705	192.8413	
WWHRS PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 0.0000 0.0000	0.0000 0.0000 0.0000	0.0000	0.0000 0.0000 0.0000	0.0000 0.0000 0.0000	0.0000	0.0000	(63b)
Solar input FGHRS Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
12Total per yea	193.2531 ar (kWh/yea		182.8359	166.0340	162.5530	145.6123	141.1750	150.7831 Total p		167.4018 h/year) = Si	176.0705 um(64)m =	192.8413 2000.0972 2000	(64)
Electric shower	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Heat gains from					al Energy us							0.0000	
	91.4881	81.5407	88.0243	81.5593	81.2803	74.7691	74.1721	77.3668	76.3196	82.8925	84.8964	91.3511	(65)
5. Internal gai													
Metabolic gains	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m Lighting gains	(calculate	d in Append	dix L, equat	tion L9 or		see Table 5					74.9534		. ,
Appliances gair	ns (calcula	ited in Appe	endix L, equ	uation L13		lso see Tabl	le 5		68.5836	66.3712		66.3712	
Cooking gains	(calculated	l in Appendi	ix L, equati	ion L15 or		see Table S	5			106.6605			
	0.0000	0.0000	0.0000	0.0000	30.4953 0.0000	30.4953 0.0000	30.4953 0.0000	30.4953 0.0000					
	-59.9627	-59.9627			-59.9627	-59.9627	-59.9627	-59.9627	-59.9627	-59.9627	-59.9627	-59.9627	(71)
	122.9678		118.3123	113.2768	109.2477	103.8459	99.6937	103.9876	105.9994	111.4146	117.9117	122.7838	(72)
Total internal		371.8029	358.2604	348.1924	332.8055	321.0206	308.9137	311.8572	319.4845	329.9323	347.7872	359.0424	(73)
6. Solar gains													
[Jan]			Aı	rea	Solar flux		g		FF data	Acce fact Table	ss or	Gains W	
Northeast			8.38	 300	w/m2 11.2829					0.77		28.8960	(75)
Solar gains	28.8960	58.8187	105.9726	174.0374	233.9405	249.4053	233.3136	186.0003	129.1293	71.8811	36.3587	23.5980	(83)
Total gains	393.8647	430.6216	464.2330	522.2298	566.7459	570.4259	542.2273	497.8574	448.6137	401.8134	384.1459	38Z.6403	(84)

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7. Mean intern	al temperat	ture (heati	ng season)										
Temperature du	ring heatin	ng periods	in the livi			Th1 (C)						21.0000	(85)
Utilisation fa	Jan	Feb	ving area, : Mar 135.5949	Apr	May 137.4297	Jun 138.8078	Jul 138.8078	Aug 139.0661	Sep 138.2737	Oct 137.4297	Nov 136.8393	Dec 136.2275	
alpha util living ar	9.9961 ea	10.0181	10.0397	10.1425	10.1620	10.2539	10.2539	10.2711	10.2182	10.1620	10.1226	10.0818	
	0.9995	0.9984	0.9926	0.9366	0.7428	0.5100	0.3690	0.4194	0.6964	0.9680	0.9978	0.9996	(86)
Living Non living 24 / 16	20.4831 19.4338	20.5713 19.5481 0	20.7141 19.7298 0	20.9094 19.9614 0	20.9917 20.0308 0	20.9998 20.0434 0	21.0000 20.0434 0		20.9966 20.0390 0	20.8814 19.9398 0	20.6555 19.6643 0	20.4714 19.4258	
24 / 9 16 / 9	0 3 28		0	0	0		0	0	0	0	0		
MIT Th 2 util rest of h	20.7356 20.0187	20.5713 20.0209	20.7141 20.0230	20.9094 20.0329	20.9917 20.0348	20.9998 20.0434	21.0000 20.0434	21.0000 20.0450	20.9966 20.0401	20.8814 20.0348		20.5453 20.0271	
MIT 2	0.9991 19.7855	0.9972 19.5481	0.9872 19.7298	0.9014 19.9614	0.6714 20.0308	0.4339 20.0434	0.2888 20.0434	0.3323 20.0450	0.6031 20.0390	0.9407 19.9398	0.9958 19.6643	0.9993 19.5341 0.4727	(90)
Living area fr MIT Temperature ad	20.2346	20.0317	20.1951	20.4095	20.4850	20.4955	20.4956	20.4964	20.4916	Living are 20.3849		20.0121	
adjusted MIT		20.0317	20.1951	20.4095	20.4850	20.4955	20.4956	20.4964	20.4916	20.3849	20.1328	20.0121	(93)
8. Space heati													
Utilisation	Jan 0.9992	Feb 0.9972	Mar 0.9884	Apr 0.9167	May 0.7054	Jun 0.4699	Jul 0.3267	Aug 0.3735	Sep 0.6476	Oct 0.9524	Nov 0.9961	Dec 0.9993	(94)
Useful gains Ext temp.	4.3000	429.4320 4.9000	458.8505 6.5000	478.7050 8.9000	399.7557 11.7000	268.0485 14.6000	177.1596 16.6000	185.9438 16.4000	290.5279 14.1000	382.7005 10.6000	382.6469 7.1000	382.3786 4.2000	
Heat loss rate Space heating	745.4220	706.1422	637.5718	529.7965	403.5234	268.1102	177.1608	185.9485	291.7967	449.4529	601.2233	732.7118	(97)
Space heating	261.7938 requirement		132.9686 er year (kW	36.7858 h/year)	2.8032	0.0000	0.0000	0.0000	0.0000	49.6638	157.3750	260.6479 1087.9874	(98a)
Solar heating Solar heating	0.0000	0.0000 on - total	0.0000 per year (ki	0.0000 Wh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Space heating	kWh 261.7938	185.9492	132.9686	36.7858		0.0000	0.0000	0.0000	0.0000	49.6638	157.3750	260.6479	(98c)
Space heating Space heating		arter sor	ar contribu	tion - total	ı per year	(kwn/year)				(98c) / (4) =	1087.9874 25.0746	(99)
9a. Energy req	quirements -	- Individua	l heating s	ystems, incl	luding micr	ro-CHP							
Fraction of sp Fraction of sp				ntary system	n (Table 11	1)						0.0000	
Efficiency of Efficiency of	main space	heating sy	stem 2 (in	용)								219.8872 0.0000	(207)
Efficiency of	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	0.0000 Dec	(208)
Space heating	requirement	5	132.9686	36.7858	2.8032	0.0000	0.0000	0.0000	0.0000	49.6638	157.3750	260.6479	(98)
Space heating	219.8872	219.8872	219.8872		219.8872	0.0000	0.0000	0.0000	0.0000	219.8872	219.8872	219.8872	(210)
Space heating	119.0582	84.5658	60.4713	16.7294	1.2748	0.0000	0.0000	0.0000	0.0000	22.5860	71.5708	118.5371	(211)
Space heating Space heating	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	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)
	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 193.2531		182.8359	166.0340	162.5530	145.6123	141.1750	150.7831	150.2754	167.4018	176.0705	192.8413	(64)
Efficiency of (217)m	192.2472	192.2472	192.2472	192.2472	192.2472	192.2472	192.2472	192.2472	192.2472	192.2472	192.2472	192.2472 192.2472	
Fuel for water	100.5232	89.0842	95.1046	86.3649	84.5542	75.7422	73.4341	78.4319	78.1678	87.0763	91.5855	100.3090	(219)
Space cooling (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	0.0000	0.0000	
Pumps and Fa Lighting Electricity ge	13.7906	11.0634	9.9613	7.2981	5.6373	4.6057	5.1425	6.6844	8.6824	11.3918	12.8670	0.0000 14.1739	
(233a)m Electricity ge	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)
(234a)m Electricity ge	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 itv)	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
(235a)m Electricity us	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 meneration)	0.0000	0.0000	0.0000	0.0000	(235a)
(235c)m Electricity ge	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)
(233b)m Electricity ge	0.0000	0.0000	0.0000	0.0000 ix M) (negat	0.0000	0.0000 ty)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
(234b)m Electricity ge								0.0000	0.0000	0.0000	0.0000	0.0000	
(235b)m Electricity us									0.0000	0.0000	0.0000	0.0000	
(235d)m Annual totals Space heating		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 494.7935	
Space heating Space heating	fuel - main	n system 2										0.0000	(213)
Efficiency of Water heating	water heate											192.2472 1040.3780	
Space cooling													(221)

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Energy saving/ge	eneration to	echnologies	(Appendice	es M ,N and	Q)							0.0000	(233)
Wind generation Hydro-electric	generation											0.0000	(234) (235a)
Electricity gene Appendix Q - spe Energy saved or	ecial featu		pendix N)									0.0000	
Energy used Total delivered		all uses										0.0000 1646.4697	(237)
12a. Carbon dio	xide emissi	ons - Indiv	idual heati	ng systems	including m	icro-CHP							
								Energy kWh/year				Emissions kg CO2/year	
Space heating - Total CO2 assoc:	iated with		ystems					494.7935		0.1575		77.9501 0.0000	(261)
Water heating (of Space and water	heating							1040.3780		0.1406		146.2844 224.2345	(265)
Pumps, fans and Energy for light Total CO2, kg/ye	ting	eep-not						0.0000 111.2982		0.0000 0.1443		0.0000 16.0638 240.2983	(268)
EPC Dwelling Car		Emission	Rate (DER)									5.5400	
13a. Primary end									Drimawa	, factor	Decision	manti once	
Space heating -									Primary energy kg		rrli	mary energy kWh/year 783.3654	
Total CO2 assoc: Water heating (other fuel)	community s	ystems					1040.3780		1.5199		0.0000 1581.2685	(473) (278)
Space and water Pumps, fans and Energy for light	electric k	eep-hot						0.0000 111.2982		0.0000 1.5338		2364.6339 0.0000 170.7130	(281)
Total Primary en	nergy kWh/y							111.2902		1.5550		2535.3469 58.4300	(286)
SAP 10 WORKSHEET CALCULATION OF 1			signed)	(Version 10.	2, February	2022)							
1. Overall dwell													
								Area (m2)		y height (m)		Volume (m3)	
Ground floor Total floor area Dwelling volume)+(1b)+(1c)	+(ld)+(le).	(ln)	4	3.3900			(1b) x 3a)+(3b)+(3c)+	2.5000 (3d)+(3e)			(1b) - (3b) (4) (5)
								,	, ((, ((,)	(, - (, -	,		(-)
2. Ventilation	rate 												
Number of open (chimneys										0 * 80 =	m3 per hour 0.0000	
Number of open in Number of chimne	flues eys / flues			re							0 * 20 = 0 * 10 =	0.0000	(6b) (6c)
Number of flues Number of flues Number of blocks	attached to	o other hea									0 * 20 = 0 * 35 = 0 * 20 =	0.0000	(6e)
Number of intern Number of passiv	mittent ext ve vents	ract fans									2 * 10 = 0 * 10 =	20.0000	(7a) (7b)
Number of fluele		es									0 * 40 =	0.0000	(7c)
Infiltration due Pressure test	e to chimne	ys, flues a	nd fans =	= (6a)+(6b)+	(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			Air change / (5) =	es per hour 0.1844 Yes	(8)
Pressure Test Me Measured/design	AP50										1	Blower Door 5.0000	(17)
Infiltration rat Number of sides												0.4344 3	(18) (19)
Shelter factor Infiltration rat	te adjusted	to include	shelter fa	ctor					(20) = 1 - (21)		(19)] = (20) =		
	Jan		Mar			Jun	Jul	Aug		Oct	Nov		
Wind speed Wind factor Adj infilt rate				4.4000 1.1000	4.3000 1.0750	3.8000 0.9500			4.0000 1.0000		4.5000 1.1250		
Effective ac	0.4292			0.3703 0.5686		0.3198 0.5511			0.3366 0.5567				
													-
3. Heat losses a Element			r 	Gross	Openings	Mo+1	Area	U-value	AxU	ν.	-value	AxK	
TER Opening Type		0)		m2	m2	8.3	m2 3800	W/m2K 1.1450	W/K 9.5954	3	cJ/m2K	kJ/K	(27)
Heatloss Floor							3900	0.1300					(28a)

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Cavity Wall Basement Wall Total net area of e Fabric heat loss, W Party Wall 1			40.5100 5.2700	8.380	5. 89.	.1300 .2700 .1700 (26)(3	0.1800 0.1800 30) + (32) = 0.0000	5.78 0.94 = 21.96 0.00	86 81			(29a) (29a) (31) (33) (32)
Thermal mass parame		TFA) in kJ/r	n2K								533.7463	(35)
List of Thermal Bri Kl Element	ages								Psi-value	Tot		
E2 Other li E3 Sill	ntels (including	g other stee	l lintels)					.4300 .4300	0.0500 0.0500	0.22 0.22		
E4 Jamb	loor (normal)						15.	.1800 .0500	0.0500 0.1600	0.75 2.56	90	
E7 Party fl	oor between dwel	llings (in b	locks of fla	ats)			16.	.0500	0.0700	1.12	35	
E22 Basemen E19 Ground	t floor floor (inverted))						.2700 .2700	0.0700	0.36 0.36		
	ll - Ground floo ll - Intermediat		ween dwelli	nas (in blo	cks of flats	s)		.0750 .0750	0.0800	1.20		
El6 Corner	(normal)					- /	9.	.5000	0.0900	0.85	50	
El8 Party w	(inverted - inte all between dwe)	llings			rea)			.0000 .0000	-0.0900 0.0600	-0.45 0.30	00	
Thermal bridges (Su Point Thermal bridg	es	ulated using	Appendix K)						(36a) =	7.5423 0.0000	(36)
Total fabric heat 1	oss							(33) + (36)	+ (36a) =	29.5104	(37)
Ventilation heat lo Ja		onthly (38)m Mar	= 0.33 x (25)m x (5) May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1957 21.0677	20.9422	20.3527	20.2424	19.7290	19.7290	19.6339	19.9267	20.2424	20.4655	20.6988	(38)
50.	7061 50.5781	50.4526	49.8631	49.7528	49.2394	49.2394	49.1443	49.4372	49.7528	49.9759	50.2092	(39)
Average = Sum(39)m											49.8626	
Ja HLP 1.	n Feb 1686 1.1657	Mar 1.1628	Apr 1.1492	May 1.1466	Jun 1.1348	Jul 1.1348	Aug 1.1326	Sep 1.1394	Oct 1.1466	Nov 1.1518	Dec 1.1572	(40)
HLP (average) Days in mont	31 28	31	30	31	30	31	31	30	31	30	1.1492	
-												
4. Water heating en												
Assumed occupancy											1.4991	(42)
Hot water usage for		60 0036	E0 2204	E 6 272E	E4 1900	E2 0470	E4 2240	EE 0226	E0 1770	60 9971		
Hot water usage for		60.9836	58.3304	56.3725	54.1890	52.9479	54.3240	55.8326	58.1770	60.8871	63.0792	
Hot water usage for			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
29. Average daily hot w	9819 28.8917 ater use (litres		26.7112	25.6209	24.5307	24.5307	25.6209	26.7112	27.8014	28.8917	29.9819 85.6369	
Ja	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use 93.	3038 91.2619	88.7850	85.0416	81.9934	78.7196	77.4785	79.9450	82.5438	85.9784	89.7788	93.0612	(44)
Energy conte 147. Energy content (ann		136.4592	116.4177	110.3789	96.7950	93.7036	98.9886	101.7847	116.6719 Total = S	127.9064 um(45)m =	145.7113 1422.5435	(45)
Distribution loss			17.4627	16.5568	14.5192	14.0555	14.8483	15.2677	17.5008	19.1860	21.8567	(46)
Water storage loss: Store volume											150.0000	
a) If manufacturer Temperature facto		factor is kno	own (kWh/da	ay):							1.3938 0.5400	(48)
Enter (49) or (54)											0.7527	
	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 contain 23.	s dedicated sola 3325 21.0745	ar storage 23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23. Combi loss 0.	2624 21.0112 0000 0.0000	23.2624 0.0000	22.5120 0.0000	23.2624 0.0000	22.5120 0.0000	23.2624 0.0000	23.2624 0.0000	22.5120 0.0000	23.2624 0.0000	22.5120 0.0000	23.2624 0.0000	
Total heat required	for water heat: 3653 172.0415	ing calculate	ed for each	month 156.9738	141.8868	140.2985	145.5835	146.8766	163.2668	172.9982	192.3062	(62)
WWHRS -28. PV diverter -0.	9481 -25.6019	-26.8089	-22.1988	-20.6885	-17.7033	-16.5940	-17.6461	-18.3165	-21.5931	-24.4624	-28.4120	(63a)
Solar input 0.	0000 0.0000 0000 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
Output from w/h												
	4172 146.4396	156.2455	139.3107	130.2053	124.1035	123.7045	Total pe	er year (kW	h/year) = Si	um(64)m =	1702.1872	(64)
12Total per year (k Electric shower(s)											1702	
0. Heat gains from wat	0000 0.0000	0.0000	Tota	0.0000 al Energy u	0.0000 sed by insta	0.0000 antaneous el	0.0000 lectric show	0.0000 ver(s) (kWh	0.0000 /year) = Su	0.0000 m(64a)m =	0.0000 0.0000	(64a) (64a)
Heat gains from wat 86.	er heating, kWh, 4096 76.8789	/month 82.6486	74.7824	73.9769	68.2578	68.4324	70.1896	69.9169	76.0693	78.6024	85.7249	(65)
5. Internal gains (
Metabolic gains (Ta Ja	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m 74. Lighting gains (cal	9534 74.9534 culated in Apper	74.9534 ndix L, equa	tion L9 or 1	L9a), also	see Table 5			74.9534	74.9534	74.9534	74.9534	(66)
66. Appliances gains (c	3712 73.4824 alculated in Apr	66.3712 pendix L, eq	68.5836 uation L13	66.3712 or L13a), a	68.5836 lso see Tabl	66.3712 Le 5	66.3712	68.5836	66.3712	68.5836	66.3712	(67)
130. Cooking gains (calc	1437 131.4941	128.0910	120.8460	111.7006	103.1051	97.3628	96.0123	99.4155	106.6605	115.8059	124.4014	(68)
30.	4953 30.4953 0000 3.0000	30.4953		30.4953	30.4953		30.4953 0.0000		30.4953 3.0000	30.4953 3.0000	30.4953 3.0000	
Losses e.g. evapora		values) (Tab	le 5)					-59.9627		-59.9627	-59.9627	
Water heating gains						91.9790	94.3409		102.2437		115.2217	
Total internal gain												
301.		554.0550	541.7000	020.5031	011.7/16	001.1990	002.2104	010.0313	020.7014	0.2.0404	554.4003	(.5)

6. Solar gains

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[Jan]				rea m2	Solar flux Table 6a W/m2	Speci	g fic data	Specific	FF data	Acces facto Table	or	Gains W	
Northeast				B00	11.2829		0.6300	0		0.77		28.8960	(75)
Solar gains Total gains	28.8960	58.8187	105.9726	174.0374	233.9405	249.4053	233.3136	186.0003		71.8811 395.6425	36.3587 378.4041	23.5980 378.0782	
7. Mean inter		ure (heatin	ng season)										
Temperature d	uring heatin	ng periods i	in the livir	ng area fro	m Table 9, I							21.0000	(85)
tau alpha	Jan 126.8707 9.4580	Feb 127.1919 9.4795		Apr 129.0157 9.6010	May 129.3017 9.6201	Jun 130.6500 9.7100	Jul 130.6500 9.7100	Aug 130.9027 9.7268	Sep 130.1273 9.6752	Oct 129.3017 9.6201	Nov 128.7244 9.5816	Dec 128.1264 9.5418	
util living a		0.9990	0.9954	0.9602	0.8000	0.5604	0.4053	0.4629	0.7598	0.9811	0.9986	0.9997	
MIT	20.4061	20.4954	20.6441	20.8593	20.9808	20.9993	21.0000	20.9999	20.9908	20.8316	20.5876	20.3942	
Th 2 util rest of	19.9452 house 0.9994	19.9476	19.9499	19.9609 0.9330	19.9629 0.7238	19.9725	19.9725	19.9743	19.9688 0.6558	19.9629 0.9620	19.9588	19.9544	
MIT 2 Living area f	19.2722 raction	19.3884	19.5789	19.8434	19.9532	19.9723	19.9725	19.9743	19.9658 fLA =	19.8205 Living area	19.5157 a / (4) =	19.2646 0.4727	(90) (91)
MIT Temperature a adjusted MIT			20.0824	20.3236	20.4389	20.4578	20.4582	20.4591	20.4503	20.2984	20.0224	19.7986 0.0000 19.7986	
adjusted HII	19.0002	19.9117	20.0024	20.3236	20.4309	20.4576	20.4502	20.4591	20.4503	20.2904	20.0224	19.7906	(93)
8. Space heat													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation Useful gains	389.7796	425.8899		0.9440 486.9341	425.6374		0.3554 189.9690	0.4086 199.4613	0.7059 310.3977	0.9696 383.6328	0.9975 377.4662	0.9995 377.8905	(95)
Ext temp. Heat loss rat			6.5000 685.2668	8.9000 569.6176	11.7000 434.7859	14.6000 288.4343	16.6000 189.9744	16.4000 199.4808	14.1000 313.9427	10.6000 482.5240	7.1000 645.8076	4.2000 783.1914	
Space heating Space heating	295.0553	224.0256		59.5322	6.8064	0.0000	0.0000	0.0000	0.0000	73.5751	193.2058	301.5439 1323.9273	
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 Space heating	kWh	on - total p 224.0256		Wh/year) 59.5322	6.8064	0.0000	0.0000	0.0000	0.0000	72 5751	193.2058	0.0000	
Space heating Space heating	requirement						0.0000	0.0000	0.0000		/ (4) =	1323.9273 30.5123	
9a. Energy re	 guirements -	Individual	l heating sy	vstems, inc	luding micro								
Fraction of s	pace heat fr	om secondar	ry/supplemen									0.0000	
Fraction of s Efficiency of Efficiency of Efficiency of	main space main space	heating sys	stem`l´(in 9 stem 2 (in 9	8)								1.0000 92.3000 0.0000 0.0000	(206) (207)
			Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating Space heating	295.0553	224.0256		59.5322	6.8064	0.0000	0.0000	0.0000	0.0000	73.5751	193.2058	301.5439	(98)
Space heating	92.3000 fuel (main	92.3000 heating sys	92.3000 stem)	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating	efficiency		ing system 2		7.3742	0.0000	0.0000	0.0000	0.0000	79.7130	209.3237	326.6998	
Space heating	0.0000 fuel (main 0.0000	0.0000 heating sys 0.0000	0.0000 stem 2) 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Space heating			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Water heating													
Water heating Efficiency of	165.4172	146.4396	156.2453	139.3107	136.2853	124.1835	123.7045	127.9374	128.5601	141.6737	148.5358	163.8942 79.8000	
(217)m Fuel for wate	85.3423	85.0102	84.2518	82.2972	80.1866	79.8000	79.8000	79.8000	79.8000	82.6637	84.6504	85.4081	
Space cooling	193.8278 fuel requir	172.2612 ement		169.2776		155.6185	155.0181	160.3226		171.3855	175.4697	191.8953	
(221)m Pumps and Fa Lighting	0.0000 7.3041 13.7906	0.0000 6.5973 11.0634	0.0000 7.3041 9.9613	0.0000 7.0685 7.2981	0.0000 7.3041 5.6373	0.0000 7.0685 4.6057	0.0000 7.3041 5.1425	0.0000 7.3041 6.6844	0.0000 7.0685 8.6824	0.0000 7.3041 11.3918	0.0000 7.0685 12.8670	0.0000 7.3041 14.1739	(231)
Electricity g (233a)m	enerated by -15.0243	PVs (Append -22.0071	dix M) (nega -32.8669	ative quant -38.4686	ity) -42.8374	-40.5222	-40.0662	-37.1717	-32.2647	-25.8692	-16.8220	-12.8977	
Electricity g (234a)m	enerated by 0.0000	wind turbin 0.0000	nes (Appendi 0.0000	ix M) (nega 0.0000	tive quantit 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(234a)
Electricity g (235a)m Electricity u	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)
(235c)m Electricity g	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)
(233b)m Electricity g	-6.1529 enerated by	-13.1539 wind turbin	-26.5252 nes (Appendi	-40.3859 ix M) (nega	-53.9128 tive quantit	·γ)			-32.7709	-18.9480	-8.2625	-4.8471	
(234b)m Electricity g	0.0000 enerated by	0.0000 hydro-elect	0.0000 tric generat	0.0000 tors (Appen	0.0000 dix M) (nega	0.0000 ative quant		0.0000	0.0000	0.0000	0.0000		(234b)
(235b)m Electricity u (235d)m	0.0000 sed or net e 0.0000		0.0000 generated h 0.0000		P (Appendix		0.0000 ve if net go 0.0000	0.0000 eneration) 0.0000	0.0000	0.0000	0.0000		(235b) (235d)
		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235U)
Annual totals Space heating		n system 1										1434.3741	(211)

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Space heating fuel - main system 2 Space heating fuel - secondary Efficiency of water heater Water heating fuel used Space cooling fuel			0.0000 (213) 0.0000 (215) 79.8000 2061.5887 (219) 0.0000 (221)
Electricity for pumps and fans: Total electricity for the above, kWh/year Electricity for lighting (calculated in Appendix L)			86.0000 (231) 111.2982 (232)
Energy saving/generation technologies (Appendices M ,N and Q) PV generation Wind generation Hydro-electric generation (Appendix N) Electricity generated - Micro CHP (Appendix N) Appendix Q - special features			-714.8865 (233) 0.0000 (234) 0.0000 (235a) 0.0000 (235)
Energy saved or generated Energy used Total delivered energy for all uses			-0.0000 (236) 0.0000 (237) 2978.3756 (238)
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP			
Space heating - main system 1 Total CO2 associated with community systems	Energy kWh/year 1434.3741	Emission factor kg CO2/kWh 0.2100	Emissions kg CO2/year 301.2186 (261) 0.0000 (373)
Water heating (other fuel)	2061.5897	0.2100	432.9338 (264)
Space and water heating			734.1524 (265)
Pumps, fans and electric keep-hot	86.0000		11.9293 (267)
Energy for lighting	111.2982	0.1443	16.0638 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-356.8179		
PV Unit electricity exported Total	-358.0686	0.1255	-44.9435 -92.6679 (269)
Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER)			669.4775 (272) 15.4300 (273)
13a. Primary energy - Individual heating systems including micro-CHP			
	Energy	Primary energy factor	Primary energy
Constitution and survey 1	kWh/year	kg CO2/kWh	kWh/year
Space heating - main system 1 Total CO2 associated with community systems	1434.3/41	kg CO2/kWh 1.1300	0.0000 (473)
Water heating (other fuel)	2061.5897	1.1300	2329.5963 (278)
Space and water heating			3950.4391 (279)
Pumps, fans and electric keep-hot Energy for lighting	86.0000 111.2982		130.1008 (281) 170.7130 (282)
B			
Energy saving/generation technologies PV Unit electricity used in dwelling	-356.8179	1.4943	-533.1824
PV Unit electricity exported	-358.0686		-164.9676
Total			-698.1500 (283)
Total Primary energy kWh/year			3553.1028 (286)
Target Primary Energy Rate (TPER)			81.8900 (287)

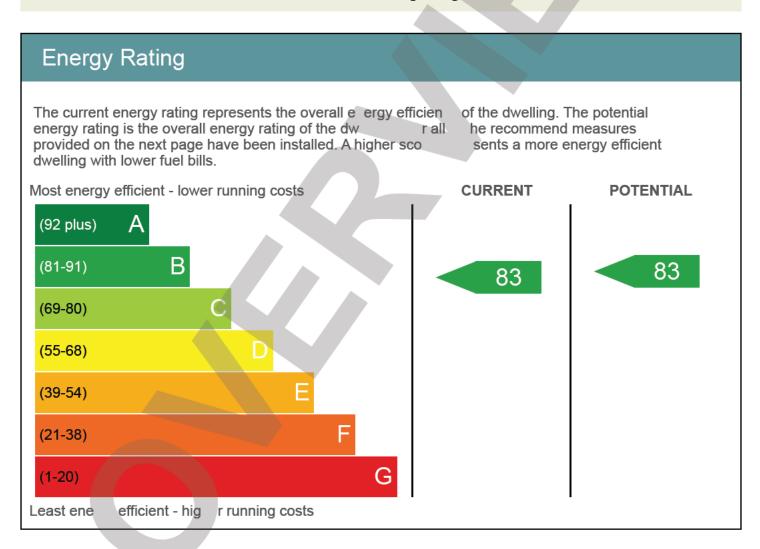
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Overview Report



Dwelling Address	Unit 1, Highland Square , Bristol
Report Date	05/03/2024
Property Type	Flat, Semi-Detached
Floor Area [m ²]	43

This document is not an Energy Performance Certificat EPC) s required by the Energy Performance of Buildings Reg io



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Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good
Feature	Description			gy Performance
Walls	Average thermal transmi	ttance 0.18 W/m²K		Very Good
Floor	Average thermal transmi	ttance 0.12 W/m²K		Very Good
Windows	High performance glazin	g		Good
Main heating	Air source heat pump, radiators, electric			Average
Main heating controls	Time and temperature zone control			Very Good
Secondary heating	None			
Hot water	From main system			Average
Lighting	Good lighting e iciency			Good
Air tightness	Air perm ity [AP5	4.5 m³/h.m² (assumed)		Good

Primary Energy e

The primary ener e for this operty per year is 54 kilowatt hour (kWh) per square metre

Estimat d C emissions of the dwelling

The estimed CO rating rovides an indication of the dwelling's impact on the environment in terms of carbon dio emissio; the higher the rating the less impact it has on the environment.

The estimated CO emissions for this dwellings is: 0.2 per year

With the recommended measures the potential CO emissions could be: per year

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Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.

To reach the dwelling's potential energy rating all of the recommended measures shown below would need t installed. Having these measures installed individually or in any other order may give a different result wh pared w the cumulative potential rating.

Recommended measure	Typical	Potential Rating	lative	Cumulative
	Yearly	after	s	Potential
	Saving	measure installed	(per yea	Rating

Estimated energy use and potential savin s

Estimated energy cost for this property over a year

£384

Over a year you could save

£0

The estimated cost and savings show how much the average househ would spend in this property heating, lighting and hot water. It not based on how energy is ed by the people living at the propert

Contacting asses or and the accreditation scheme

Assessor contact details			
Asse r name	Mr.		
Assess accredita n number			
Email Address			

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Accreditation scheme contact details			
Accreditation scheme	Elmhurst Energy Systems Ltd		
Telephone			
Email Address			

Assessment details			
Related party disclosure	No related pa		
Date of assessment	05/03/202		
Date of certificate	05/03/202		
Type of assessment	SAP w dwellin		



Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Tue 05 Mar 2024 08:41:59

Project Information			
Assessed By		Building Type	Flat, Semi-detached
OCDEA Registration	EES/025661	Assessment Date	2024-03-05

Dwelling Details			
Assessment Type	As designed	Total Floor Area	43 m ²
Site Reference	Unit 1	Plot Reference	PV
Address	Unit 1 Highland Square, Bristo	ol	

Client Details	
Name	Tebby & Son
Company	SF Tebby & Son
Address	Unit 11 Avon Gorge Industrial Estate , Bristol, BS2 9XX

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission	rate			
Fuel for main heating system	Electricity			
Target carbon dioxide emission rate	15.43 kgCO ₂ /m ²			
Dwelling carbon dioxide emission rate	3.03 kgCO ₂ /m ²	ОК		
1b Target primary energy rate and dwelling pri	mary energy			
Target primary energy	81.89 kWh _{PE} /m ²			
Dwelling primary energy	38.53 kWh _{PE} /m ²	OK		
1c Target fabric energy efficiency and dwelling fabric energy efficiency				
Target fabric energy efficiency	40.8 kWh/m ²			
Dwelling fabric energy efficiency	35.6 kWh/m ²	ОК		

2a Fabric U-values	;			
Element	Maximum permitted average U-Value [W/m²K]	Dwelling average U-Value [W/m²K]	Element with highest individual U-Value	
External walls	0.26	0.18	Walls (1) (0.18)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	0.12	Heatloss Floor 1 (0.12)	OK
Roofs	0.16	N/A	N/A	N/A
Windows, doors, and roof windows	1.6	1.31	W01 (1.31)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))				
Name	Net area [m ²]	U-Value [W/m ² K]		
Exposed wall: Walls (1)	32.13	0.18		
Exposed wall: Walls (2)	5.27	0.18		
Party wall: Party Wall (1)	32.92	0 (!)		
Ground floor: Heatloss Floor 1, Heatloss Floor 1	43.39	0.12		

2c Openings (better than typically expected values are flagged with a subsequent (!))					
Name Area [m ²] Orientation Frame factor U-Value [W/m ² l					
W01, Windows	2.24	North East	0.7	1.31	
W02, Windows	2.35	North East	0.7	1.31	
W03, Windows	1.53	North East	0.7	1.31	
W04, Windows	2.26	North East	0.7	1.31	

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))								
Building part 1 - Main Dwelling: Thermal bridging calculated from linear thermal transmittances for each junction								
Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference				
External wall	E2: Other lintels (including other steel lintels)	Not government-approved scheme	0.023 (!)					
External wall	E3: Sill	Calculated by person with suitable expertise	0.021 (!)					

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E4: Jamb	Calculated by person with suitable expertise	0.016 (!)	
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.047	Marmox Spec
External wall	E7: Party floor between dwellings (in blocks of flats)	Calculated by person with suitable expertise	0.038 (!)	
External wall	E22: Basement floor	Calculated by person with suitable expertise	-0.08	Marmox Spec
External wall	E19: Ground floor (inverted)	SAP table default	0.1	
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.093	
Party wall	P3: Intermediate floor between dwellings (in blocks of flats)	SAP table default	0 (!)	
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.043	
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.073	
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.046	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))							
Maximum permitted air permeability at 50Pa	$8 \text{ m}^3/\text{hm}^2$						
Dwelling air permeability at 50Pa	4.5 m ³ /hm ² , Design value	OK					
Air permeability test certificate reference							

4 Space heating	
Main heating system 1: Heat pump with	radiators or underfloor heating - Electricity
Efficiency	219.9%
Emitter type	Radiators
Flow temperature	55°C
System type	Heat Pump
Manufacturer	Atlantic
Model	Logic Air 8kW
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water						
Cylinder/store - type: Cylinder						
Capacity	150 litres					
Declared heat loss	2.09 kWh/day					
Primary pipework insulated	Yes					
Manufacturer						
Model						
Commissioning						
Waste water heat recovery system 1 -	type: N/A					
Efficiency						
Manufacturer						
Model						

6 Controls							
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services							
Function							
Ecodesign class							
Manufacturer							
Model							
Water heating - type: Cylinder thermosta	at and HW separately timed						
Manufacturer							
Model							

7 Lighting						
Minimum permitted light source efficacy	75 lm/W					
Lowest light source efficacy	80 lm/W		OK			
External lights control	N/A					
8 Mechanical ventilation						
System type: N/A	N1/A					
Maximum permitted specific fan power	N/A		NI/A			
Specific fan power	N/A		N/A			
Minimum permitted heat recovery	N/A					
efficiency			1			
Heat recovery efficiency	N/A		N/A			
Manufacturer/Model						
Commissioning						
9 Local generation						
Technology type: Photovoltaic system	(1)					
Peak power	1.045 kWp					
Orientation	South West					
Pitch	45°					
Overshading	None or very little					
Manufacturer	THORIO OF YORY III.IIO					
MCS certificate						
10 Heat networks						
N/A						
11 Supporting documentary evidence						
N/A						
40 Paulanatiana						
12 Declarations						
a. Assessor Declaration	offerentiae that the car	atauta af this DDEL Occupions a Danset				
		ntents of this BREL Compliance Report				
		formation submitted for this dwelling for				
the purpose of carrying out the "As designed" assessment, and that the supporting documentary						
evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum						
documentary evidence required) has been reviewed in the course of preparing this BREL						
Compliance Report.						
Signed: Assessor ID:						
Name:		Date:				

N/A

b. Client Declaration



Property Reference	Unit 1									Issued	on Date	05/	03/202	4
Assessment Reference	PV						Prop	Туре	Ref	Tebby a	Tebby and Son Garage			
Property	Unit 1	Highland	Square , E	Bristol										
SAP Rating				89 B		DER		3.03	3		TER		15.43	
Environmental				98 A		% DER	< TER						30.36	
CO ₂ Emissions (t/year)				0.11		DFEE		35.6	33		TFEE	•	10.78	
Compliance Check				See BREI	L	% DFE	E < TFEE						12.64	
% DPER < TPER				52.95		DPER		38.	53		TPER		31.89	
Assessor Details											Assesso	r ID	J367-0	001
Client														
SUMMARY FOR INPU	IT DATA FOI	R: New E	Build (As	s Desigr	ned)									
Orientation				Southwes	t									
Property Tenture				1										
Transaction Type			[6										
Terrain Type			Ī	Urban										
1.0 Property Type				Flat, Semi	i-Detached									
Position of Flat				Ground-flo	oor flat									
Which Floor				0										
2.0 Number of Storeys			Ī	1										
3.0 Date Built			[:	2024										
3.0 Property Age Band			Ī	L										
4.0 Sheltered Sides			[3										
5.0 Sunlight/Shade				Average o	or unknown									
6.0 Thermal Mass Parame	ter		Ī	Precise ca	alculation									
Thermal Mass				N/A						k	J/m²K			
7.0 Electricity Tariff				Standard										
Smart electricity meter f	fitted			No										
Smart gas meter fitted				No										
7.0 Measurements					Basement round floot 1st Storey 2nd Storey 3rd Storey 4th Storey 5th Storey 7th Storey		21.33 r 0.00 m 21.33 r 0.00 m 0.00 m 0.00 m 0.00 m 0.00 m 0.00 m	1 m 1 1 1 1 1	r in	0.00 r 0.00 r 0.00 r 0.00 r 0.00 r 0.00 r 0.00 r 0.00 r	n ² m ² n ² n ² n ² n ² n ²	Avera	ge Sto 0.00 2.50 0.00 0.00 0.00 0.00 0.00 0.00	m m m m m m
8.0 Living Area			:	20.51						п	1 ²			
9.0 External Walls Description	Туре	Construct	ion			U-Value	Kappa	Gross	Nett Area	Shelter	Shelter	Openi	ngs Are	a Calculati
Cavity Wall	Cavity Wall	Cavity wal	: plasterboa		dense block,		(kJ/m²K) 150.00			Res 0.00	None	8.38	_	Type er Gross Ar
Basement Wall	Cavity Wall	Cavity wal	/, any outside I : plasterboa /, any outside	ard on dabs,	dense block,	0.18	150.00	5.27	5.27	0.00	None	0.00) Ent	er Gross Ar
9.1 Party Walls														
Description Party Wall 1	Type Filled Cav Edge Sea	ty with S	constructi Single plass avity		on both side	s, dense	cellular b	olocks,		• Kappa) (kJ/m²K) 70.00	Area (m²) 32.92	Shelter Res 0.00		Shelter None
9.2 Internal Walls	Luge Sea	nny C	avity											
Description		Co	nstructio	n									appa /m²K)	Area (n
Internal Wall 1		De	nse block	, dense pl	aster								00.00	102.5

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10.1 Party Ceilings Description		Constr								Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete planks floor, screed, carpeted									30.00	43.39
11.0 Heat Loss Floors Description	Туре	Storey Index		Construction		U- V a	lue	Shelter Code	Sh	elter Kap	pa Area (m²)
Heatloss Floor 1	Ground Floor - Solid	•		Suspended concrete floor,	carpeted	(W/m 0.1	²K)	None	Fa	ctor (kJ/r .00 75.	n²K)
12.0 Opening Types											
Description	Data Source	Туре		Glazing		Glazing	Filling	G-value	Frame	Frame	U Value
Windows	Manufacturer	Window		Double Low-E S	oft 0.05	Gap	Type Air Filled	0.63	Type Wood	Factor 0.70	(W/m²K) 1.31
13.0 Openings											
Name W01 W02 W03	Opening Ty Windows Windows Windows	pe		Location Cavity Wall Cavity Wall Cavity Wall		Orient North North North	East East East	Area (2.2 2.3 1.5	4 5 3	P	itch 0 0 0
W04	Windows			Cavity Wall		North	East	2.2	ь		0
14.0 Conservatory				None							
15.0 Draught Proofing				100				%			
16.0 Draught Lobby				No							
17.0 Thermal Bridging				Calculate Bridges							
17.1 List of Bridges			_	_							
Bridge Type E2 Other lintels (includir E3 Sill E4 Jamb E5 Ground floor (norma E7 Party floor between of E22 Basement floor E19 Ground floor (invert P1 Party wall - Ground f P3 Party wall - Intermed (in blocks of flats) E16 Corner (normal)	l) dwellings (in block ted) floor liate floor between	s of flats) dwellings	Non Inde Inde Inde Inde Tab Inde Tab	Irce Type I Gov Approved Scheme pendently assessed ependently assessed ependently assessed ependently assessed ependently assessed ependently assessed le K1 - Default ependently assessed le K1 - Default ependently assessed	4.43 15.18 16.05 16.05 5.27 5.27 15.07 15.07	Psi 0.02 0.02 0.05 0.04 -0.08 0.10 0.09 0.00	0.02 0.02 0.02 0.05 0.04 -0.08 0.10 0.09 0.00	Marmox Sp	ec		Imported No
E17 Corner (inverted – i external area)	internal area great	er than	Inde	ependently assessed	5.00	-0.07	-0.07				No
E18 Party wall between	dwellings		Inde	ependently assessed	5.00	0.05	0.05				No
Y-value				0.04				W/m²K			
18.0 Pressure Testing				Yes							
Designed AP ₅₀				4.50				m³/(h.m	²) @ 50 Pa	a	
Property Tested?				Yes							
Test Method				Blower Door							
19.0 Mechanical Ventilation	on .										
Mechanical Ventilation											
Mechanical Ventila	ation System Pres	ent		No							
20.0 Fans, Open Fireplace	s, Flues										
21.0 Fixed Cooling System	n			No							
22.0 Lighting No Fixed Lighting				No Name Lighting 1	Efficacy 80.00		wer	Capa 12		С	ount 5
24.0 Main Heating 1				Database			_				-
_								<u></u> %			
Percentage of Heat				100.00				70			
Database Ref. No.				106764							
Fuel Type				Electricity							
SAP Code				0							
In Winter				219.89							
In Summer				192.25							
Model Name				Logic Air 8kW							

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Manufacturer	Atlantic	7
		_ ¬
System Type	Heat Pump	_
Controls SAP Code	2207	=
Delayed Start Stat	No	_
HETAS approved System	No	=
Oil Pump Inside	No	_
FI Case	0.00	
Flue Type	None or Unknown	
Fan Assisted Flue	No	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	_
Flow Temperature	Enter value	_
Flow Temperature Value	55.00	
Boiler Interlock	No]
25.0 Main Heating 2	None	
26.0 Heat Networks	None	
Heat Source Fuel Type Heating U	Jse Efficiency Percentage Of Heat Heat Ele	ectrical Fuel Factor Efficiency typ
	Heat Power Ratio	
Heat source 1 None	1440	
Heat source 2 None Heat source 3 None		
Heat source 4 None		
Heat source 5 None		
28.0 Water Heating	Main Hanting 4	
Water Heating SAP Code	Main Heating 1 901	_ _
		_
Flue Gas Heat Recovery System	No	_
Waste Water Heat Recovery Instantaneous System 1	No	_
Waste Water Heat Recovery Instantaneous System 2	No	_
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	_
Summer Immersion	No	
Cold Water Source	From header tank	
Bath Count	0	
Supplementary Immersion	No	
Immersion Only Heating Hot Water	No	
28.1 Showers		
Description Shower Typ		Connected Connected To
1 Combi boile	r or unvented hot water system 7.00 [kW]	No
28.3 Waste Water Heat Recovery System		
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	Ī
Insulation Type	Measured Loss	Ī
Cylinder Volume	150.00	_ ☐ L
Loop	2.00	1300-74

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kWh/day

2.09

Loss



Pipes insulation	on			Fully insu	lated prin	nary pipewoi	k]		
In Airing Cupb	oard			No]		
31.0 Thermal Sto	re			None]		
32.0 Photovoltaid	Unit			One Dwe	lling						
Export Capab	le Meter?			Yes							
Connected To	Dwelling			Yes]		
Diverter				No]		
Battery Capac	city [kWh]			0.00]		
PV Cell	s kWp	Orientation	Elevation	Over	shading	FGHRS	MCS Cert	ificate Over Fact	shading or	Certificate	Panel Manufacturer
1.04		South West	45°	None	Or Little	No	No	1.00		Reference	
34.0 Small-scale	Hydro			None]		
Electricity Ger	nerated			0.00]		
Apportioned				0.00					kWh/Ye	ear	
Connected to	dwelling's elec	tricity meter		Yes]		
Electricity Ger	neration			Annual]		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oc	t Nov	Dec
Recommendation Lower cost m None Further meas	neasures	ve even higher	standards								

	Tunical Cost	Tomical cardena accusas	Ratings after improvement			
	Typical Cost	Typical savings per year	SAP rating	Environmental Impact		
Solar water heating			0	0		
_			0	0		
			0	0		

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Property Reference		Uni								Issued on Dat	te	05/03/2024	
Assessment Refer	rence	PV						Prop Type Ref	Te	ebby and Son (Garage		
Property		Uni	it 1, Highland	Square , Bristol									
SAP Rating					89 B		DER	3.03		TER		15.43	
Environmental					98 A		% DER < TER	t e				80.36	
CO ₂ Emissions (t/)	year)				0.11		DFEE	35.63	3	TFEE		40.78	
Compliance Check	k				See BREL		% DFEE < TF	EE				12.64	
% DPER < TPER					52.95		DPER	38.53	3	TPER		81.89	
Assessor Details										Asses	sor ID	U367-000	01
Client													
SAP 10 WORKSHEET CALCULATION OF D						2022)							
l. Overall dwell	ling charac	cteristics											
Ground floor Total floor area Dwelling volume	a TFA = (la	a)+(lb)+(lc))+(ld)+(le)(ln)	4	3.3900		Area (m2) 43.3900 (ey height (m) 2.5000 (+(3d)+(3e).		Volume (m3) 108.4750 108.4750	(lb) - (4)
2. Ventilation r	rate												
Number of open of Number of open for Number of chimne Number of flues Number of flues Number of blocke Number of interm Number of passiv Number of fluele	flues ys / flues attached t attached t ed chimneys ittent ext e vents	to solid fue to other hea s tract fans	el boiler	fire							0 * 20 = 0 * 35 = 0 * 20 =	0.0000 0.0000 0.0000 0.0000 0.0000 20.0000 0.0000	(6b) (6c) (6d) (6e) (6f) (7a) (7b)
Infiltration due Pressure test Pressure Test Me Measured/design Infiltration rat Number of sides	ethod AP50 ce		and fans	= (6a)+(6b)	+ (6c) + (6d) + (6e)+(6f)+	(6g)+(7a)+(7b)+(7c) =			/ (5) =	0.1844 Yes 31ower Door 4.5000 0.4094	(8)
Shelter factor Infiltration rat	ce adjusted	d to include	e shelter :	factor				(20) = 1 - (2)	[0.075 x 1) = (18) x			
Wind speed Wind factor Adj infilt rate	Jan 5.1000 1.2750	Feb 5.0000 1.2500	Mar 4.9000 1.2250		May 4.3000 1.0750	Jun 3.8000 0.9500		Aug 3.7000 0.9250			Nov 4.5000 1.1250		
Effective ac	0.4045				0.3411 0.5582			0.2935 0.5431		0.3411 0.5582			
3. Heat losses a	and heat lo	oss paramete	er										
Element				Gross	Openings	Net	tArea	U-value	Ax	U K-	value	AxK	
Vindows (Uw = 1.				m2	m2	8.	m2 .3800	W/m2K 1.2448	W/I 10.431	K k 2	:J/m2K	kJ/K	(27)
Meatloss Floor 1 Cavity Wall Basement Wall Cotal net area o	of external		Aum (A, m2)	40.5100 5.2700	8.3800	32. 5.	.3900 .1300 .2700 .1700	0.1200 0.1800 0.1800	5.206 5.783 0.948	8 75 4 150 6 150	.0000 .0000	3254.2500 4819.5000 790.5000	(31)
Fabric heat loss Party Wall 1 Party Ceiling 1 Internal Wall 1	o, w/K = St	unt (AXU)				43.	(26)(.9200 .3900 .5500	30) + (32) = 0.0000	22.370 0.000	0 70 30		2304.4000 1301.7000 10255.0000	(32b)
Meat capacity Cm Thermal mass par			FA) in laTh	m2K				(28)	. (30) + (32)) + (32a)	.(32e) =	22725.3500 523.7463	
List of Thermal K1 Eleme E2 Other E3 Sill E4 Jamb E5 Groun E7 Party	Bridges ent r lintels and floor (r	(including of the control of the con	other stee		ts)			4. 4. 15. 16.	4300 4300 1800 0500 0500	si-value 0.0230 0.0210 0.0160 0.0470 0.0380 -0.0800	0.79	tal 019 930 429 544 099	(55)

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P1 Part P3 Part E16 Cor E17 Cor	y wall - I ner (norma ner (inver ty wall be	round floor ntermediate 1) ted - inter tween dwell	e floor betw mal area gr Lings	reater than	ngs (in bloomer) external and		3)	15 15 9 5	.2700 .0750 .0750 .5000 .0000	0.1000 0.0930 0.0000 0.0430 -0.0730 0.0460	0.52 1.40 0.00 0.40 -0.36 0.23	20 00 85 50	(36)
Point Thermal b	ridges	rsi, carcar	acca asing	Appendia i	•1				(33) + (36)	(36a) = + (36a) =	0.0000 25.9529	
Ventilation hea (38)m Heat transfer o	Jan 20.8271	culated mon Feb 20.7134	thly (38)m Mar 20.6019	= 0.33 x (Apr 20.0783	25)m x (5) May 19.9803	Jun 19.5243	Jul 19.5243	Aug 19.4399	Sep 19.7000	Oct 19.9803	Nov 20.1785	Dec 20.3857	(38)
Average = Sum(3	46.7800	46.6663	46.5548	46.0312	45.9333	45.4772	45.4772	45.3928	45.6529	45.9333	46.1315	46.3386 46.0308	(39)
HLP HLP (average) Days in mont	Jan 1.0781 31	Feb 1.0755	Mar 1.0729	Apr 1.0609	May 1.0586	Jun 1.0481 30	Jul 1.0481 31	Aug 1.0462 31	Sep 1.0522	Oct 1.0586	Nov 1.0632	Dec 1.0680 1.0609 31	(40)
Days III MOIIC	31	20	31	30	31	30	31	31	30	31	30	31	
4. Water heatin	g energy r	equirements	(kWh/year)									1 4001	(40)
Assumed occupan Hot water usage		showers 60.7771	59.3845	57.2421	55.3227	52.6374	50.5135	52.9964	54.2453	56.9049	59.6748	1.4991	
Hot water usage	for baths 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Hot water usage Average daily h	29.9819	28.8917	27.8014 (day)	26.7112	25.6209	24.5307	24.5307	25.6209	26.7112	27.8014	28.8917	29.9819 84.1592	
Daily hot water	Jan use	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte Energy content	91.7040 135.0041 (annual)	89.6688 118.6499	87.1859 124.5869	83.9533 109.6640	80.9436 104.3040	77.1680 89.2423	75.0441 82.9260	78.6174 92.5341	80.9564 93.9054	84.7064 109.1528 Total = S	88.5665 119.7005 um(45)m =	91.6483 134.5923 1314.2622	
Distribution lo Water storage 1	20.2506	= 0.15 X (4 17.7975		16.4496	15.6456	13.3863	12.4389	13.8801	14.0858	16.3729	17.9551	20.1888	(46)
Store volume a) If manufact Temperature f Enter (49) or (urer decla actor from	Table 2b	actor is kno	own (kWh/d	lay):							150.0000 2.0900 0.5400 1.1286	(48) (49)
Total storage 1	oss 34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	
If cylinder con Primary loss Combi loss	34.9866 23.2624 0.0000	31.6008 21.0112 0.0000	34.9866 23.2624 0.0000	33.8580 22.5120 0.0000	34.9866 23.2624 0.0000	33.8580 22.5120 0.0000	34.9866 23.2624 0.0000	34.9866 23.2624 0.0000	33.8580 22.5120 0.0000	34.9866 23.2624 0.0000	33.8580 22.5120 0.0000	34.9866 23.2624 0.0000	(59)
Total heat requ	193.2531 0.0000	171.2619 0.0000	182.8359 0.0000	166.0340 0.0000	162.5530 0.0000	145.6123 0.0000	141.1750 0.0000	150.7831 0.0000	150.2754 0.0000	167.4018 0.0000	176.0705 0.0000	192.8413 0.0000	(62) (63a)
PV diverter Solar input FGHRS	-0.0000 0.0000 0.0000	-0.0000 0.0000 0.0000	-0.0000 0.0000 0.0000	-0.0000 0.0000 0.0000	-0.0000 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 0.0000	-0.0000 0.0000 0.0000	-0.0000 0.0000 0.0000	-0.0000 0.0000 0.0000	(63c)
Output from w/h	193.2531		182.8359	166.0340	162.5530	145.6123	141.1750	150.7831 Total pe	150.2754 er year (kW		176.0705 um(64)m =	192.8413 2000.0972 2000	(64)
Electric shower		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from					81.2803							0.0000	
	91.4881	81.5407	88.0243	81.5593	61.2603	74.7691	74.1721	77.3668	76.3196	82.8925	84.8964	91.3511	(65)
5. Internal gai			ia)										
Metabolic gains (66)m	Jan 74.9534	Feb 74.9534			May 74.9534			Aug 74.9534	Sep 74.9534	Oct 74.9534	Nov 74.9534	Dec 74.9534	(66)
Lighting gains Appliances gain	66.3712	73.4824	66.3712	68.5836	66.3712	68.5836	66.3712	66.3712	68.5836	66.3712	68.5836	66.3712	(67)
	130.1437	131.4941	128.0910	120.8460	111.7006	103.1051	97.3628	96.0123	99.4155	106.6605	115.8059	124.4014	(68)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	30.4953 0.0000	30.4953 0.0000	30.4953 0.0000	30.4953 0.0000				30.4953 0.0000	
Losses e.g. eva Water heating g	-59.9627	-59.9627			-59.9627	-59.9627	-59.9627	-59.9627	-59.9627	-59.9627	-59.9627	-59.9627	(71)
	122.9678		118.3123	113.2768	109.2477	103.8459	99.6937	103.9876	105.9994	111.4146	117.9117	122.7838	(72)
		371.8029	358.2604	348.1924	332.8055	321.0206	308.9137	311.8572	319.4845	329.9323	347.7872	359.0424	(73)
6. Solar gains													
[Jan]				rea m2	Solar flux Table 6a W/m2	Specif or 1	g fic data Table 6b	Specific or Tab	FF data le 6c	Acce: fact: Table	ss or 6d	Gains W	
Northeast			8.38	300	11.2829							28.8960	(75)
Solar gains Total gains													

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7. Mean interna	al temperat	ture (heati	ng season)										
Temperature du	ring heatin	ng periods	in the livi			Th1 (C)						21.0000	(85)
Utilisation factau	Jan	Feb	Mar 135.5949	Apr	May 137.4297	Jun 138.8078	Jul 138.8078	Aug 139.0661	Sep 138.2737	Oct 137.4297	Nov 136.8393	Dec 136.2275	
alpha util living are		10.0181	10.0397	10.1425	10.1620	10.2539	10.2539	10.2711	10.2182	10.1620	10.1226	10.0818	
Living	0.9995 20.4831	0.9984	0.9926 20.7141	0.9366 20.9094	0.7428	0.5100	0.3690	0.4194	0.6964	0.9680 20.8814	0.9978 20.6555	0.9996	(86)
Non living			19.7298	19.9614 0	20.0308	20.0434	20.0434	20.0450 0	20.0390	19.9398 0	19.6643 0	19.4258	
16 / 9	28	0	0	0	0	0	0	0	0	0		0 10	
	20.7356 20.0187 ouse	20.5713 20.0209	20.7141 20.0230	20.9094 20.0329	20.9917 20.0348	20.9998 20.0434	21.0000 20.0434	21.0000 20.0450	20.9966 20.0401	20.8814 20.0348	20.6555 20.0310	20.5453 20.0271	
MIT 2	0.9991 19.7855	0.9972 19.5481	0.9872 19.7298	0.9014 19.9614	0.6714 20.0308	0.4339 20.0434	0.2888 20.0434	0.3323 20.0450	0.6031 20.0390	0.9407 19.9398	0.9958	0.9993 19.5341 0.4727	(90)
Living area fra MIT Temperature ad	20.2346	20.0317	20.1951	20.4095	20.4850	20.4955	20.4956	20.4964	20.4916	Living are 20.3849		20.0121	
adjusted MIT		20.0317	20.1951	20.4095	20.4850	20.4955	20.4956	20.4964	20.4916	20.3849	20.1328	20.0121	(93)
8. Space heatin													
Utilisation	Jan 0.9992	Feb 0.9972	Mar 0.9884	Apr 0.9167	May 0.7054	Jun 0.4699	Jul 0.3267	Aug 0.3735	Sep 0.6476	Oct 0.9524	Nov 0.9961	Dec 0.9993	(94)
Useful gains Ext temp.	4.3000	429.4320 4.9000	458.8505 6.5000	478.7050 8.9000	399.7557 11.7000	268.0485 14.6000	177.1596 16.6000	185.9438 16.4000	290.5279 14.1000	382.7005 10.6000	382.6469 7.1000	382.3786 4.2000	
Heat loss rate Space heating 1	745.4220	706.1422	637.5718	529.7965	403.5234	268.1102	177.1608	185.9485	291.7967	449.4529	601.2233	732.7118	(97)
Space heating	261.7938 requirement		132.9686 er year (kW	36.7858 h/year)	2.8032	0.0000	0.0000	0.0000	0.0000	49.6638	157.3750	260.6479 1087.9874	(98a)
Solar heating (0.0000	0.0000 on - total	0.0000 per year (ki	0.0000 Wh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Space heating 1	kWh 261.7938	185.9492	132.9686	36.7858	2.8032	0.0000	0.0000	0.0000	0.0000	49.6638	157.3750	260.6479 1087.9874	(98c)
Space heating page 5		, alter sol	ar contribu	cion - cocai	. per year	(KWII/Year)				(98c) / (4) =	25.0746	(99)
9a. Energy requ	uirements -	- Individua	l heating s	ystems, incl	uding micr	ro-CHP							
Fraction of spa Fraction of spa	ace heat fr	com main sy	stem(s)		(Table 11	1)						0.0000 1.0000	(202)
Efficiency of r Efficiency of r Efficiency of s	main space	heating sy	stem 2 (in	웅)								219.8872 0.0000 0.0000	(207)
Lillerency of .	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(200)
Space heating :	261.7938	185.9492	132.9686	36.7858	2.8032	0.0000	0.0000	0.0000	0.0000	49.6638	157.3750	260.6479	(98)
Space heating e	219.8872	219.8872	219.8872		219.8872	0.0000	0.0000	0.0000	0.0000	219.8872	219.8872	219.8872	(210)
	119.0582	84.5658	60.4713	16.7294	1.2748	0.0000	0.0000	0.0000	0.0000	22.5860	71.5708	118.5371	(211)
Space heating of Space heating is	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 i	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)
	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 193.2531		182.8359	166.0340	162.5530	145.6123	141.1750	150.7831	150.2754	167.4018	176.0705	192.8413	(64)
	192.2472	192.2472	192.2472	192.2472	192.2472	192.2472	192.2472	192.2472	192.2472	192.2472	192.2472	192.2472 192.2472	
Fuel for water	100.5232	89.0842	95.1046	86.3649	84.5542	75.7422	73.4341	78.4319	78.1678	87.0763	91.5855	100.3090	(219)
Space cooling (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	
Pumps and Fa Lighting	0.0000 13.7906	0.0000 11.0634	0.0000 9.9613	0.0000 7.2981	0.0000 5.6373	0.0000 4.6057	0.0000 5.1425	0.0000 6.6844	0.0000 8.6824	0.0000 11.3918	0.0000 12.8670	0.0000 14.1739	
	-19.3527	-28.9497	-43.6155	-50.2036	-55.5668		-51.8109	-48.1887	-41.2895	-33.2584	-21.6905	-16.5374	(233a)
Electricity ger (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 ger (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 use (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 ger (233b)m Electricity ger	-5.5111	-12.3325	-26.1162	-42.3787	-58.0267		-58.2088	-48.4648	-35.0681	-19.3610	-7.7611	-4.2966	(233b)
(234b)m Electricity ger	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 itv)	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
(235b)m Electricity use	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 eneration)	0.0000	0.0000	0.0000	0.0000	(235b)
(235d)m Annual totals 1	0.0000 kWh/year	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Space heating in Space heating in	fuel – main	n system 2										494.7935 0.0000	(213)
Space heating in Efficiency of w	water heate											0.0000 192.2472	
Water heating i	fuel used											1040.3780 0.0000	
Electricity for Total electric Electricity for	ity for the	above, kW		ix L)								0.0000 111.2982	

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Energy saving/generation technologies (Appendices M ,N and Q) PV generation Wind generation Hydro-electric generation (Appendix N) Electricity generated - Micro CHP (Appendix N) Appendix Q - special features Energy saved or generated Energy used Total delivered energy for all uses	-839.3408 (233) 0.0000 (234) 0.0000 (235a) 0.0000 (235) -0.0000 (236) 0.0000 (237) 807.1289 (238)
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP	
Energy Emission factor	Emissions
Emily Emilsion Retter Ref C02/kWh	
Total CO2 associated with community systems Water heating (other fuel) 1040.3780 0.1406	0.0000 (373)
Space and water heating Pumps, fans and electric keep-hot 0.0000 0.0000	224.2345 (265)
Energy for lighting 111.2982 0.1443	
Energy saving/generation technologies PV Unit electricity used in dwelling -463.0509 0.1338 PV Unit electricity exported -376.2900 0.1242 Total CO2, kg/year	-61.9635 -46.7419 -108.7054 (269) 131.5929 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)	3.0300 (273)
13a. Primary energy - Individual heating systems including micro-CHP	
Energy Primary energy factor kWh/year kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1 494.7935 1.5832 Total CO2 associated with community systems	783.3654 (275) 0.0000 (473)
Water heating (other fuel) 1040.3780 1.5199 Space and water heating	
Pumps, fans and electric keep-hot 0.0000 0.0000 Energy for lighting 111.2982 1.5338	0.0000 (281) 170.7130 (282)
Energy saving/generation technologies PV Unit electricity used in dwelling -463.0509 1.4945 PV Unit electricity exported -376.2900 0.4559	-692.0394 -171.5539
Total Total Primary energy kWh/year Dwelling Primary energy Rate (DPER)	-863.5933 (283) 1671.7536 (286) 38.5300 (287)
DWEITING FIRMARY ENERGY RACE (DFER)	30.3300 (207)
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS	
1. Overall dwelling characteristics	Volume
1. Overall dwelling characteristics	(4)
1. Overall dwelling characteristics Area (m2) (m) Ground floor (10) (10) (10) (10) (10) (10) (10) (10)	(m3) 2b) = 108.4750 (1b) - (3b) (4)
1. Overall dwelling characteristics Area Storey height (m2) (m) (3a)+(3b)+(3c)+(3d)+(3e) Storey height (m2) (m) (3a)+(3b)+(3c)+(3d)+(3e) (3a)+(3b)+(3c)+(3d)+(3e)	(m3) 2b) = 108.4750 (1b) - (3b) (4)
1. Overall dwelling characteristics Area Storey height (m2) (m) Ground floor area TFA = (la)+(lb)+(lc)+(ld)+(le)(ln) 43.3900 (lb) x 2.5000 (2 (3a)+(3b)+(3c)+(3d)+(3e) 2. Ventilation rate Number of open chimneys Number of pen flues Number of chimneys / flues attached to closed fire Number of flues attached to solid fuel boiler Number of blocked chimneys Number of blocked chimneys Number of intermittent extract fans Number of passive vents	(m3) 2b) = 108.4750 (1b) - (3b) (4) (3n) = 108.4750 (5)
1. Overall dwelling characteristics Area Storey height (m2) (m) (3.3900 (lb) x 2.5000 (2.7000 (lo) (3.3900 (lo) (lo) (lo) (3.3900 (lo) (lo) (lo) (lo) (lo) (lo) (lo) (lo)	(m3) 2b) = 108.4750 (1b) - (3b) (4)(3n) = 108.4750 (5) m3 per hour 0 * 80 = 0.0000 (6a) 0 * 20 = 0.0000 (6b) 0 * 20 = 0.0000 (6d) 0 * 20 = 0.0000 (6d) 0 * 20 = 0.0000 (6f) 2 * 10 = 20.0000 (7a) 0 * 10 = 0.0000 (7c) Air changes per hour
1. Overall dwelling characteristics Area (m2) (m2) (m3) (m3) (m4) (m2) (m3) (m3) (m4) (m4) (m2) (m4) (m4) (m4) (m4) (m4) (m4) (m4) (m4	(m3) 2b) = 108.4750 (1b) - (3b) (4)(3n) = 108.4750 (5) m3 per hour 0 * 80 = 0.0000 (6a) 0 * 20 = 0.0000 (6b) 0 * 20 = 0.0000 (6d) 0 * 20 = 0.0000 (6d) 0 * 20 = 0.0000 (6f) 2 * 10 = 20.0000 (7a) 0 * 10 = 0.0000 (7b) 0 * 40 = 0.0000 (7c) Air changes per hour / (5) = Yes Blower Door 5.0000 (17) 0.4344 (18) 3 (19) (19)] = 0.7750 (20)
1. Overall dwelling characteristics	(m3) 2b) = 108.4750 (1b) - (3b) (4)(3n) = 108.4750 (5) m3 per hour 0 * 80 = 0.0000 (6a) 0 * 20 = 0.0000 (6b) 0 * 20 = 0.0000 (6d) 0 * 20 = 0.0000 (6d) 0 * 20 = 0.0000 (6f) 2 * 10 = 20.0000 (7a) 0 * 10 = 0.0000 (7b) 0 * 40 = 0.0000 (7c) Air changes per hour / (5) = Yes Blower Door 5.0000 (17) 0.4344 (18) 3 (19) (19)] = 0.7750 (20)

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Heat losses and heat losses												
Element			Gross	Openings		tArea	U-value	Αx		K-value	AxK	
TER Opening Type (Uw = 1.2 Heatloss Floor 1 Cavity Wall Basement Wall	20)		m2 40.5100 5.2700	m2 8.3800	8 43 32	m2 .3800 .3900 .1300 .2700	W/m2K 1.1450 0.1300 0.1800 0.1800	W, 9.599 5.640 5.780 0.940	54 07 34	kJ/m2K	kJ/K	(27) (28a) (29a) (29a)
Total net area of external Fabric heat loss, W/K = St Party Wall 1		Aum(A, m2)			89	.1700	0) + (32) = 0.0000		81			(31) (33) (32)
Thermal mass parameter (The List of Thermal Bridges	MP = Cm / 1	FFA) in kJ/m	2K								533.7463	(35)
K1 Element E2 Other lintels E3 Sill E4 Jamb E5 Ground floor (r E7 Party floor bet E22 Basement floor E19 Ground floor P1 Party wall - G P3 Party wall - I E16 Corner (normal E17 Corner (invert E18 Party wall bet Thermal bridges (Sum(L x)	normal) tween dwell r (inverted) round floon ntermediate 1) ted - inter tween dwell	lings (in bl r e floor betw rnal area gr lings	ocks of fla	ngs (in bloo external an		3)	4. 44 15. 16. 16. 5. 5. 15. 15.	.4300 .4300 .1800 .0500 .0500 .2700 .2700 .0750	Psi-value 0.0500 0.0500 0.0500 0.0500 0.0700 0.0700 0.0700 0.0800 0.0900 -0.0900 0.0600	Tot: 0.22 0.22 0.75 2.56 1.12 0.36 0.36 1.20 0.00 0.85 -0.45 0.30	15 15 90 80 335 89 89 60 00 50	(36)
Point Thermal bridges Total fabric heat loss								(:	33) + (36)	(36a) = + (36a) =	0.0000 29.5104	
Ventilation heat loss cald Jan	Feb	Mar	Apr	25)m x (5) May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m 21.1957 Heat transfer coeff 50.7061 Average = Sum(39)m / 12 =	21.0677 50.5781	20.9422 50.4526	20.3527 49.8631	20.2424 49.7528	19.7290 49.2394	19.7290 49.2394	19.6339 49.1443	19.9267 49.4372	20.2424 49.7528		20.6988 50.2092 49.8626	(39)
Jan HLP 1.1686	Feb 1.1657	Mar 1.1628	Apr 1.1492	May 1.1466	Jun 1.1348	Jul 1.1348	Aug 1.1326	Sep 1.1394	Oct 1.1466	Nov 1.1518	Dec 1.1572	(40)
HLP (average) Days in mont 31	28	31	30	31	30	31	31	30	31	30	1.1492 31	
4. Water heating energy re	equirements											
Assumed occupancy		,,									1.4991	(42)
Hot water usage for mixer 63.3218	62.3702	60.9836	58.3304	56.3725	54.1890	52.9479	54.3240	55.8326	58.1770	60.8871	63.0792	(42a)
Hot water usage for baths 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other 29.9819 Average daily hot water us	28.8917	27.8014 /day)	26.7112	25.6209	24.5307	24.5307	25.6209	26.7112	27.8014	28.8917	29.9819 85.6369	
Jan Daily hot water use	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
93.3038 Energy conte 147.7704 Energy content (annual)	91.2619 129.9558		85.0416 116.4177	81.9934 110.3789	78.7196 96.7950	77.4785 93.7036	79.9450 98.9886	82.5438 101.7847		89.7788 127.9064 Sum(45)m =	93.0612 145.7113 1422.5435	(45)
Water storage loss:	= 0.15 x (4 19.4934		17.4627	16.5568	14.5192	14.0555	14.8483	15.2677	17.5008	19.1860	21.8567	
Store volume a) If manufacturer declar Temperature factor from Enter (49) or (54) in (55)	Table 2b	actor is kmo	wn (kWh/da	ay):							150.0000 1.3938 0.5400 0.7527	(48) (49)
Total storage loss 23.3325 If cylinder contains dedic		23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
23.3325 Primary loss 23.2624 Combi loss 0.0000	21.0745 21.0112 0.0000	23.3325 23.2624 0.0000	22.5120 0.0000	23.2624 0.0000	22.5120	23.2624	23.3325 23.2624 0.0000	22.5120	23.2624	22.5798 22.5120 0.0000	23.3325 23.2624 0.0000	(59)
Total heat required for wa 194.3653 WWHRS -28.9481 PV diverter -0.0000 Solar input 0.0000	172.0415 -25.6019 -0.0000 0.0000	183.0541 -26.8089 -0.0000 0.0000	161.5095 -22.1988 -0.0000 0.0000	156.9738 -20.6885 -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 0.0000	-0.0000 0.0000	(63b) (63c)
FGHRS 0.0000 Output from w/h 165.4172			0.0000				127.9374		141.6737	148.5358	163.8942	(64)
12Total per year (kWh/year Electric shower(s)	r)						Total pe	er year (kWl	h/year) = 1	Sum(64)m =	1702.1872 1702	(64) (64)
0.0000 Heat gains from water heat	0.0000 ting. kWh/m	0.0000 month	0.0000 Tota	0.0000 al Energy us	0.0000 sed by insta	0.0000 antaneous el	0.0000 ectric show	0.0000 wer(s) (kWh	0.0000 /year) = S	0.0000 um(64a)m =	0.0000	(64a) (64a)
86.4096	76.8789	82.6486	74.7824	73.9769	68.2578	68.4324	70.1896	69.9169	76.0693	78.6024	85.7249	(65)
												
5. Internal gains (see Tah												
Jan	Feb	Mar 74.9534	Apr 74.9534	May 74.9534	Jun 74.9534	Jul 74.9534	Aug 74.9534	Sep 74.9534	Oct 74.9534	Nov 74.9534	Dec 74.9534	(66)
Lighting gains (calculated 66.3712	d in Append 73.4824	dix L, equat 66.3712	ion L9 or 1 68.5836	19a), also s 66.3712	see Table 5 68.5836	66.3712	66.3712	68.5836			66.3712	
Appliances gains (calculat 130.1437	ted in Appe 131.4941	endix L, equ 128.0910	ation L13 o 120.8460	or L13a), al 111.7006	lso see Tab: 103.1051	le 5 97.3628		99.4155	106.6605	115.8059	124.4014	
Cooking gains (calculated 30.4953 Pumps, fans 3.0000 Losses e.g. evaporation (n	30.4953	30.4953 3.0000	30.4953	30.4953	30.4953	30.4953	30.4953 0.0000	30.4953 0.0000	30.4953 3.0000	30.4953 3.0000	30.4953 3.0000	

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Ustan basting		-59.9627	-59.9627	-59.9627	-59.9627	-59.9627	-59.9627	-59.9627	-59.9627	-59.9627	-59.9627	-59.9627	(71)
Water heating	116.1419	114.4031	111.0869	103.8644	99.4313	94.8025	91.9790	94.3409	97.1068	102.2437	109.1699	115.2217	(72)
Total internal		367.8656	354.0350	341.7800	325.9891	311.9772	301.1990	302.2104	310.5919	323.7614	342.0454	354.4803	(73)
6. Solar gains													
[Jan]			λ,	rea	Solar flux		g		FF	Acces		Gains	
[vaii]				m2	Table 6a W/m2	Specif or 1	fic data Table 6b	Specific or Tab	data le 6c	facto Table 6	or	W	
Northeast				300						0.770	00	28.8960	(75)
Solar gains Total gains	28.8960 390.0388	58.8187 426.6843	105.9726 460.0076	174.0374 515.8174	233.9405 559.9295	249.4053 561.3825	233.3136 534.5126	186.0003 488.2107	129.1293 439.7212	71.8811 395.6425	36.3587 378.4041		
7. Mean intern	al tempera	ture (heati	ng season)										
Temperature du	ring heati	ng periods i	in the livin	ng area from	n Table 9, I							21.0000	(85)
Utilisation fa	Jan	Feb 127.1919	Mar	Apr	May	Jun	Jul 130.6500	Aug	Sep 130.1273	Oct 129.3017	Nov	Dec 128.1264	
	9.4580	9.4795	9.5006	9.6010	9.6201	9.7100	9.7100	9.7268	9.6752	9.6201	9.5816	9.5418	
util living ul	0.9996	0.9990	0.9954	0.9602	0.8000	0.5604	0.4053	0.4629	0.7598	0.9811	0.9986	0.9997	(86)
MIT Th 2	20.4061 19.9452	20.4954 19.9476	20.6441 19.9499	20.8593 19.9609	20.9808 19.9629	20.9993 19.9725	21.0000 19.9725	20.9999 19.9743	20.9908 19.9688	20.8316 19.9629	20.5876 19.9588	20.3942 19.9544	
util rest of h	0.9994	0.9982	0.9918	0.9330	0.7238	0.4711	0.3107	0.3598	0.6558	0.9620	0.9974	0.9995	
MIT 2 Living area fr			19.5789	19.8434	19.9532	19.9723	19.9725	19.9743		19.8205 Living area		19.2646	(91)
MIT Temperature ad adjusted MIT	justment	19.9117	20.0824	20.3236	20.4389	20.4578	20.4582	20.4591	20.4503	20.2984	20.0224	19.7986 0.0000 19.7986	
aajastea mii	13.0002	13.3117	20.0024	20.0200	20.4005	20.4070	20.4002	20.4031	20.4000	20.2304	20.0224	13.7500	(55)
8. Space heati													
Utilisation	Jan 0.9993	Feb 0.9981	Mar 0.9924	Apr 0.9440	May 0.7602	Jun 0.5134	Jul 0.3554	Aug 0.4086	Sep 0.7059	Oct 0.9696	Nov 0.9975	Dec 0.9995	(94)
Useful gains Ext temp.	389.7796	425.8899		486.9341 8.9000				199.4613 16.4000	310.3977 14.1000	383.6328 10.6000			(95)
Heat loss rate	W			569.6176		288.4343	189.9744		313.9427	482.5240	645.8076	783.1914	
Space heating	295.0553	224.0256			6.8064	0.0000	0.0000	0.0000	0.0000	73.5751	193.2058	301.5439	(98a)
Space heating Solar heating	kWh	_		-								1323.9273	(0.01-)
Solar heating Space heating	contributi	0.0000 on - total p		0.0000 Wh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Space heating	295.0553			59.5322 tion - total		0.0000 (kWh/year)	0.0000	0.0000	0.0000	73.5751	193.2058	301.5439 1323.9273	(98c)
Space heating										(98c)	/ (4) =	30.5123	(99)
9a. Energy req	uirements ·	- Individual	l heating sy	ystems, incl	uding micro	-CHP							
Fraction of sp Fraction of sp	ace heat f	rom seconda:	ry/supplemen									0.0000	
Efficiency of Efficiency of	main space main space	heating sys	stem 1 (in 9 stem 2 (in 9	b)								92.3000 0.0000	(206) (207)
Efficiency of	_		_	_		_						0.0000	(208)
Space heating		Feb t 224.0256	Mar 170.1830	Apr 59.5322	May 6.8064	Jun 0.0000	Jul 0.0000	Aug 0.0000	Sep 0.0000	Oct 73.5751	Nov 193.2058	Dec 301.5439	(98)
Space heating	efficiency		ing system 1	L)	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	
Space heating	fuel (main		stem)		7.3742	0.0000	0.0000	0.0000	0.0000	79.7130		326.6998	
Space heating	efficiency 0.0000	(main heat: 0.0000	ing system 2 0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Space heating	0.0000	0.0000	o.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating	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	requiremen	t											
Efficiency of	165.4172 water heat	146.4396 er	156.2453	139.3107	136.2853	124.1835	123.7045	127.9374	128.5601	141.6737	148.5358	79.8000	(216)
(217)m Fuel for water	85.3423 heating,	85.0102 kWh/month	84.2518	82.2972	80.1866	79.8000	79.8000	79.8000	79.8000	82.6637	84.6504	85.4081	(217)
Space cooling	fuel requi:	rement								171.3855			
(221)m Pumps and Fa Lighting	7.3041	6.5973	0.0000 7.3041 9.9613	0.0000 7.0685 7.2981 ative quanti	0.0000 7.3041 5.6373	7.0685	0.0000 7.3041 5.1425	0.0000 7.3041 6.6844	0.0000 7.0685 8.6824	0.0000 7.3041 11.3918	0.0000 7.0685 12.8670		(231)
Electricity ge (233a)m	nerated by	PVs (Append	dix M) (nega		ty)								
Electricity ge (234a)m	nerated by	wind turbing	nes (Appendi 0.0000	ix M) (negat 0.0000	ive quantit	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Electricity ge (235a)m	nerated by 0.0000	hydro-elect 0.0000	0.0000	tors (Append	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	
Electricity us (235c)m								0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

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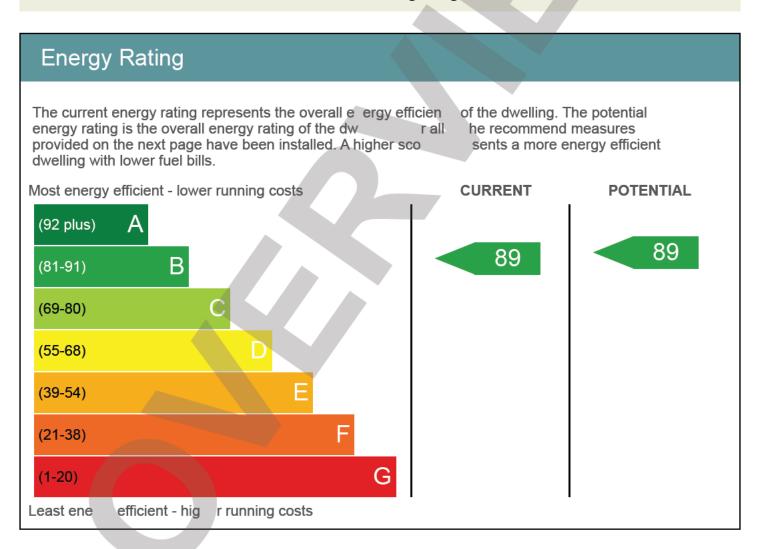
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m -6.1529 -13.1539 -26.5252 -40.3859 -53.9128 -54.3187 -53	3.6401 -45.1504	-32.7709	-18.9480	-8.2625	-4.8471	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.0		0.0000	0.0000	0.0000	0.0000	(234b)
(235b)m 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 (235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0	0.0000 0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year Space heating fuel - main system 1 Space heating fuel - main system 2 Space heating fuel - secondary Efficiency of water heater Water heating fuel used Space cooling fuel					1434.3741 0.0000 0.0000 79.8000 2061.5897 0.0000	(213) (215) (219)
Electricity for pumps and fans: Total electricity for the above, kWh/year Electricity for lighting (calculated in Appendix L)					86.0000 111.2982	
Energy saving/generation technologies (Appendices M ,N and Q) PV generation Wind generation Hydro-electric generation (Appendix N) Electricity generated - Micro CHP (Appendix N) Appendix Q - special features					-714.8865 0.0000 0.0000 0.0000	(234) (235a)
Energy saved or generated Energy used Total delivered energy for all uses					-0.0000 0.0000 2978.3756	(237)
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP						
	Energy kWh/year		ion factor	1	Emissions g CO2/year	
Space heating - main system 1	1434.3741		kg CO2/kWh 0.2100	ĸ	301.2186	(261)
Total CO2 associated with community systems Water heating (other fuel)					301.2186 0.0000 432.9338	(261) (373) (264)
Total CO2 associated with community systems	1434.3741		0.2100		301.2186 0.0000	(261) (373) (264) (265) (267)
Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies	1434.3741 2061.5897 86.0000 111.2982		0.2100 0.2100 0.1387 0.1443		301.2186 0.0000 432.9338 734.1524 11.9293 16.0638	(261) (373) (264) (265) (267)
Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported	1434.3741 2061.5897 86.0000		0.2100 0.2100 0.1387		301.2186 0.0000 432.9338 734.1524 11.9293 16.0638	(261) (373) (264) (265) (267) (268)
Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling	1434.3741 2061.5897 86.0000 111.2982 -356.8179		0.2100 0.2100 0.1387 0.1443		301.2186 0.0000 432.9338 734.1524 11.9293 16.0638	(261) (373) (264) (265) (267) (268) (269) (272)
Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year	1434.3741 2061.5897 86.0000 111.2982 -356.8179 -358.0686		0.2100 0.2100 0.1387 0.1443		301.2186 0.0000 432.9338 734.1524 11.9293 16.0638 -47.7245 -44.9435 -92.6679 669.4775	(261) (373) (264) (265) (267) (268) (269) (272)
Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER)	1434.3741 2061.5897 86.0000 111.2982 -356.8179 -358.0686		0.2100 0.2100 0.1387 0.1443		301.2186 0.0000 432.9338 734.1524 11.9293 16.0638 -47.7245 -44.9435 -92.6679 669.4775	(261) (373) (264) (265) (267) (268) (269) (272)
Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) 13a. Primary energy - Individual heating systems including micro-CHP Space heating - main system 1	1434.3741 2061.5897 86.0000 111.2982 -356.8175 -358.0686	Primary ene	0.2100 0.2100 0.1387 0.1443 0.1338 0.1255	Prima	301.2186 0.0000 432.9338 734.1524 11.923 16.0638 -47.7245 -44.9435 -92.6679 669.4775 15.4300	(261) (373) (264) (265) (267) (268) (269) (272) (273)
Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel)	1434.3741 2061.5897 86.0000 111.2982 -356.8179 -358.0686	Primary ene	0.2100 0.2100 0.1387 0.1443 0.1338 0.1255	Prima	301.2186 0.0000 432.9338 734.1524 11.9293 16.0638 -47.7245 -44.9435 -92.6679 669.4775 15.4300 ary energy kWh/year 1620.8428 0.0000 2329.5963	(261) (373) (264) (265) (267) (268) (269) (272) (273) (273)
Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot	1434.3741 2061.5897 86.0000 111.2982 -356.8179 -358.0686 Energy kWh/year 1434.3741 2061.5897	Primary ene	0.2100 0.2100 0.1387 0.1443 0.1338 0.1255 ergy factor kg CO2/kWh 1.1300 1.1300 1.5128	Prima	301.2186 0.0000 432.9338 734.1524 11.9293 16.0638 -47.7245 -44.9435 -92.6679 669.4775 15.4300 ary energy kWh/year 1620.8428 0.0000 2329.5963 3950.4391 130.1008	(261) (373) (264) (265) (267) (268) (269) (272) (273) (273) (275) (473) (278) (279) (281)
Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies FV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Space and water heating	1434.3741 2061.5897 86.0000 111.2982 -356.8175 -358.0686	Primary ene	0.2100 0.2100 0.1387 0.1443 0.1338 0.1255 rgy factor kg CO2/kWh 1.1300 1.1300	Prima	301.2186 0.0000 432.9338 734.1524 11.9223 16.0638 -47.7245 -44.9435 -92.6679 669.4775 15.4300 ary energy kWh/year 1620.8428 0.0000 2329.5963 3950.4391	(261) (373) (264) (265) (267) (268) (269) (272) (273) (273) (275) (473) (278) (279) (281)

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Dwelling Address	Unit 1, Highland Square , Bristol
Report Date	05/03/2024
Property Type	Flat, Semi-Detached
Floor Area [m ²]	43

This document is not an Energy Performance Certificat EPC) s required by the Energy Performance of Buildings Reg io



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Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good
Feature	Description			gy Performance
Walls	Average thermal transmi	ttance 0.18 W/m²K		Very Good
Floor	Average thermal transmi	ttance 0.12 W/m²K		Very Good
Windows	High performance glazin	g		Good
Main heating	Air source heat pump, ra	diators, electric		Average
Main heating controls	Time and temperature zo	one control		Very Good
Secondary heating	None			
Hot water	From main system			Average
Lighting	Good lighting e iciency			Good
Air tightness	Air perm ity [AP5	4.5 m³/h.m² (assumed)		Good

Primary Energy e

The primary ener e for this operty per year is 34 kilowatt hour (kWh) per square metre

Estimat d C emissions of the dwelling

The estimed CO rating rovides an indication of the dwelling's impact on the environment in terms of carbon dio emissio; the higher the rating the less impact it has on the environment.

The estimated CO emissions for this dwellings is: 0.1 per year

With the recommended measures the potential CO emissions could be: per year

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Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.

To reach the dwelling's potential energy rating all of the recommended measures shown below would need to installed. Having these measures installed individually or in any other order may give a different result who pared work the cumulative potential rating.

Recommended measure	Typical	Potential Rating	lative	Cumulative
	Yearly	after	s	Potential
	Saving	measure installed	(per yea	Rating

Estimated energy use and potential savin s

Estimated energy cost for this property over a year

£242

Over a year you could save

£0

The estimated cost and savings show how much the average househ would spend in this property heating, lighting and hot water. It not based on how energy is ed by the people living at the propert

Contacting asses or and the accreditation scheme

As	sessor contact details
Asse r name	
Assess accredita n number	
Email Address	

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Accreditation scheme contact details						
Accreditation scheme	Elmhurst Energy Systems Ltd					
Telephone						
Email Address						

Assessment details		
Related party disclosure	No related pa	
Date of assessment	05/03/202	
Date of certificate	05/03/202	
Type of assessment	SAP w dwellin	



Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Tue 05 Mar 2024 08:41:58

Project Information			
Assessed By		Building Type	Flat, Semi-detached
OCDEA Registration	EES/025661	Assessment Date	2024-03-05

Dwelling Details			
Assessment Type	As designed	Total Floor Area	43 m ²
Site Reference	Unit 2	Plot Reference	Residual
Address	Unit 1 Highland Square, Bristo	ol	•

Client Details	
Name	Tebby & Son
Company	SF Tebby & Son
Address	Unit 11 Avon Gorge Industrial Estate , Bristol, BS2 9XX

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission	rate		
Fuel for main heating system	Electricity		
Target carbon dioxide emission rate	14.62 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	5.86 kgCO ₂ /m ²	OK	
1b Target primary energy rate and dwelling prin	1b Target primary energy rate and dwelling primary energy		
Target primary energy	77.71 kWh _{PE} /m ²		
Dwelling primary energy	62.13 kWh _{PE} /m ²	OK	
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	35.8 kWh/m ²		
Dwelling fabric energy efficiency	31.6 kWh/m ²	OK	

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m²K]	Dwelling average U-Value [W/m²K]	Element with highest individual U-Value	
External walls	0.26	0.18	Walls (1) (0.18)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	0.12	Heatloss Floor 1 (0.12)	OK
Roofs	0.16	N/A	N/A	N/A
Windows, doors,	1.6	1.31	W01 (1.31)	OK
and roof windows				
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	Net area [m ²]	U-Value [W/m ² K]
Exposed wall: Walls (1)	37.82	0.18
Party wall: Party Wall (1)	41.54	0 (!)
Ground floor: Heatloss Floor 1, Heatloss Floor 1	42.61	0.12

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
W01, Windows	1.86	North East	0.7	1.31
W02, Windows	1.86	North East	0.7	1.31
W03, Windows	1.86	South East	0.7	1.31

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part 1 -	Main Dwelling: Thermal bridging ca	alculated from linear thermal transmit	tances for eac	h junction
Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Not government-approved scheme	0.023 (!)	
External wall	E3: Sill	Calculated by person with suitable expertise	0.021 (!)	
External wall	E4: Jamb	Calculated by person with suitable expertise	0.016 (!)	

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.047	
External wall	E7: Party floor between dwellings (in blocks of flats)	Calculated by person with suitable expertise	0.038 (!)	
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.093	
Party wall	P3: Intermediate floor between dwellings (in blocks of flats)	SAP table default	0 (!)	
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.043	
External wall	E25: Staggered party wall between dwellings	Calculated by person with suitable expertise	0.036 (!)	
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.046	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	8 m ³ /hm ²	
Dwelling air permeability at 50Pa	5 m ³ /hm ² , Design value	ОК
Air permeability test certificate reference		·

4 Space heating			
Main heating system 1: Heat pump with	radiators or underfloor heating - Electricity		
Efficiency	216.4%		
Emitter type	Radiators		
Flow temperature	55°C		
System type	Heat Pump		
Manufacturer	Atlantic		
Model	Logic Air 8kW		
Commissioning			
Secondary heating system: N/A	Secondary heating system: N/A		
Fuel	N/A		
Efficiency	N/A		
Commissioning			

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	150 litres
Declared heat loss	2.09 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 -	type: N/A
Efficiency	
Manufacturer	
Model	

6 Controls									
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services									
Function									
Ecodesign class									
Manufacturer									
Model									
Water heating - type: Cylinder thermosta	at and HW separately timed								
Manufacturer									
Model									

7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation										
System type: N/A Maximum permitted specific fan power	N/A									
Specific fan power	N/A		N/A							
Minimum permitted heat recovery efficiency	N/A		IVA							
Heat recovery efficiency	N/A		N/A							
Manufacturer/Model										
Commissioning										
9 Local generation N/A										
10 Heat networks N/A										
11 Supporting documentary evidence N/A										
12 Declarations										
a. Assessor Declaration										
I -		ontents of this BREL Compliance Report of this dwelling for								
the purpose of carrying out the "As d evidence (SAP Conventions, Append documentary evidence required) has Compliance Report.	dix 1 (documentary ev									
			•							
Signed:		Assessor ID:								
Name:		Date:								

b. Client Declaration

N/A



Property Reference	Ur	nit 2							Issued	d on Date	05/03	3/2024	
Assessment Reference	e Re	esidual				Prop	Type	Ref	Tebby a	nd Son G	arage		
Property	Ur	nit 1, Highla	nd Square	, Bristol									
SAP Rating				82 B	DER		5.86	6		TER	14	1.62	
Environmental				96 A	% DER	< TER					59	9.92	
CO₂ Emissions (t/year	·)			0.23	DFEE		31.5	57		TFEE	35	5.81	
Compliance Check				See BREL	% DFE	E < TFEE					11	1.86	
% DPER < TPER				20.05	DPER		62.1	3		TPER	77	7.71	
Assessor Details										Assesso	r ID U:	367-00	001
Client			-										
SUMMARY FOR INF	PUT DATA	FOR: Nev	v Build (<i>F</i>	As Designed)									
Orientation				Southeast									
Property Tenture				1									
Transaction Type				6									
Terrain Type				Urban									
1.0 Property Type				Flat, Semi-Detache	ed								
Position of Flat				Ground-floor flat									
Which Floor				0									
2.0 Number of Storeys				1									
3.0 Date Built				2024									
3.0 Property Age Band				L									
4.0 Sheltered Sides				3									
5.0 Sunlight/Shade				Average or unknow	m								
6.0 Thermal Mass Paran	neter			Precise calculation									
Thermal Mass	iletei			N/A					k	J/m²K			
7.0 Electricity Tariff				Standard									
Smart electricity mete	r fitted			No									
Smart gas meter fitted	d			No									
7.0 Measurements													
				Basem Ground flo 1st Stor 2nd Stor 3rd Stor 4th Stor 5th Stor 7th Stor	ent: por: rey: rey: rey: rey: rey: rey: rey:	0.00 m 17.36 m 0.00 m 0.00 m 0.00 m 0.00 m 0.00 m 0.00 m 0.00 m	l	r Int	ernal Flo 0.00 r 42.61 0.00 r 0.00 r 0.00 r 0.00 r 0.00 r 0.00 r	n² m² n² n² n² n² n² n²	Average	0.00 2.50 0.00 0.00 0.00 0.00 0.00 0.00	m m m m m m m
8.0 Living Area				21.73					n	n²			
9.0 External Walls	Туре	Constr	ruction		U-Value			Nett Area		Shelter	Opening	js Area	Calculation
Description			wall : plasterbo avity, any outsi	oard on dabs, dense block de structure	(W/m²K)	(kJ/m²K) A	rea(m²) 43.40	(m²) 37.82	Res 0.00	None	5.58		Type or Gross Are
Description Cavity Wall	Cavity Wall	filled ca										-	
Cavity Wall	Cavity Wall Type	Tilled Ca	Construc	tion				U-Value		Area	Shelter	S	helter
Cavity Wall	Type Filled	Cavity with Sealing		tion sterboard on both si	des, dense	cellular bl	ocks,	U-Value (W/m²K) 0.00			Shelter Res 0.00		helter None
9.1 Party Walls Description	Type Filled	Cavity with Sealing	Single pla	sterboard on both si	des, dense	cellular bl	ocks,	(W/m^2K)	(kJ/m²K)	(m²)	Res 0.00 Kaj		

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	Factor
Description Type Storey Index Construction Suspended concrete floor, carpeted Suspended Suspended concrete floor, carpeted Suspended concrete f	Factor (KJ/m²K) 0.00 75.00 42.61 Per Frame Factor (W/m²K) 1 0.70 1.31 Pitch 0 0 0 Imported No
Heatloss Floor 1 Ground Floor - Solid Lowest occupied Suspended concrete floor, carpeted Suspended concrete floor, carpeted Suspended concrete floor, carpeted Color Col	Factor (KJ/m²K) 0.00 75.00 42.61 Per Frame Factor (W/m²K) 1 0.70 1.31 Pitch 0 0 0 Imported No
12.0 Opening Types Description Data Source Type Glazing Double Low-E Soft 0.05 Glazing Gap Type O.63 O.63 Type O.63	Pitch 0 0 0 Imported No
Manufacturer Window Double Low-E Soft 0.05 Gap Type Air Filled 0.63 Wood	Factor
Name	0.70 1.31
Name Opening Type Location Orientation Area (m²)	Imported No No No No No No No No
W01 Windows Cavity Wall North East 1.86 W02 Windows Cavity Wall North East 1.86 W03 Windows Cavity Wall South East 1.86 W14.0 Conservatory Independently assessed 17.36 0.05 Independently assessed 17.36 0.04 Independently assessed 17.42 0.09	Imported No No No No No No No No
Windows Cavify Wall South East 1.86 14.0 Conservatory None 15.0 Draught Proofing 100 No 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (including other steel lintels) E3 Sill E4 Jamb Independently assessed E5 Ground floor (normal) E7 Party floor between dwellings (in blocks of flats) P1 Party wall - Ground floor None None 100 **Calculate Bridges Calculate Bridges Length Psi Adjusted Reference: 3.41 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.0	Imported No No No No No No
14.0 Conservatory 15.0 Draught Proofing 100 No 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (including other steel lintels) E3 Sill E4 Jamb I6.0 Draught Lobby Source Type Non Gov Approved Schemes Independently assessed Independently assessed Independently assessed I7.36 Independently assessed I7.42 If I	Imported No No No No No No
15.0 Draught Proofing 100 No 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (including other steel lintels) E3 Sill E4 Jamb E4 Jamb E7 Party floor between dwellings (in blocks of flats) E7 Party wall - Ground floor E100 100 No Calculate Bridges Calculate Bridges Length Psi Adjusted Reference: Non Gov Approved Schemes 3.41 0.02 0.02 1.02 0.02 0.02 0.02 0.02 0.0	No No No No No No
17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (including other steel lintels) E3 Sill Independently assessed I7.36 Independently assessed IT.36 Independently assessed IT.36 Independently assessed IT.36 Independently assessed IT.36 Independently	No No No No No No
17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (including other steel lintels) E3 Sill E4 Jamb E5 Ground floor (normal) E7 Party floor between dwellings (in blocks of flats) P1 Party wall - Ground floor Calculate Bridges Calculate Bridges Length Psi Adjusted Reference: 3.41 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.0	No No No No No No
17.1 List of Bridges Bridge Type E2 Other lintels (including other steel lintels) E3 Sill E4 Jamb E5 Ground floor (normal) E7 Party floor between dwellings (in blocks of flats) P1 Party wall - Ground floor Independently assessed Independently assessed Independently assessed Independently assessed Independently assessed I7.36 Independently assessed I7.42 Independently assessed I7.42 Independently assessed I7.42 Independently assessed	No No No No No No
Bridge Type E2 Other lintels (including other steel lintels) Non Gov Approved Schemes E3 Sill Independently assessed E4 Jamb Independently assessed E5 Ground floor (normal) Independently assessed Independently assessed Independently assessed Independently assessed I7.36 Indepe	No No No No No No
E2 Other lintels (including other steel lintels) E3 Sill E4 Jamb E5 Ground floor (normal) E7 Party floor between dwellings (in blocks of flats) E1 Party wall - Ground floor Independently assessed Independently assessed Independently assessed Independently assessed I7.36 Independently assessed	No No No No No No
E4 Jamb Independently assessed 9.84 0.02 0.02 E5 Ground floor (normal) Independently assessed 17.36 0.05 0.05 E7 Party floor between dwellings (in blocks of flats) Independently assessed 17.36 0.04 0.04 P1 Party wall - Ground floor Independently assessed 17.42 0.09 0.09	No No No No
E7 Party floor between dwellings (in blocks of flats) Independently assessed 17.36 0.04 0.04 P1 Party wall - Ground floor Independently assessed 17.42 0.09 0.09	No No
P1 Party wall - Ground floor Independently assessed 17.42 0.09 0.09	
F3 Fally Wall - Internediate 1001 between dwellings Table NT - Default 17.42 0.00 0.00	No
(in blocks of flats)	
E16 Corner (normal) Independently assessed 5.00 0.04 0.04 E25 Staggered party wall between dwellings Independently assessed 5.00 0.04 0.04	No No
E18 Party wall between dwellings Independently assessed 5.00 0.05 0.05	No
Y-value 0.05 W/m²K	
18.0 Pressure Testing Yes	
Designed AP ₅₀ 5.00 m ³ /(h.m ²) @ 50	Pa
Property Tested? Yes	
Test Method Blower Door	
19.0 Mechanical Ventilation	
Mechanical Ventilation	
Mechanical Ventilation System Present No	
20.0 Fans, Open Fireplaces, Flues	
21.0 Fixed Cooling System	
22.0 Lighting No Fixed Lighting No	
Name Efficacy Power Capacity Lighting 1 80.00 15 1200	Count 5
24.0 Main Heating 1 Database	
Percentage of Heat 100.00 %	
Database Ref. No. 106764	
Fuel Type Electricity	
SAP Code 0	
In Winter 216.41	
In Summer 193.00	
Model Name Logic Air 8kW	
Manufacturer Atlantic	
System Type Heat Pump	
Controls SAP Code 2207	

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		1
Delayed Start Stat	No]
HETAS approved System	No]
Oil Pump Inside	No]
FI Case	0.00]
Flue Type	None or Unknown]
Fan Assisted Flue	No	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	No	
25.0 Main Heating 2	None]
26.0 Heat Networks	None	
Heat Source Fuel Type Heating U Heat source 1 None Heat source 2 None Heat source 3 None Heat source 4 None Heat source 5 None	se Efficiency Percentage Of Heat Heat Ele Heat Power Ratio	ctrical Fuel Factor Efficiency typ
28.0 Water Heating		
Water Heating	Main Heating 1	
SAP Code	901	
Flue Gas Heat Recovery System	No]
Waste Water Heat Recovery Instantaneous System 1	No]
Waste Water Heat Recovery Instantaneous System 2	No]
Waste Water Heat Recovery Storage System	No]
Solar Panel	No]
Water use <= 125 litres/person/day	Yes]
Summer Immersion	No]
Cold Water Source	From header tank]
Bath Count	0]
Supplementary Immersion	No	
Immersion Only Heating Hot Water	No	
28.1 Showers Description Shower Typ 1 Combi boiler	e Flow Rate Rated Power ([[/min] [kW] or unvented hot water system 11.00	Connected Connected To
28.3 Waste Water Heat Recovery System	or anvented not water system 11.00	110
29.0 Hot Water Cylinder	Hot Water Cylinder	 1
	Yes]
Cylinder In Heated Space]
Cylinder In Heated Space	Yes	J 1
Independent Time Control	Yes Magazinad Laga]
Insulation Type	Measured Loss]
Cylinder Volume	150.00] L
Loss	2.09	kWh/day
Pipes insulation	Fully insulated primary pipework]
In Airing Cupboard	No	
31.0 Thermal Store	None]

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34.0 Small-scale	Hydro			None]		
Electricity Ger	nerated			0.00]				
Apportioned				0.00					kWh/Year		
Connected to	dwelling's ele	ectricity meter		Yes							
Electricity Ger	neration			Annual]		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations Lower cost measures None

Further measures to achieve even higher standards

Ratings after improvement

SAP rating Environmental Impact

0 0
0
0 **Typical Cost** Typical savings per year Solar water heating

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Property Reference		Ur	nit 2							Issued on Da	te	05/03/2024	
Assessment Refer	rence	Re	esidual					Prop Type Re	ef	Tebby and Son	Garage		
Property		Ur	nit 1, Highland S	quare, Bristol									
SAP Rating					82 B		DER	5.8	6	TER		14.62	
Environmental					96 A		% DER < TER	0.0	<u>-</u>			59.92	
CO ₂ Emissions (t/)	vear)				0.23		DFEE	31.	57	TFEE		35.81	
Compliance Check					See BREL		% DFEE < TFE		J1			11.86	
% DPER < TPER					20.05		DPER	62.	12	TPER		77.71	
W DFER 4 IFER					20.03		DELK	02.	13	II LIN		11.11	
Assessor Details										Asses	sor ID	U367-000)1
SAP 10 WORKSHEET													
. Overall dwell			OK REGULATION	NS COMPLIAN									
Ground floor Total floor area Welling volume			:)+(ld)+(le)	(ln)	4	2.6100		Area (m2) 42.6100			(2b) =(3n) =	Volume (m3) 106.5250	(4)
Number of open continued to the state of the	chimneys llues eys / flues attached t attached t ed chimneys ittent ext events	to solid fu to other he s tract fans	el boiler	ire							0 * 80 = 0 * 20 = 0 * 10 = 0 * 20 = 0 * 35 = 0 * 20 = 2 * 10 = 0 * 10 =	0.0000 0.0000 0.0000 0.0000 0.0000	(6a) (6b) (6c) (6d) (6e) (6f) (7a) (7b)
infiltration due ressure test Pressure Test Me Measured/design Infiltration rat Number of sides	ethod AP50 ce	eys, flues	and fans :	= (6a)+(6b)	+(6c)+(6d)+(6e)+(6f)+((6g) + (7a) + (7	7b)+(7c) =			/ (5) =	es per hour 0.1877 Yes Blower Door 5.0000 0.4377	(17)
Shelter factor Infiltration rat	e adjusted	i to includ	de shelter fa	actor					(20) = 1 -	- [0.075 x 21) = (18) x	(19)] = (20) =	0.7750 0.3393	
Wind speed Wind factor Adj infilt rate	Jan 5.1000 1.2750		Mar 4.9000 1.2250		May 4.3000 1.0750	Jun 3.8000 0.9500		Aug 3.7000 0.9250		Oct 4.3000 1.0750			
Effective ac	0.4326				0.3647 0.5665			0.3138 0.5492		0.3647 0.5665			
. Heat losses a	and heat lo	ss paramet	er										
Clement				Gross m2	Openings m2	Net	Area m2	U-value W/m2K	Ax	U K-	-value	AxK kJ/K	
indows (Uw = 1. eatloss Floor 1 avity Wall		olem			5.5800	5. 42. 37.	5800	1.2448	6.94	58			(27) (28a) (29a)
otal net area o abric heat loss arty Wall 1 arty Ceiling 1 nternal Wall 1			Aum(A, M2)			41. 42.	(26) (3		= 18.866 0.000	00 70 30	0.0000 0.0000 0.0000	2907.8000 1278.3000 5050.0000	(32b)
eat capacity Cm hermal mass par ist of Thermal	ameter (TM Bridges		FA) in kJ/m	2K					(30) + (32	2) + (32a)	. (32e) =	18104.8500 424.8967	(34)
E3 Sill E4 Jamb E5 Groun E7 Party P1 Party	r lintels (nd floor (n / floor bet / wall - Gr	normal) ween dwell		ocks of fla	ts) gs (in block	s of flats	s)	3 9 17 17	3.4100 3.4100 9.8400 7.3600 7.3600	0.0230 0.0210 0.0210 0.0160 0.0470 0.0380 0.0930 0.0000	Tot 0.07 0.07 0.15 0.81 0.65 1.62	784 716 574 597 801	

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E25 St E18 Pa	rty wall be	rty wall bet etween dwell		_				5	.0000 .0000 .0000	0.0430 0.0360 0.0460	0.21 0.18 0.23	00 00	(26)
Thermal bridge Point Thermal : Total fabric h	bridges	Psi) calcul	lated using	Appendix K	5)				(33) + (36) -	(36a) = + (36a) =	4.0281 0.0000 22.8948	
Ventilation he	at loss cal	lculated mor	nthly (38)m Mar	= 0.33 x ((25)m x (5) May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m Heat transfer	20.8652	20.7375	20.6123	20.0244	19.9144	19.4024	19.4024	19.3075	19.5996	19.9144	20.1369	20.3696	(38)
Average = Sum(43.7600 39)m / 12 =	43.6323	43.5071	42.9192	42.8092	42.2971	42.2971	42.2023	42.4944	42.8092	43.0317	43.2644 42.9187	(39)
HLP HLP (average)	Jan 1.0270	Feb 1.0240	Mar 1.0211	Apr 1.0073	May 1.0047	Jun 0.9927	Jul 0.9927	Aug 0.9904	Sep 0.9973	Oct 1.0047	Nov 1.0099	Dec 1.0154 1.0072	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
4. Water heati	ng energy i	requirements	s (kWh/year)										
Assumed occupa Hot water usag	ncy											1.4773	(42)
Hot water usag	84.2374 e for baths	82.9478 3	81.0472	78.1233	75.5037	71.8388	68.9401	72.3289	74.0333	77.6632	81.4434	84.1615	
Hot water usag			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Average daily	29.7591 hot water i	28.6769 use (litres	27.5948 /day)	26.5126	25.4305	24.3483	24.3483	25.4305	26.5126	27.5948	28.6769	29.7591 104.7141	
Daily hot wate		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte		111.6247 147.7021	108.6419 155.2471	104.6360 136.6807	100.9342 130.0639	96.1872 111.2372	93.2885 103.0865	97.7593 115.0645	100.5459 116.6282	105.2579 135.6355	110.1203	113.9206 167.3007	
Energy content Distribution 1		= 0.15 x (4	45)m 23.2871	20.5021	19.5096	16.6856	15.4630	17.2597	17.4942	Total = Si 20.3453	22.3247	1635.3004 25.0951	(46)
Water storage Store volume a) If manufac	turer decla		actor is kno	own (kWh/d	lay):							150.0000 2.0900	(48)
Temperature Enter (49) or Total storage	(54) in (55											0.5400 1.1286	
If cylinder co	34.9866 ntains dedi			33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	
Primary loss Combi loss Total heat req	34.9866 23.2624 0.0000	31.6008 21.0112 0.0000	34.9866 23.2624 0.0000	33.8580 22.5120 0.0000	34.9866 23.2624 0.0000	33.8580 22.5120 0.0000	34.9866 23.2624 0.0000	34.9866 23.2624 0.0000	33.8580 22.5120 0.0000	34.9866 23.2624 0.0000	33.8580 22.5120 0.0000	34.9866 23.2624 0.0000	(59)
WWHRS	226.0716 0.0000	200.3141 0.0000		193.0507 0.0000	188.3129 0.0000	167.6072 0.0000	161.3355 0.0000	173.3135 0.0000	172.9982 0.0000	193.8845 0.0000	205.2013	225.5497 0.0000	
PV diverter 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 Output from w/	0.0000 h 226.0716	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 161.3355	0.0000 173.3135	0.0000 172.9982	0.0000	0.0000	0.0000	
12Total per ye	ar (kWh/yea								er year (kW			2321.1354 2321	(64)
Electric showe	0.0000	0.0000	0.0000	0.0000 Tot	0.0000 al Energy us	0.0000	0.0000	0.0000	0.0000 wer(s) (WWh	0.0000 /wear) = Su	0.0000 m(64a)m =	0.0000	
Heat gains from	m water hea 102.4002	ating, kWh/r 91.2005	month 98.2189	90.5423	89.8455	82.0824	80.8755	84.8582	83.8749	91.6980	94.5824	102.2267	
5. Internal ga	ins (see Ta	able 5 and 5											
Metabolic gain	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m Lighting gains	(calculate	ed in Append	dix L, equat	tion L9 or	73.8652 L9a), also s 70.3680	see Table 5		73.8652 70.3680		73.8652 70.3680	73.8652 72.7136		
Appliances gai	ns (calcula	ated in Appe	endix L, eq	ation L13	or L13a), al 109.9886	so see Tab	le 5	94.5408		105.0258		70.3680	
Cooking gains	(calculated 30.3865	d in Appendi 30.3865	ix L, equat: 30.3865	ion L15 or 30.3865	L15a), also 30.3865	see Table : 30.3865	5 30.3865	30.3865	30.3865	30.3865	30.3865	30.3865	(69)
Pumps, fans Losses e.g. ev	aporation	(negative va	alues) (Tabi	le 5)					0.0000				
Water heating	gains (Tabl	le 5)			-59.0922 120.7600				-59.0922 116.4929	-59.0922		-59.0922 137.4015	
Total internal	gains				346.2762								
6. Solar gains													
[Jan]				rea m2	Solar flux Table 6a W/m2	Speci or	g fic data Table 6b	Specific or Tab	FF data le 6c	Acce facto Table	ss or 6d	Gains W	
Northeast Southeast			3.72 1.80	200 500	11.2829 36.7938		0.6300 0.6300	0	.7000 .7000	0.77 0.77	00 00	12.8274 20.9151	(75) (77)
Solar gains Total gains													
7. Mean intern	al temperat	ture (heatin	ng season)										

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Temperature du Utilisation fa	actor for ga	ains for li	ving area, n	nil,m (see T	Cable 9a)							21.0000	(85)
tau alpha util living ar	Jan 114.9252 8.6617	Feb 115.2615 8.6841	Mar 115.5931 8.7062	Apr 117.1766 8.8118	May 117.4777 8.8318	Jun 118.8999 8.9267	Jul 118.8999 8.9267	Aug 119.1671 8.9445	Sep 118.3480 8.8899	Oct 117.4777 8.8318	Nov 116.8702 8.7913	Dec 116.2417 8.7494	
util living al	0.9968	0.9924	0.9793	0.9140	0.7500	0.5286	0.3810	0.4165	0.6570	0.9268	0.9894	0.9974	(86)
Living Non living 24 / 16 24 / 9	20.4788 19.4774 0 3	20.5792 19.6060 0 0	20.7186 19.7800 0 0	20.8978 19.9920 0 0	20.9839 20.0701 0 0	20.9993 20.0892 0 0	21.0000 20.0895 0 0	20.9999 20.0913 0 0	20.9957 20.0839 0 0	20.9003 20.0006 0 0	20.6739 19.7354 0	20.4666 19.4698 0	
16 / 9 MIT Th 2 util rest of h	28 20.7334 20.0609	20.5792 20.0634	20.7186 20.0658	20.8978 20.0773	20.9839 20.0794	20.9993 20.0895	21.0000 20.0895	20.9999 20.0913	20.9957 20.0856	20.9003 20.0794	20.6739 20.0751	10 20.5412 20.0706	
MIT 2 Living area fr	0.9951 19.8283	0.9885 19.6060	0.9687 19.7800	0.8782 19.9920	0.6842 20.0701	0.4539 20.0892	0.3022 20.0895	0.3343 20.0913	0.5732 20.0839 fLA =	0.8878 20.0006 Living area	0.9831 19.7354 a / (4) =	0.9960 19.5781 0.5100	(90)
MIT Temperature ac adjusted MIT		20.1023	20.2586	20.4539	20.5361	20.5533	20.5538	20.5547	20.5489	20.4594	20.2141	20.0692 0.0000 20.0692	
8. Space heati	ing requirem	nent											
****	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation Useful gains Ext temp. Heat loss rate	4.3000	0.9887 444.8991 4.9000	0.9713 455.9742 6.5000	0.8941 447.2852 8.9000	0.7177 371.5924 11.7000	0.4921 251.5790 14.6000	0.3424 167.2263 16.6000	0.3762 175.3195 16.4000	0.6161 272.5521 14.1000	0.9056 375.9118 10.6000	0.9842 398.0864 7.1000	0.9960 402.1897 4.2000	(95)
Space heating	699.7161	663.3118	598.5985	495.8843	378.2663	251.8087	167.2340	175.3370	274.0424	422.0737	564.3203	686.5728	(97)
Space heating Solar heating	213.1605 requirement		106.1124 er year (kW)	34.9914 n/year)	4.9654	0.0000	0.0000	0.0000	0.0000	34.3445	119.6884	211.5810 871.6171	(98a)
Solar heating Space heating	0.0000 contributio	0.0000 on - total p	0.0000 per year (ki	0.0000 Wh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Space heating Space heating	requirement	146.7733 t after sol		34.9914 cion - total	4.9654 per year	0.0000 (kWh/year)	0.0000	0.0000	0.0000	34.3445 (98c)	119.6884	211.5810 871.6171 20.4557	
9a. Energy red	quirements -	- Individua	l heating sy	stems, incl	luding micr	ro-CHP							
Fraction of sp Fraction of sp Efficiency of Efficiency of Efficiency of	pace heat fr main space main space	rom main sy: heating sy: heating sy:	stem(s) stem 1 (in 9 stem 2 (in 9	b)	n (Table 11)						0.0000 1.0000 216.4148 0.0000 0.0000	(202) (206) (207)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating	213.1605	146.7733		34.9914	4.9654	0.0000	0.0000	0.0000	0.0000	34.3445	119.6884	211.5810	(98)
Space heating	216.4148	216.4148	216.4148		216.4148	0.0000	0.0000	0.0000	0.0000	216.4148	216.4148	216.4148	(210)
Space heating	98.4963	67.8204	49.0320	16.1687	2.2944	0.0000	0.0000	0.0000	0.0000	15.8697	55.3051	97.7664	(211)
Space heating Space heating	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	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	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	226.0716	200.3141	213.4961	193.0507	188.3129	167.6072	161.3355	173.3135	172.9982	193.8845	205.2013	225.5497	
Efficiency of (217)m	192.9954	192.9954	192.9954	192.9954	192.9954	192.9954	192.9954	192.9954	192.9954	192.9954	192.9954	192.9954 192.9954	
Fuel for water Space cooling	117.1384	103.7922	110.6224	100.0287	97.5738	86.8452	83.5955	89.8019	89.6385	100.4607	106.3245	116.8679	(219)
(221)m 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	0.0000	0.0000	
Lighting Electricity ge	14.6211	11.7296	10.5612	7.7376	5.9767	4.8830	5.4522	7.0869	9.2052	12.0778	13.6418	15.0274	
(233a)m Electricity ge	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)
(234a)m Electricity ge	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)
(235a)m Electricity us	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 eneration)	0.0000	0.0000	0.0000	0.0000	(235a)
(235c)m Electricity ge	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
(233b)m Electricity ge	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)
(234b)m Electricity ge	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)
(235b)m Electricity us	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 eneration)	0.0000	0.0000	0.0000	0.0000	(235b)
(235d)m Annual totals	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Space heating Space heating Space heating Efficiency of Water heating Space cooling	fuel - mair fuel - mair fuel - seco water heate fuel used	n system 2 ondary										402.7529 0.0000 0.0000 192.9954 1202.6898 0.0000	(213) (215) (219)
Electricity for Total electricity for Electric	or pumps and	e above, kW		ix L)								0.0000 118.0005	(231)
Energy saving/ PV generation	generation/	technologi	es (Appendio	ces M ,N and	i Q)							0.0000	(233)

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Wind generation Hydro-electric generation (Appendix N Electricity generated - Micro CHP (Ap Appendix Q - special features Energy saved or generated Energy used Total delivered energy for all uses									0.0000 0.0000 0.0000 -0.0000 0.0000 1723.4432	(235a) (235) (236) (237)
12a. Carbon dioxide emissions - Indiv	idual heating systems	including m	icro-CHP		Fnarau	Emission	factor		Emissions	
Space heating - main system 1 Total CO2 associated with community s Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Total CO2, kg/year EPC Dwelling Carbon Dioxide Emission	-				Energy kWh/year 402.7529 1202.6898 0.0000 118.0005	kg (1actor C02/kWh 0.1576 0.1407 0.0000 0.1443	k	Emissions g CO2/year 63.4683 0.0000 169.2707 232.7390 0.0000 17.0311 249.7702 5.8600	(261) (373) (264) (265) (267) (268) (272)
13a. Primary energy - Individual heat	ing systems including	micro-CHP								
Space heating - main system 1 Total CO2 associated with community s Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Total Primary energy kWh/year Dwelling Primary energy Rate (DPER)	-				kWh/year 402.7529 1202.6898 0.0000 118.0005				ary energy kWh/year 637.7116 0.0000 1828.5813 2466.2929 0.0000 180.9931 2647.2860 62.1300	(275) (473) (278) (279) (281) (282) (286)
SAP 10 WORKSHEET FOR New Build (As De CALCULATION OF TARGET EMISSIONS 1. Overall dwelling characteristics	signed) (Version 10	.2, February	2022)		Area	Storey	height		Volume	
Ground floor Total floor area TFA = (la)+(lb)+(lc) Dwelling volume 2. Ventilation rate	+(ld)+(le)(ln)	4	2.6100		(m2) 42.6100 (3	_	(m) 2.5000 (2)		(m3) 106.5250	(1b) - (3b) (4)
								m	3 per hour	
Number of open chimneys Number of open flues Number of chimneys / flues attached t Number of flues attached to solid fue Number of flues attached to other hea Number of blocked chimneys Number of intermittent extract fans Number of passive vents Number of flueless gas fires	l boiler						0 0 0 0 0 2 0	* 20 = * 35 = * 20 = * 10 =	0.0000	(6b) (6c) (6d) (6e) (6f) (7a) (7b)
Infiltration due to chimneys, flues a Pressure test Pressure Test Method Measured/design AP50 Infiltration rate Number of sides sheltered	nd fans = (6a)+(6b)	+(6c)+(6d)+(6e)+(6f)+(6g	y) + (7a) + (7	7b)+(7c) =			(5) =	s per hour 0.1877 Yes lower Door 5.0000 0.4377 3	(8)
Shelter factor Infiltration rate adjusted to include	shelter factor					(20) = 1 - (21)	[0.075 x (= (18) x		0.7750 0.3393	
Wind speed 5.1000 5.0000 Wind factor 1.2750 1.2500 Adj infilt rate 0.4326 0.4241 Effective ac 0.5936 0.5899	Mar Apr 4.9000 4.4000 1.2250 1.1000 0.4156 0.3732 0.5864 0.5696	1.0750	0.9500	0.9500	0.9250	4.0000 1.0000	1.0750	1.1250	1.1750	(22a) (22b)
3. Heat losses and heat loss paramete										
Element TER Opening Type (Uw = 1.20) Heatloss Floor 1 Cavity Wall Total net area of external elements A	Gross m2 43.4000	Openings m2 5.5800	NetAr 5.58 42.61 37.82 86.01	.00 200	U-value W/m2K 1.1450 0.1300 0.1800	5.5393	kJ.	alue /m2K	A x K kJ/K	

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Fabric heat loss, W/K = Sum (A x U) Party Wall 1		41.	(26)(3 5400	30) + (32) = 0.0000	= 18.73 0.00				(33) (32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K List of Thermal Bridges Kl Element E2 Other lintels (including other steel lint E3 Sill E4 Jamb E5 Ground floor (normal) E7 Party floor between dwellings (in blocks P1 Party wall - Ground floor P3 Party wall - Intermediate floor between d E16 Corner (normal) E25 Staggered party wall between dwellings E18 Party wall between dwellings	of flats) twellings (in bloc	cks of flats	Length 3.4100 3.4100 9.8400 17.3600 17.3600 17.4200 5.0000 5.0000		Psi-value Tot 0.0500 0.17 0.0500 0.17 0.0500 0.45 0.1600 2.77 0.0700 1.21 0.0800 1.38 0.0000 0.00 0.0900 0.45 0.0600 0.36		05 05 20 76 52 36 00 00 00		
Thermal bridges (Sum(L x Psi) calculated using Appen Point Thermal bridges Total fabric heat loss	dix K)				(33) + (36) +	(36a) = + (36a) =	7.2694 0.0000 26.0056	
		Jun 19.4024	Jul 19.4024	Aug 19.3075	Sep 19.5996	Oct 19.9144	Nov 20.1369	Dec 20.3696	(38)
Heat transfer coeff 46.8708 46.7431 46.6180 46. Average = Sum(39)m / 12 =	0300 45.9200	45.4080	45.4080	45.3131	45.6052	45.9200	46.1426	46.3752 46.0295	(39)
Jan Feb Mar Ap HLP 1.1000 1.0970 1.0941 1.	or May 0803 1.0777	Jun 1.0657	Jul 1.0657	Aug 1.0634	Sep 1.0703	Oct 1.0777	Nov 1.0829	Dec 1.0884 1.0803	(40)
Days in mont 31 28 31	30 31	30	31	31	30	31	30	31	
4. Water heating energy requirements (kWh/year)									
Assumed occupancy Hot water usage for mixer showers 62.8515 61.9070 60.5306 57.	8972 55.9538	53.7865	52.5546	53.9206	55.4179	57.7449	60.4349	1.4773 62.6107	
Hot water usage for baths	0000 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Hot water usage for other uses 29.7591 28.6769 27.5948 26. Average daily hot water use (litres/day)	5126 25.4305	24.3483	24.3483	25.4305	26.5126	27.5948	28.6769	29.7591 85.0007	(42c)
Jan Feb Mar Ap Daily hot water use	or May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
92.6106 90.5839 88.1254 84. Energy conte 146.6726 128.9903 135.4455 115. Energy content (annual)	4098 81.3842 5528 109.5588	78.1348 96.0759	76.9029 93.0074	79.3510 98.2532	81.9305 101.0285	85.3397 115.8051 Total = St	89.1118 126.9562 um(45)m =	92.3698 144.6288 1411.9751	
	3329 16.4338	14.4114	13.9511	14.7380	15.1543	17.3708	19.0434	21.6943	(46)
Water storage loss: Store volume a) If manufacturer declared loss factor is known (Temperature factor from Table 2b Enter (49) or (54) in (55)	kWh/day):							150.0000 1.3938 0.5400 0.7527	(48) (49)
	5798 23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
Primary loss 23.2624 21.0112 23.2624 22.	5798 23.3325 5120 23.2624 0000 0.0000	22.5798 22.5120 0.0000	23.3325 23.2624 0.0000	23.3325 23.2624 0.0000	22.5798 22.5120 0.0000	23.3325 23.2624 0.0000	22.5798 22.5120 0.0000	23.3325 23.2624 0.0000	(59)
WHRS -28.7331 -25.4118 -26.6098 -22. PV diverter -0.0000 -0.0000 -0. Solar input 0.0000 0.0000 0.0000 0.	6447 156.1537 0339 -20.5348 0000 -0.0000 0000 0.0000	141.1677 -17.5718 -0.0000 0.0000	139.6023 -16.4708 -0.0000 0.0000	144.8481 -17.5150 -0.0000 0.0000	146.1204 -18.1805 -0.0000 0.0000	162.4000 -21.4328 -0.0000 0.0000		191.2237 -28.2010 -0.0000 0.0000	(63a) (63b) (63c)
FGHRS 0.0000 0.0000 0.0000 0. Output from w/h 164.5344 145.6642 155.4306 138.	0000 0.0000 6107 135.6189	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 163.0227	
12Total per year (kWh/year) Electric shower(s)				Total pe	er year (kW	h/year) = Si	um(64)m =	1693.6166 1694	
0.0000 0.0000 0.0000 0.	0000 0.0000 Total Energy us	0.0000 sed by insta	0.0000 intaneous el	0.0000 lectric show	0.0000 ver(s) (kWh	0.0000 /year) = Sur	0.0000 m(64a)m =	0.0000	
Heat gains from water heating, kWh/month 86.0446 76.5579 82.3115 74.	4948 73.7042	68.0187	68.2009	69.9451	69.6655	75.7811	78.2864	85.3650	(65)
5. Internal gains (see Table 5 and 5a) Metabolic gains (Table 5), Watts									
Jan Feb Mar Ap (66)m 73.8652 73.8652 73.8652 73.	r May 8652 73.8652	Jun 73.8652	Jul 73.8652	Aug 73.8652	Sep 73.8652	Oct 73.8652	Nov 73.8652	Dec 73.8652	(66)
Lighting gains (calculated in Appendix L, equation L 70.3680 77.9074 70.3680 72.	.9 or L9a), also s 7136 70.3680	see Table 5 72.7136	70.3680		72.7136	70.3680	72.7136	70.3680	(67)
Appliances gains (calculated in Appendix L, equation 128.1491 129.4788 126.1278 118.	9939 109.9886	101.5249	95.8706	94.5408	97.8919	105.0258	114.0311	122.4948	(68)
Cooking gains (calculated in Appendix L, equation L1 30.3865 30.3865 30.3865 30. Pumps, fans 3.0000 3.0000 3.0000 3.	3865 30.3865	30.3865	30.3865 0.0000		30.3865	30.3865 3.0000		30.3865 3.0000	
Losses e.g. evaporation (negative values) (Table 5) -59.0922 -59.0922 -59.0922 -59.0922						-59.0922			
Water heating gains (Table 5) 115.6513 113.9254 110.6338 103.			91.6679	94.0122		101.8564			
Total internal gains 362.3279 369.4712 355.2892 343.									
6. Solar gains									
					P.F.	_			
[Jan] Area m2	Solar flux Table 6a W/m2	Specif or T	g ic data able 6b	Specific or Tabl	FF data Le 6c	Acces facto Table (or	Gains W	

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Northeast Southeast			3.72 1.86		11.2829 36.7938		0.6300 0.6300		.7000 .7000	0.770 0.770		12.8274 20.9151	
Solar gains Total gains						177.8758 491.7443				71.2835 396.6932	41.1916 384.8269		
7. Mean inter	nal temperat	ture (heatin	g season)										
Temperature d	uring heatin	ng periods i	n the livin	g area from	n Table 9,							21.0000	(85)
Utilisation f	Jan	Feb	Mar	Apr 111.8289	May	Jun 113.3608	Jul 113.3608	Aug	Sep 112.8706	Oct 112.0967	Nov 111.5561	Dec 110.9965	
alpha util living a	8.3215	8.3415	8.3612	8.4553	8.4731	8.5574	8.5574	8.5732	8.5247	8.4731	8.4371	8.3998	
-	0.9983	0.9959	0.9884	0.9474	0.8130	0.5883	0.4237	0.4670	0.7282	0.9575	0.9946	0.9987	
MIT Th 2 util rest of	20.3815 20.0008 house	20.4839 20.0033	20.6323 20.0057	20.8379 20.0170	20.9659 20.0191	20.9979 20.0290	20.9999 20.0290	20.9997 20.0308	20.9889 20.0252	20.8436 20.0191	20.5862 20.0148	20.3677 20.0103	
MIT 2	0.9973 19.3024	0.9936 19.4344	0.9817 19.6228	0.9197 19.8746	0.7452 19.9983	0.5006 20.0283	0.3303 20.0290	0.3689 20.0308	0.6342 20.0207	0.9288 19.8875	0.9910 19.5743	0.9979 19.2925	(90)
Living area f	19.8527	19.9696	20.1376	20.3659	20.4917	20.5227	20.5241	20.5249	fLA = 20.5145	Living area 20.3750		19.8408	
Temperature a adjusted MIT		19.9696	20.1376	20.3659	20.4917	20.5227	20.5241	20.5249	20.5145	20.3750	20.0904	0.0000 19.8408	(93)
8. Space heat	ing requires	ment											
Utilisation Useful gains Ext temp.			Mar 0.9828 443.3315 6.5000	Apr 0.9308 447.6961 8.9000	May 0.7793 388.9424 11.7000	Jun 0.5455 268.2411 14.6000	Jul 0.3779 178.1587 16.6000	Aug 0.4190 186.8500 16.4000	Sep 0.6826 288.4993 14.1000	Oct 0.9409 373.2316 10.6000	Nov 0.9914 381.5000 7.1000	Dec 0.9977 383.2653 4.2000	(95)
Heat loss rat	728.9678	704.4007	635.7579	527.7739	403.7174	268.9400	178.1855	186.9128	292.5324	448.8706	599.4086	725.3459	(97)
Space heating Space heating	248.5186	185.4793		57.6560 (vear)	10.9926	0.0000	0.0000	0.0000	0.0000	56.2754	156.8942	254.5080 1113.4893	
Solar heating	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 Space heating	kWh 248.5186	185.4793	143.1652	57.6560		0.0000	0.0000	0.0000	0.0000	56.2754	156.8942	254.5080	(98c)
Space heating Space heating		after sola	r contribut	ion - total	per year	(kWh/year)				(98c)	/ (4) =	1113.4893 26.1321	(99)
9a. Energy re													
Fraction of s Fraction of s Efficiency of Efficiency of Efficiency of	pace heat fr pace heat fr main space main space	rom secondar rom main sys heating sys heating sys	y/supplementem(s) tem(s) tem 1 (in % tem 2 (in %	tary system								0.0000 1.0000 92.3000 0.0000 0.0000	(202) (206) (207)
Space heating	Jan requirement	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating	efficiency		ng system l	.)	10.9926	0.0000	0.0000	0.0000	0.0000			254.5080	
Space heating				92.3000 62.4659	92.3000 11.9096	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	
Space heating					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	275.7400 0.0000	
Space heating	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Space heating	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													
Efficiency of	water heate			138.6107 82.2488	135.6189	123.5959	123.1316	127.3331	127.9399	140.9673	147.7673	163.0227 79.8000	(216)
(217)m Fuel for wate		84.6028 Wh/month 172.1743	83.8759 185.3103	168.5261	80.4111 168.6571	79.8000 154.8821	79.8000 154.3002	79.8000 159.5652	79.8000 160.3257	82.1763 171.5426	84.1944 175.5072	85.0546 191.6683	
Space cooling (221)m	fuel requir 0.0000	rement 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 Lighting Electricity g	14.6211	6.5973 11.7296	7.3041 10.5612	7.0685 7.7376	7.3041 5.9767	7.0685 4.8830	7.3041 5.4522	7.3041 7.0869	7.0685 9.2052	7.3041 12.0778	7.0685 13.6418	7.3041 15.0274	
(233a)m Electricity g	-14.7805	-21.6607	-32.3614	-37.8882	-42.1984		-39.4789	-36.6317	-31.7939	-25.4780	-16.5556	-12.6876	(233a)
(234a)m Electricity g	0.0000 enerated by	0.0000 hydro-elect	0.0000 ric generat	0.0000 ors (Append	0.0000 dix M) (neg	0.0000 ative quant:		0.0000	0.0000	0.0000	0.0000		(234a)
(235a)m Electricity u		0.0000 electricity 0.0000							0.0000	0.0000	0.0000		(235a)
(235c)m Electricity g (233b)m						0.0000 -53.2149	0.0000 -52.5429	0.0000 -44.2105	0.0000 -32.0726	0.0000 -18.5336	0.0000 -8.0780	-4.7381	(235c) (233b)
Electricity g (234b)m	enerated by 0.0000	wind turbin 0.0000	es (Appendi 0.0000	x M) (negat 0.0000	ive quanti 0.0000	ty) 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(234b)
Electricity g (235b)m	0.0000	hydro-elect 0.0000	ric generat 0.0000	ors (Append 0.0000	iix M) (neg 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(235b)
Electricity u (235d)m Annual totals	0.0000	0.0000	generated h 0.0000	y micro-CHE 0.0000	? (Appendix 0.0000	N) (negative 0.0000	ve if net ge 0.0000	eneration) 0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Space heating Space heating Space heating Efficiency of	fuel - mair fuel - mair fuel - seco	n system 2 ondary										1206.3806 0.0000 0.0000 79.8000 2056.0695	(213) (215)

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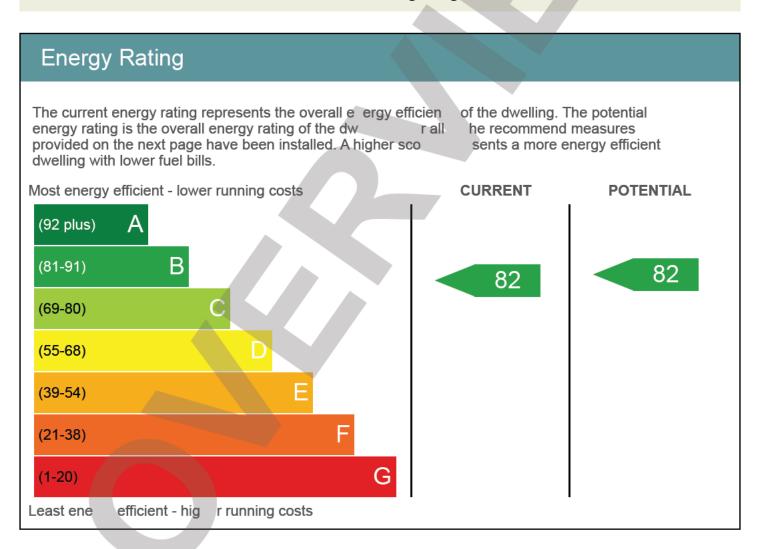
Space cooling fuel			0.0000 (221)
Electricity for pumps and fans: Total electricity for the above, kWh/year Electricity for lighting (calculated in Appendix L)			86.0000 (231) 118.0005 (232)
Energy saving/generation technologies (Appendices M ,N and Q) PV generation Wind generation Hydro-electric generation (Appendix N) Electricity generated - Micro CHP (Appendix N) Appendix Q - special features			-702.0353 (233) 0.0000 (234) 0.0000 (235a) 0.0000 (235)
Energy saved or generated Energy used Total delivered energy for all uses			-0.0000 (236) 0.0000 (237) 2764.4153 (238)
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP			
Space heating - main system 1 Total CO2 associated with community systems	Energy kWh/year 1206.3806	0.2100	Emissions kg CO2/year 253.3399 (261) 0.0000 (373)
Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting	2056.0695 86.0000 118.0005		431.7746 (264) 685.1145 (265) 11.9293 (267) 17.0311 (268)
Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER)	-351.4360 -350.5993		-47.0017 -44.0019 -91.0037 (269) 623.0712 (272) 14.6200 (273)
13a. Primary energy - Individual heating systems including micro-CHP			
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting	Energy P: kWh/year 1206.3806 2056.0695 86.0000 118.0005	1.1300	kWh/year 1363.2101 (275) 0.0000 (473) 2323.3586 (278) 3686.5686 (279) 130.1008 (281)
Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total Primary energy kWh/year Target Primary Energy Rate (TPER)	-351.4360 -350.5993	1.4942 0.4607	-525.1295 -161.5115 -686.6411 (283) 3311.0215 (286) 77.7100 (287)

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Dwelling Address	Unit 1, Highland Square , Bristol
Report Date	05/03/2024
Property Type	Flat, Semi-Detached
Floor Area [m ²]	43

This document is not an Energy Performance Certificat EPC) s required by the Energy Performance of Buildings Reg io



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Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good
Feature	Description			gy Performance
Walls	Average thermal transmi	ttance 0.18 W/m²K		Very Good
Floor	Average thermal transmi	ttance 0.12 W/m²K		Very Good
Windows	High performance glazing			Good
Main heating	Air source heat pump, radiators, electric			Average
Main heating controls	Time and temperature zone control			Very Good
Secondary heating	None			
Hot water	From main system			Average
Lighting	Good lighting e iciency			Good
Air tightness	Air perm ity [AP5	5.0 m³/h.m² (assumed)		Good

Primary Energy e

The primary ener e for this operty per year is 58 kilowatt hour (kWh) per square metre

Estimat d C emissions of the dwelling

The estimed CO rating rovides an indication of the dwelling's impact on the environment in terms of carbon dio emissio; the higher the rating the less impact it has on the environment.

The estimated CO emissions for this dwellings is: 0.2 per year

With the recommended measures the potential CO emissions could be: per year

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Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.

To reach the dwelling's potential energy rating all of the recommended measures shown below would need to installed. Having these measures installed individually or in any other order may give a different result who pared work the cumulative potential rating.

Recommended measure	Typical	Potential Rating	lative	Cumulative
	Yearly	after	s	Potential
	Saving	measure installed	(per yea	Rating

Estimated energy use and potential savin s

Estimated energy cost for this property over a year

£408

Over a year you could save

£0

The estimated cost and savings show how much the average househ would spend in this property heating, lighting and hot water. It not based on how energy is ed by the people living at the propert

Contacting asses or and the accreditation scheme

Assessor contact details					
Asse r name					
Assess accredita n number					
Email Address					

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Accreditation scheme contact details			
Accreditation scheme Elmhurst Energy Systems Ltd			
Telephone			
Email Address			

Assessment details				
Related party disclosure	No related pa			
Date of assessment	05/03/202			
Date of certificate 05/03/202				
Type of assessment	SAP w dwellin			



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Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Tue 05 Mar 2024 08:41:59

Project Information					
Assessed By		Building Type	Flat, Semi-detached		
OCDEA Registration	EES/025661	Assessment Date	2024-03-05		

Dwelling Details				
Assessment Type	As designed	Total Floor Area	43 m ²	
Site Reference	Unit 2	Plot Reference	PV	
Address	Unit 1 Highland Square, Bristo	ol .		

Client Details		
Name	Tebby & Son	
Company	SF Tebby & Son	
Address	Unit 11 Avon Gorge Industrial Estate , Bristol, BS2 9XX	

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate				
Fuel for main heating system	Electricity			
Target carbon dioxide emission rate	14.62 kgCO ₂ /m ²			
Dwelling carbon dioxide emission rate	3.31 kgCO ₂ /m ²	OK		
1b Target primary energy rate and dwelling primary energy				
Target primary energy	77.71 kWh _{PE} /m ²			
Dwelling primary energy	41.74 kWh _{PE} /m ²	OK		
1c Target fabric energy efficiency and dwelling fabric energy efficiency				
Target fabric energy efficiency	35.8 kWh/m²			
Dwelling fabric energy efficiency	31.6 kWh/m ²	OK		

2a Fabric U-values						
Element	Maximum permitted average U-Value [W/m²K]	Dwelling average U-Value [W/m²K]	Element with highest individual U-Value			
External walls	0.26	0.18	Walls (1) (0.18)	OK		
Party walls	0.2	0	Party Wall (1) (0)	N/A		
Curtain walls	1.6	0	N/A	N/A		
Floors	0.18	0.12	Heatloss Floor 1 (0.12)	OK		
Roofs	0.16	N/A	N/A	N/A		
Windows, doors,	1.6	1.31	W01 (1.31)	OK		
and roof windows						
Rooflights	2.2	N/A	N/A	N/A		

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))				
Name	Net area [m ²]	U-Value [W/m ² K]		
Exposed wall: Walls (1)	37.82	0.18		
Party wall: Party Wall (1)	41.54	0 (!)		
Ground floor: Heatloss Floor 1, Heatloss Floor 1	42.61	0.12		

2c Openings (better than typically expected values are flagged with a subsequent (!))						
Name Area [m²] Orientation Frame factor U-Value [W/m²K]						
W01, Windows	1.86	North East	0.7	1.31		
W02, Windows	1.86	North East	0.7	1.31		
W03, Windows	1.86	South East	0.7	1.31		

2d Thermal brid	dging (better than typically expect	ted values are flagged with a subse	equent (!))	
Building part 1 -	Main Dwelling: Thermal bridging ca	alculated from linear thermal transmit	tances for eacl	h junction
Main element	Junction detail	Source	Psi value	Drawing /
			[W/mK]	reference
External wall	E2: Other lintels (including other	Not government-approved	0.023 (!)	
	steel lintels)	scheme		
External wall	E3: Sill	Calculated by person with suitable	0.021 (!)	
		expertise		
External wall	E4: Jamb	Calculated by person with suitable	0.016 (!)	
		expertise		

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.047	
External wall	E7: Party floor between dwellings (in blocks of flats)	Calculated by person with suitable expertise	0.038 (!)	
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.093	
Party wall	P3: Intermediate floor between dwellings (in blocks of flats)	SAP table default	0 (!)	
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.043	
External wall	E25: Staggered party wall between dwellings	Calculated by person with suitable expertise	0.036 (!)	
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.046	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))								
Maximum permitted air permeability at 50Pa	8 m ³ /hm ²							
Dwelling air permeability at 50Pa	5 m ³ /hm ² , Design value	OK						
Air permeability test certificate reference		·						

4 Space heating								
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity								
Efficiency	216.4%							
Emitter type	Radiators							
Flow temperature	55°C							
System type	Heat Pump							
Manufacturer	Atlantic							
Model	Logic Air 8kW							
Commissioning								
Secondary heating system: N/A								
Fuel	N/A							
Efficiency	N/A							
Commissioning								

5 Hot water							
Cylinder/store - type: Cylinder							
Capacity	150 litres						
Declared heat loss	2.09 kWh/day						
Primary pipework insulated	Yes						
Manufacturer							
Model							
Commissioning							
Waste water heat recovery system 1 -	type: N/A						
Efficiency							
Manufacturer							
Model							

6 Controls							
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services							
Function							
Ecodesign class							
Manufacturer							
Model							
Water heating - type: Cylinder thermosta	at and HW separately timed						
Manufacturer							
Model							

7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation			
System type: N/A			
Maximum permitted specific fan power	N/A		
Specific fan power	N/A		N/A
Minimum permitted heat recovery	N/A		
efficiency			
Heat recovery efficiency	N/A		N/A
Manufacturer/Model			
Commissioning			
O Local manageries	<u>'</u>		
9 Local generation	(4)		
Technology type: Photovoltaic system Peak power	1.045 kWp		
Orientation	South West		
Pitch	45°		
Overshading	None or very little		
Manufacturer	None of very little		
MCS certificate			
MC3 certificate			
10 Heat networks			
N/A			
11 Supporting documentary evidence	•		
N/A	•		
12 Declarations			
a. Assessor Declaration			
		ontents of this BREL Compliance Report	
		nformation submitted for this dwelling for	
		and that the supporting documentary	
evidence (SAP Conventions, Append			
documentary evidence required) has	been reviewed in the	course of preparing this BREL	
Compliance Report.			
Signed:		Assessor ID:	
Name		Date	
Name:		Date:	

b. Client Declaration

N/A



Property Reference	Uni	t 2							Issued	on Date	05/03	/2024
Assessment Reference	e PV					Prop 1	Type F	Ref	Tebby an	d Son G	arage	
Property	Uni	t 1, Highla	nd Square ,	Bristol								
SAP Rating				88 B	DER		3.31		Т	ER	14	.62
Environmental				98 A	% DER	< TER					77	.36
CO₂ Emissions (t/year)			0.12	DFEE		31.5	7	T	FEE	35	.81
Compliance Check				See BREL	% DFEE	< TFEE					11.	.86
% DPER < TPER				46.29	DPER		41.7	4	Т	PER	77	.71
Assessor Details									A	ssessor	· ID U3	67-0001
Client												
SUMMARY FOR INF	UT DATA F	OR: Nev	v Build (A	s Designed)								
Orientation				Southeast								
Property Tenture				1								
Transaction Type				6								
Terrain Type				Urban								
1.0 Property Type				Flat, Semi-Detache	d							
Position of Flat				Ground-floor flat								
Which Floor				0								
2.0 Number of Storeys				1								
3.0 Date Built				2024								
3.0 Property Age Band				L								
4.0 Sheltered Sides				3								
5.0 Sunlight/Shade				Average or unknow	n							
6.0 Thermal Mass Paran	neter			Precise calculation								
Thermal Mass				N/A					kJ	/m²K		
7.0 Electricity Tariff				Standard								
Smart electricity mete	r fitted			No								
Smart gas meter fitted	l			No								
7.0 Measurements												
				Baseme Ground flo 1st Store 2nd Store 3rd Store	nt: or: ey: ey:	Loss Peri 0.00 m 17.36 m 0.00 m 0.00 m 0.00 m	meter	· Int	ternal Floo 0.00 m 42.61 n 0.00 m 0.00 m 0.00 m	2 11 ² 2 2 2 2 2		Storey Heig 0.00 m 2.50 m 0.00 m 0.00 m 0.00 m 0.00 m 0.00 m
				4th Store 5th Store 6th Store 7th Store	eý: ey:	0.00 m 0.00 m 0.00 m 0.00 m			0.00 m 0.00 m 0.00 m	2		0.00 m 0.00 m
8.0 Living Area				5th Store	eý: ey:	0.00 m 0.00 m			0.00 m 0.00 m	2 2		0.00 m
	Туре	Constr	ruction	5th Store 6th Store 7th Store	ey: ey: ey: U-Value	0.00 m 0.00 m 0.00 m		Nett Area	0.00 m 0.00 m 0.00 m	2 2		0.00 m 0.00 m
9.0 External Walls	Type Cavity Wall	Cavity		5th Store 6th Store 7th Store 21.73	U-Value (W/m²K)	0.00 m 0.00 m 0.00 m			0.00 m 0.00 m 0.00 m	2 2 2		0.00 m 0.00 m
9.0 External Walls Description Cavity Wall		Cavity	wall : plasterbo	5th Store 6th Store 7th Store 21.73	U-Value (W/m²K)	0.00 m 0.00 m 0.00 m	r ea(m²) 43.40	(m²) 37.82	0.00 m 0.00 m 0.00 m	2 2 Shelter	Openings	0.00 m 0.00 m s Area Calculat Type
9.0 External Walls Description Cavity Wall	Cavity Wall Type	Cavity filled ca	wall : plasterbo avity, any outsion	5th Store 6th Store 7th Store 21.73	U-Value (W/m²K)	0.00 m 0.00 m 0.00 m	ea(m²) 43.40	(m²) 37.82 U-Value	0.00 m 0.00 m 0.00 m	Shelter	Opening: 5.58	0.00 m 0.00 m s Area Calculat Type Enter Gross A
9.0 External Walls Description Cavity Wall 9.1 Party Walls Description	Cavity Wall Type Filled C	Cavity filled ca	wall : plasterbo avity, any outsion Construct Single plas	5th Store 6th Store 7th Store 21.73 and on dabs, dense block le structure sterboard on both sice	U-Value (W/m²K)	0.00 m 0.00 m 0.00 m	ea(m²) 43.40	(m²) 37.82 U-Value (W/m²K)	0.00 m 0.00 m 0.00 m m Shelter Res 0.00	Shelter None Area (m²)	Opening: 5.58 Shelter Res	S Area Calculat Type Enter Gross A Shelter None

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Description Party Ceiling 1		Constr Precasi		on ocrete planks floor, scree	ed, carpete	ed					Kap (kJ/n 30.	n²K)	Area (m²) 42.61
11.0 Heat Loss Floors													
Description	Туре	Storey Index		Construction			U-Valı (W/m²		Shelter Code		nelter actor	Kappa (kJ/m²k	Area (m²)
Heatloss Floor 1	Ground Floor - Solid	Lowest occup	oied	Suspended concrete floor, o	carpeted		0.12		None		0.00	75.00	
12.0 Opening Types Description	Data Source	Туре		Glazing			Glazing Gap	Filling Type	G-value	Frame Type		ame ctor	U Value (W/m²K)
Windows	Manufacturer	Window		Double Low-E So	oft 0.05			Air Filled	0.63	Wood		.70	1.31
13.0 Openings Name W01 W02	Opening Ty Windows Windows	pe		Location Cavity Wall Cavity Wall			Orienta North E North E	East East	Area (1.86 1.86) }		Pito 0 0	
W03	Windows			Cavity Wall			South	East	1.86	<u> </u>		0	
14.0 Conservatory				None									
15.0 Draught Proofing				100					%				
16.0 Draught Lobby				No									
17.0 Thermal Bridging 17.1 List of Bridges				Calculate Bridges									
Bridge Type E2 Other lintels (include E3 Sill E4 Jamb E5 Ground floor (norm E7 Party floor between P1 Party wall - Ground P3 Party wall - Intermet (in blocks of flats) E16 Comer (normal) E25 Staggered party w E18 Party wall between	al) n dwellings (in block: I floor ediate floor between vall between dwellin	s of flats) dwellings	Non Inde Inde Inde Inde Tab	orce Type In Gov Approved Scheme ependently assessed ependently assessed ependently assessed ependently assessed ependently assessed ependently assessed le K1 - Default ependently assessed	Len 3.4 3.4 9.8 17. 17. 17. 17. 5.0 5.0	41 41 84 .36 .36 .42 .42 .42	Psi 0.02 0.02 0.02 0.05 0.04 0.09 0.00 0.04 0.04	Adjusted 0.02 0.02 0.02 0.05 0.04 0.09 0.00 0.04 0.04 0.05	Reference:				Imported No
Y-value	g -			0.05					W/m²K				
18.0 Pressure Testing				Yes									
Designed AP₅o				5.00					m³/(h.m²	²) @ 50 P	a		
Property Tested?				Yes					= `	, 0			
Test Method				Blower Door					\exists				
19.0 Mechanical Ventilati	ion												
Mechanical Ventilation													
Mechanical Vent	ilation System Prese	ent		No									
20.0 Fans, Open Fireplac	es, Flues												
21.0 Fixed Cooling Syste	em			No									
22.0 Lighting													
No Fixed Lighting				No Name Lighting 1	Efficacy 80.00		Pov 1		Capa 120	city		Cou 5	
24.0 Main Heating 4					00.00								•
24.0 Main Heating 1				Database									
Percentage of Heat				100.00					<u>%</u>				
Database Ref. No.				106764					\exists				
Fuel Type				Electricity					\exists				
SAP Code				0									
In Winter				216.41					\exists				
In Summer				193.00					\exists				
Model Name				Logic Air 8kW					\exists				
Manufacturer				Atlantic					_				
System Type				Heat Pump					_				
Controls SAP Code				2207									

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		1
Delayed Start Stat	No]
HETAS approved System	No]
Oil Pump Inside	No]
FI Case	0.00]
Flue Type	None or Unknown]
Fan Assisted Flue	No	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	No	
25.0 Main Heating 2	None]
26.0 Heat Networks	None	
Heat Source Fuel Type Heating U Heat source 1 None Heat source 2 None Heat source 3 None Heat source 4 None Heat source 5 None	se Efficiency Percentage Of Heat Heat Ele Heat Power Ratio	ctrical Fuel Factor Efficiency typ
28.0 Water Heating		
Water Heating	Main Heating 1	
SAP Code	901	
Flue Gas Heat Recovery System	No]
Waste Water Heat Recovery Instantaneous System 1	No]
Waste Water Heat Recovery Instantaneous System 2	No]
Waste Water Heat Recovery Storage System	No]
Solar Panel	No]
Water use <= 125 litres/person/day	Yes]
Summer Immersion	No]
Cold Water Source	From header tank]
Bath Count	0]
Supplementary Immersion	No	
Immersion Only Heating Hot Water	No	
28.1 Showers Description Shower Typ 1 Combi boiler	e Flow Rate Rated Power ([[/min] [kW] or unvented hot water system 11.00	Connected Connected To
28.3 Waste Water Heat Recovery System	or anvented not water system 11.00	110
29.0 Hot Water Cylinder	Hot Water Cylinder	 1
	Yes]
Cylinder In Heated Space]
Cylinder In Heated Space	Yes	J 1
Independent Time Control	Yes Magazinad Laga]
Insulation Type	Measured Loss]
Cylinder Volume	150.00] L
Loss	2.09	kWh/day
Pipes insulation	Fully insulated primary pipework]
In Airing Cupboard	No	
31.0 Thermal Store	None]

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32.0 Photovoltai	ic Unit			One Dwelli	ng						
Export Capab	ole Meter?			Yes							
Connected To	Dwelling			Yes							
Diverter				No							
Battery Capa	city [kWh]			0.00							
PV Cel	ls kWp	Orientation	Elevation	Oversi	hading	FGHRS	MCS Certificate	e Overs Facto	shading or	MCS Certificate Reference	Panel Manufacturer
1.04		South West	45°	None (Or Little	No	No	1.00		reference	
34.0 Small-scale	Hydro			None							
Electricity Ge	nerated			0.00							
Apportioned				0.00					kWh/Ye	ear	
Connected to	dwelling's ele	ctricity meter		Yes							
Electricity Ge	neration			Annual							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oc	t Nov	Dec
Recommendation Lower cost rown None Further mean	neasures sures to achie	eve even higher		ypical Cost		Typical savin	gs per year	SAP ra		fter improvem Environi	ent nental Impact ()
	Solar water	er heating						0	-		

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D			7.0									arm	
Property Reference			nit 2							Issued on Da		05/03/2024	
Assessment Refer	rence	P۱						Prop Type Re	ef	ebby and Son	Garage		
Property		Ur	nit 1, Highland S	quare , Bristol									
SAP Rating					88 B		DER	3.3	1	TER		14.62	
Environmental					98 A		% DER < TER	O.C				77.36	
CO ₂ Emissions (t/)	vear)				0.12		DFEE	31.	57	TFEE		35.81	
Compliance Check					See BREL		% DFEE < TFE		J1			11.86	
% DPER < TPER	N.				46.29		DPER	41.	74	TPER		77.71	
// DPER < IPER					40.29		DFLIX	41.	14	IFLIX		11.11	
Assessor Details										Asses	sor ID	U367-000)1
SAP 10 WORKSHEET	FOR New B	Build (As D	esigned)	Version 10									
CALCULATION OF D	DWELLING EM	MISSIONS FO											
1. Overall dwell Ground floor Total floor area Dwelling volume			:)+(ld)+(le)	(ln)	4	2.6100		Area (m2) 42.6100			(2b) =(3n) =	Volume (m3) 106.5250	(4)
Number of open c Number of open f Number of chimne Number of flues Number of flues Number of blocke Number of interm Number of passiv Number of fluele	chimneys llues eys / flues attached t attached t ed chimneys ittent ext events	to solid fu to other he s tract fans	el boiler	re							0 * 80 = 0 * 20 = 0 * 10 = 0 * 20 = 0 * 35 = 0 * 20 = 2 * 10 = 0 * 10 =	0.0000 0.0000 0.0000 0.0000 0.0000	(6a) (6b) (6c) (6d) (6e) (6f) (7a) (7b)
nfiltration due ressure test Yressure Test Me leasured/design nfiltration rat Number of sides	ethod AP50 ce	eys, flues	and fans =	= (6a)+(6b)	+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7	7b)+(7c) =			/ (5) =	es per hour 0.1877 Yes 3lower Door 5.0000 0.4377	(17)
Shelter factor Infiltration rat	ce adjusted	i to includ	e shelter fa	actor					(20) = 1 - (2	[0.075 x (1) = (18) 2	(19)] = (20) =	0.7750 0.3393	
Wind speed Wind factor Adj infilt rate	Jan 5.1000 1.2750		Mar 4.9000 1.2250		May 4.3000 1.0750	Jun 3.8000 0.9500		Aug 3.7000 0.9250		Oct 4.3000 1.0750			
Effective ac	0.4326				0.3647 0.5665			0.3138 0.5492		0.3647 0.5665			
. Heat losses a	and heat lo	ss paramet	er										
lement				Gross	Openings	Net	Area	U-value	Αx	U K-	-value	AxK	
indows (Uw = 1. eatloss Floor 1 avity Wall		-1		m2 43.4000	m2 5.5800	5. 42. 37.	6100 8200	W/m2K 1.2448 0.1200 0.1800	6.945	8		kJ/K 3195.7500 5673.0000	(27) (28a) (29a)
otal net area o abric heat loss arty Wall 1 arty Ceiling 1 nternal Wall 1			Aum(A, MZ)			41. 42.			= 18.866 0.000	10 70 30	0.0000 0.0000 0.0000	2907.8000 1278.3000 5050.0000	(32b)
eat capacity Cm hermal mass par ist of Thermal	ameter (TM Bridges		FA) in kJ/m2	îK					(30) + (32	(32a).	. (32e) =	18104.8500 424.8967	(34)
K1 Eleme E2 Other E3 Sill E4 Jamb E5 Groun E7 Party P1 Party	ent : lintels (nd floor (n / floor bet / wall - Gr	normal) ween dwell		ocks of fla	ts) gs (in block	s of flats	·)	3 9 17 17	3.4100 3.4100 9.8400 7.3600 7.3600	0.0230 0.0210 0.0210 0.0160 0.0470 0.0380 0.0930 0.0000	Tot 0.07 0.07 0.15 0.81 0.65 1.62	784 716 574 159 597	

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E25 St E18 Pa	rty wall be	rty wall bet etween dwell		_				5	.0000 .0000 .0000	0.0430 0.0360 0.0460	0.21 0.18 0.23	00	(25)
Thermal bridge Point Thermal : Total fabric h	bridges	Psi) calcul	lated using	Appendix K	5)				(33) + (36) -	(36a) = + (36a) =	4.0281 0.0000 22.8948	
Ventilation he	at loss cal	lculated mor	nthly (38)m Mar	= 0.33 x ((25)m x (5) May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m Heat transfer	20.8652	20.7375	20.6123	20.0244	19.9144	19.4024	19.4024	19.3075	19.5996	19.9144	20.1369	20.3696	(38)
Average = Sum(43.7600 39)m / 12 =	43.6323	43.5071	42.9192	42.8092	42.2971	42.2971	42.2023	42.4944	42.8092	43.0317	43.2644 42.9187	(39)
HLP HLP (average)	Jan 1.0270	Feb 1.0240	Mar 1.0211	Apr 1.0073	May 1.0047	Jun 0.9927	Jul 0.9927	Aug 0.9904	Sep 0.9973	Oct 1.0047	Nov 1.0099	Dec 1.0154 1.0072	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
4. Water heati	ng energy i	requirements	s (kWh/year)										
Assumed occupa Hot water usag	ncy											1.4773	(42)
Hot water usag	84.2374 e for baths	82.9478 3	81.0472	78.1233	75.5037	71.8388	68.9401	72.3289	74.0333	77.6632	81.4434	84.1615	
Hot water usag			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Average daily	29.7591 hot water u	28.6769 use (litres	27.5948 /day)	26.5126	25.4305	24.3483	24.3483	25.4305	26.5126	27.5948	28.6769	29.7591 104.7141	
Daily hot wate		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte		111.6247 147.7021	108.6419 155.2471	104.6360 136.6807	100.9342 130.0639	96.1872 111.2372	93.2885 103.0865	97.7593 115.0645	100.5459 116.6282	105.2579 135.6355	110.1203	113.9206 167.3007	
Energy content Distribution 1		= 0.15 x (4	45)m 23.2871	20.5021	19.5096	16.6856	15.4630	17.2597	17.4942	20.3453	um(45)m = 22.3247	1635.3004 25.0951	(46)
Water storage Store volume a) If manufac		ared loss fa	actor is kno	own (kWh/d	lay):							150.0000 2.0900	
Temperature Enter (49) or Total storage	(54) in (55											0.5400 1.1286	
If cylinder co	34.9866	31.6008 icated solar	34.9866 r storage	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(56)
Primary loss Combi loss	34.9866 23.2624 0.0000	31.6008 21.0112 0.0000	34.9866 23.2624 0.0000	33.8580 22.5120 0.0000	34.9866 23.2624 0.0000	33.8580 22.5120 0.0000	34.9866 23.2624 0.0000	34.9866 23.2624 0.0000	33.8580 22.5120 0.0000	34.9866 23.2624 0.0000	33.8580 22.5120 0.0000	34.9866 23.2624 0.0000	(59)
Total heat req	0.0000		213.4961 0.0000	193.0507 0.0000	188.3129 0.0000	167.6072 0.0000	161.3355 0.0000	173.3135 0.0000	172.9982 0.0000	193.8845 0.0000	205.2013	225.5497 0.0000	
PV diverter Solar input	-0.0000 0.0000	-0.0000 0.0000	-0.0000 0.0000	-0.0000 0.0000	-0.0000 0.0000	-0.0000 0.0000	-0.0000 0.0000	-0.0000 0.0000	-0.0000 0.0000	-0.0000 0.0000	-0.0000 0.0000	-0.0000 0.0000	(63b) (63c)
FGHRS Output from w/	0.0000 h 226.0716	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 161.3355	0.0000 173.3135	0.0000 172.9982	0.0000	0.0000	0.0000	
12Total per ye	ar (kWh/yea								er year (kW			2321.1354 2321	(64)
Electric showe	0.0000	0.0000	0.0000	0.0000 Tot	0.0000 al Energy us	0.0000	0.0000	0.0000	0.0000 wer(s) (WWh	0.0000 /wear) = Su	0.0000 m(64a)m =	0.0000	
Heat gains from	m water hea 102.4002	ating, kWh/r 91.2005	month 98.2189	90.5423	89.8455	82.0824	80.8755	84.8582	83.8749	91.6980	94.5824	102.2267	
5. Internal ga	ins (see Ta	able 5 and 5											
Metabolic gain	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m Lighting gains	(calculate	ed in Append	dix L, equat	tion L9 or	73.8652 L9a), also s 70.3680	see Table 5		73.8652 70.3680		73.8652 70.3680	73.8652 72.7136		
Appliances gai	ns (calcula	ated in Appe	endix L, eq	ation L13	or L13a), al 109.9886	lso see Tab	le 5	94.5408		105.0258		70.3680	
Cooking gains	(calculated 30.3865	d in Appendi 30.3865	ix L, equat: 30.3865	ion L15 or 30.3865	L15a), also 30.3865	see Table : 30.3865	5 30.3865	30.3865	30.3865	30.3865	30.3865	30.3865	(69)
Pumps, fans Losses e.g. ev	aporation	(negative va	alues) (Tabi	le 5)					0.0000				
Water heating	gains (Tabl	le 5)			-59.0922 120.7600				-59.0922 116.4929	-59.0922		-59.0922 137.4015	
Total internal	gains				346.2762								
6. Solar gains													
[Jan]				rea m2	Solar flux Table 6a W/m2	Speci or	g fic data Table 6b	Specific or Tab	FF data le 6c	Acce fact Table	ss or 6d	Gains W	
Northeast Southeast			3.77 1.80	200 500	11.2829 36.7938		0.6300 0.6300	0	.7000 .7000	0.77 0.77	00 00	12.8274 20.9151	(75) (77)
Solar gains Total gains													
7. Mean intern	al temperat	ture (heatin	ng season)										

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Temperature du Utilisation fa						Thl (C)						21.0000	(85)
tau alpha	Jan 114.9252 8.6617	Feb 115.2615 8.6841	Mar 115.5931 8.7062	Apr 117.1766 8.8118	May 117.4777 8.8318	Jun 118.8999 8.9267	Jul 118.8999 8.9267	Aug 119.1671 8.9445	Sep 118.3480 8.8899	Oct 117.4777 8.8318	Nov 116.8702 8.7913	Dec 116.2417 8.7494	
util living ar	ea 0.9968	0.9924	0.9793	0.9140	0.7500	0.5286	0.3810	0.4165	0.6570	0.9268	0.9894	0.9974	(86)
Living Non living 24 / 16 24 / 9	20.4788 19.4774 0	20.5792 19.6060 0	20.7186 19.7800 0	20.8978 19.9920 0	20.9839 20.0701 0	20.9993 20.0892 0	21.0000 20.0895 0	20.9999 20.0913 0	20.9957 20.0839 0	20.9003 20.0006 0	20.6739 19.7354 0	20.4666 19.4698 0	
16 / 9 MIT Th 2	28 20.7334 20.0609	0 20.5792 20.0634	20.7186 20.0658	0 20.8978 20.0773	20.9839 20.0794	0 20.9993 20.0895	0 21.0000 20.0895	0 20.9999 20.0913	0 20.9957 20.0856	20.9003 20.0794	0 20.6739 20.0751	10 20.5412 20.0706	(87)
util rest of h	0.9951	0.9885	0.9687	0.8782	0.6842	0.4539	0.3022	0.3343	0.5732	0.8878	0.9831	0.9960	
MIT 2 Living area fr MIT	19.8283 action 20.2899	19.6060	19.7800 20.2586	19.9920 20.4539	20.0701	20.0892	20.0895	20.0913	20.0839 fLA = 20.5489	20.0006 Living area 20.4594	19.7354 a / (4) = 20.2141	19.5781 0.5100 20.0692	(91)
Temperature ad		20.1023	20.2586	20.4539	20.5361	20.5533	20.5538	20.5547	20.5489	20.4594	20.2141	0.0000 20.0692	
,													(/
8. Space heati	ng requirem	ment											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation Useful gains Ext temp. Heat loss rate	0.9956 413.2100 4.3000	0.9887	0.9713 455.9742 6.5000	0.8941 447.2852 8.9000	0.7177 371.5924 11.7000	0.4921 251.5790 14.6000	0.3424 167.2263 16.6000	0.3762 175.3195 16.4000	0.6161 272.5521 14.1000	0.9056 375.9118 10.6000	0.9842 398.0864 7.1000	0.9960 402.1897 4.2000	(95)
Space heating	699.7161	663.3118	598.5985	495.8843	378.2663	251.8087	167.2340	175.3370	274.0424	422.0737	564.3203	686.5728	(97)
Space heating Solar heating	213.1605 requirement kWh	_	- '		4.9654	0.0000	0.0000	0.0000	0.0000	34.3445	119.6884	211.5810 871.6171	
Solar heating Space heating		0.0000 on - total p	0.0000 per year (kV	0.0000 Wh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Space heating Space heating	213.1605 requirement	146.7733 t after sol		34.9914 tion - tota	4.9654 l per year	0.0000 (kWh/year)	0.0000	0.0000	0.0000	34.3445 (98c)	119.6884	211.5810 871.6171 20.4557	
9a. Energy req	uirements -	- Individua	l heating sy	ystems, inc	luding micr	o-CHP							
Fraction of sp Fraction of sp Efficiency of Efficiency of	ace heat fr main space main space	rom main sy: heating sy: heating sy:	stem(s) stem 1 (in 9 stem 2 (in 9	b) b)	m (Table 11)						0.0000 1.0000 216.4148 0.0000	(202) (206) (207)
Efficiency of							7		2	0	¥	0.0000	(208)
Space heating		Feb t 146.7733	Mar	Apr 34.9914	May 4.9654	Jun 0.0000	Jul 0.0000	Aug 0.0000	Sep 0.0000	Oct 34.3445	Nov 119.6884	Dec 211.5810	(98)
Space heating	efficiency	(main heat		L)	216.4148	0.0000	0.0000	0.0000	0.0000	216.4148	216.4148	216.4148	
Space heating				16.1687	2.2944	0.0000	0.0000	0.0000	0.0000	15.8697	55.3051	97.7664	
Space heating	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	0.0000	0.0000	stem 2) 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating	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													
Efficiency of	water heate			193.0507 192.9954	188.3129 192.9954	167.6072 192.9954	161.3355	173.3135 192.9954	172.9982 192.9954	193.8845	205.2013	225.5497 192.9954	(216)
(217)m Fuel for water	heating, h	192.9954 kWh/month 103.7922	192.9954	192.9954	97.5738	86.8452	192.9954 83.5955	89.8019	89.6385	192.9954	192.9954 106.3245	192.9954 116.8679	
Space cooling (221)m			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Pumps and Fa Lighting	0.0000 14.6211	0.0000 11.7296	0.0000 10.5612	0.0000 7.7376	0.0000 5.9767	0.0000 4.8830	0.0000 5.4522	0.0000 7.0869	0.0000 9.2052	0.0000 12.0778	0.0000 13.6418	0.0000 15.0274	(231)
Electricity ge (233a)m	-19.3185	-28.8947	-43.6943	-50.8931	-56.6273		-52.6553	-49.0010	-41.9125	-33.4240	-21.6612	-16.5092	(233a)
Electricity ge (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 ge (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 us (235c)m Electricity ge	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)
(233b)m Electricity ge	-5.5454	-12.3875	-26.0373	-41.6892	-56.9661		-57.3644	-47.6525	-34.4452	-19.1954	-7.7904	-4.3248	(233b)
(234b)m Electricity ge	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 itv)	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
(235b)m Electricity us	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 eneration)	0.0000	0.0000	0.0000	0.0000	(235b)
(235d)m Annual totals	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)
Space heating Space heating Space heating Efficiency of Water heating Space cooling	fuel - mair fuel - seco water heate fuel used	n system 2 ondary										402.7529 0.0000 0.0000 192.9954 1202.6898 0.0000	(213) (215) (219)
Electricity fo Total electric Electricity fo	or pumps and	e above, kW		ix L)								0.0000 118.0005	(231)
Energy saving/ PV generation	generation	technologi	es (Appendio	ces M ,N and	d Q)							-839.3408	(233)

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Wind generation Hydro-electric (Electricity gene Appendix Q - spe Energy saved or Energy used Total delivered	generation (/ erated - Micr ecial feature generated	ro CHP (Ap										0.0000 0.0000 0.0000 -0.0000 0.0000 884.1024	(235a) (235) (236) (237)
12a. Carbon diox	vide emission	ns - India	ridual heati	na erreteme	including	micro-CHP							
								Energy	Emissic	n factor		Emissions	
								kWh/year	kg	CO2/kWh		kg CO2/year	
Space heating - Total CO2 associ	iated with co		ystems					402.7529		0.1576		63.4683 0.0000	(373)
Water heating (o Space and water							1	202.6898		0.1407		169.2707 232.7390	
Pumps, fans and Energy for light		ep-hot						0.0000 118.0005		0.0000 0.1443		0.0000 17.0311	
Energy saving/o	_	echnologie	• 9										. ,
PV Unit electric	city used in	dwelling	.5					468.0970 371.2438		0.1337 0.1244		-62.5842 -46.1715	
Total		u					_	3/1.2430		0.1244		-108.7557	(269)
Total CO2, kg/ye EPC Dwelling Car		Emission	Rate (DER)									141.0145 3.3100	
13a. Primary ene	ergy - Indiv	idual heat	ing systems	including	micro-CHP								
									Primary energ				
Space heating -								kWh/year 402.7529	kg	1.5834		kWh/year 637.7116	(275)
Total CO2 associ	other fuel)	ommunity s	ystems				1	202.6898		1.5204		0.0000 1828.5813	(278)
Space and water Pumps, fans and		ep-hot						0.0000		0.0000		2466.2929 0.0000	
Energy for light								118.0005		1.5338		180.9931	
Energy saving/g			:5					468.0970		1.4941		-699.3757	
PV Unit electric								371.2438		0.4565		-169.4603	
Total Total Primary er	nergy kWh/yea	ar										-868.8359 1778.4501	(286)
Dwelling Primary	y energy Rate	e (DPER)										41.7400	(287)
SAP 10 WORKSHEET CALCULATION OF 1			esigned) (Version 10.	2, Februar	y 2022)							
1. Overall dwell	ling characte	eristics											
								Area (m2)	Store	y height			
Ground floor	- TEN (1-)	. (15) . (1-)	. (14) . (1-)	(1-)				(1112)				Volume	(1b) - (3b)
Total floor area Dwelling volume		+(1D)+(1C)	+(1a)+(1e).			40 (100		42.6100	(lb) x	(m) 2.5000	(2b) =	(m3)	(4) (5)
				,		42.6100			(1b) x 3a)+(3b)+(3c)+	2.5000		(m3) 106.5250	
				,,		42.6100				2.5000		(m3) 106.5250	
				,		42.6100				2.5000		(m3) 106.5250	
2. Ventilation	 rate					42.6100				2.5000		(m3) 106.5250	
2. Ventilation 1						42.6100				2.5000	(3n) =	(m3) 106.5250 106.5250	
						42.6100				2.5000	(3n) =	(m3) 106.5250 106.5250 m3 per hour	
Number of open of	chimneys flues					42.6100				2.5000	0 * 80 = 0 * 20 =	(m3) 106.5250 106.5250 m3 per hour 0.0000 0.0000	(6a) (6b)
Number of open of Number of open in Number of chimned Number of flues	chimneys flues eys / flues a attached to	solid fue	l boiler			42.6100				2.5000	0 * 80 = 0 * 20 = 0 * 20 = 0 * 20 =	(m3) 106.5250 106.5250 m3 per hour 0.0000 0.0000 0.0000	(6a) (6b) (6c) (6d)
Number of open of Number of open in Number of chimmen Number of flues Number of flues Number of blocke	chimneys flues eys / flues a attached to attached to ed chimneys	solid fue other hea	l boiler			42.6100				2.5000	0 * 80 = 0 * 20 = 0 * 20 = 0 * 35 = 0 * 20 =	(m3) 106.5250 106.5250 m3 per hour 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	(6a) (6b) (6c) (6d) (6e)
Number of open of Number of open in Number of chimme Number of flues Number of flues	chimneys flues eys / flues a attached to attached to ed chimneys mittent extra	solid fue other hea	l boiler			42.6100				2.5000	0 * 80 = 0 * 20 = 0 * 10 = 0 * 35 =	(m3) 106.5250 106.5250 m3 per hour 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	(6a) (6b) (6c) (6d) (6e) (6f) (7a)
Number of open of Number of open in Number of chimne Number of flues Number of blocke Number of inter	chimneys flues eys / flues a attached to attached to ed chimneys mittent extra	solid fue other hea act fans	l boiler			42.6100				2.5000	0 * 80 = 0 * 20 = 0 * 10 = 0 * 35 = 0 * 20 = 2 * 10 = 2 * 10 = 2	m3) 106.5250 106.5250 106.5250 m3 per hour 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	(6a) (6b) (6c) (6d) (6e) (6f) (7a) (7b)
Number of open of Number of open in Number of chimme Number of flues Number of flues Number of blocket Number of intern Number of passiv Number of fluele	chimneys flues eys / flues a attached to attached to ed chimneys mittent extra ve vents ess gas fires	solid fue other hea act fans	el boiler eter	re			6a) + (7a) + (7h	(:	3a)+(3b)+(3c)+	2.5000 (3d)+(3e)	0 * 80 = 0 * 10 = 0 * 20 = 0 * 20 = 2 * 10 = 0 * 20 = 2 * 10 = 0 * 40 = Air change	(m3) 106.5250 106.5250 m3 per hour 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	(6a) (6b) (6c) (6d) (6e) (6f) (7a) (7b) (7c)
Number of open of Number of open in Number of chimne Number of flues Number of flues Number of intern Number of passis Number of fluele	chimneys flues eys / flues a attached to attached to ed chimneys mittent extra ve vents ess gas fires	solid fue other hea act fans	el boiler eter	re			6g) + (7a) + (7b	(:	3a)+(3b)+(3c)+	2.5000 (3d)+(3e)	0 * 80 = 0 * 20 = 0 * 10 = 0 * 20 = 0 * 35 = 0 * 20 = 2 * 10 = 0 * 40 = Air change	m3) 106.5250 106.5250 106.5250 m3 per hour 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	(6a) (6b) (6c) (6d) (6e) (6f) (7a) (7b) (7c)
Number of open of Number of open in Number of open in Number of chimme Number of flues Number of block Number of intern Number of passiv Number of fluels Infiltration due Pressure test Pressure test Measured/design	chimneys flues eys / flues a attached to attached to ed chimneys mittent extra ve vents ess gas fires e to chimneys ethod AP50	solid fue other hea act fans	el boiler eter	re			6g) + (7a) + (7b	(:	3a)+(3b)+(3c)+	2.5000 (3d)+(3e)	0 * 80 = 0 * 20 = 0 * 10 = 0 * 20 = 0 * 35 = 0 * 20 = 2 * 10 = 0 * 40 = Air change	m3 per hour 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 20.0000 0.0000 0.0000 85 per hour 0.1877 Yes Blower Door	(6a) (6b) (6c) (6d) (6e) (6f) (7a) (7b) (7c)
Number of open of Number of open of Number of chimme Number of flues Number of flues Number of passis Number of passis Number of flueld Infiltration due Pressure test Merce Number test Number test Merce Number test Merce Number test Merce Number test N	chimneys flues eys / flues a attached to attached to ed chimneys we vents ess gas fires e to chimneys ethod AP50 te	solid fue other hea act fans	el boiler eter	re			6g) + (7a) + (7b	(:	3a)+(3b)+(3c)+	2.5000 (3d)+(3e)	0 * 80 = 0 * 20 = 0 * 10 = 0 * 20 = 0 * 35 = 0 * 20 = 2 * 10 = 0 * 40 = Air change	m3) 106.5250 106.5250 106.5250 m3 per hour 0.0000	(6a) (6b) (6c) (6d) (6e) (6f) (7a) (7b) (7c)
Number of open of Number of open of Number of chimne Number of flues Number of flues Number of inter Number of passiv Number of fluele Infiltration due Pressure test Pressure Test Me Measured/design Infiltration rat	chimneys flues eys / flues a attached to attached to ed chimneys we vents ess gas fires e to chimneys ethod AP50 te	solid fue other hea act fans	el boiler eter	re			6g) + (7a) + (7b	(:	3a)+(3b)+(3c)+	2.5000 (3d)+(3e)	0 * 80 = 0 * 20 = 0 * 10 = 0 * 20 = 0 * 35 = 0 * 20 = 2 * 10 = 0 * 40 = Air change	m3) 106.5250 106.5250 106.5250 m3 per hour 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	(6a) (6b) (6c) (6d) (6e) (6f) (7a) (7b) (7c) (8)
Number of open of Number of open in Number of chimne Number of flues Number of flues Number of intern Number of intern Number of intern Number of fluele Infiltration due Pressure test Pressure test Pressure Test Measured/design Infiltration rat Number of sides	chimneys flues eys / flues a attached to attached to ed chimneys mittent extra eve vents ess gas fires e to chimneys ethod AP50 te sheltered	solid fue other hea act fans s s, flues a	l boiler ter	re: (6a)+(6b)+			6g) + (7a) + (7b	(:	(20) = 1 -	2.5000 (3d)+(3e) 20.0000	0 * 80 = 0 * 20 = 0 * 10 = 0 * 20 = 0 * 35 = 0 * 20 = 2 * 10 = 0 * 40 = Air change	(m3) 106.5250 106.5250 106.5250 m3 per hour 0.00000 0.00000 0.00000 0.00000 0.00000 0.0000 0.0000	(6a) (6b) (6c) (6d) (6e) (6f) (7a) (7b) (7c) (8) (17) (18) (19)
Number of open of Number of open of Number of chimme Number of flues Number of flues Number of blocke Number of passis Number of fluele Infiltration due Pressure test Pressure Test Me Measured/design Infiltration rat Number of sides Shelter factor	chimneys flues eys / flues a attached to attached to ed chimneys mittent extra ve vents ess gas fire: e to chimneys ethod AP50 te sheltered te adjusted i	solid fue other hea act fans s s, flues a	el boiler ter and fans =	re: (6a)+(6b)+		(6e)+(6f)+((; 	(20) = 1 - (21)	2.5000 (3d)+(3e) 20.0000 (0.075) = (18)	0 * 80 = 0 * 20 = 0 * 20 = 0 * 20 = 2 * 10 = 0 * 40 = Air change / (5) = x (19)] = x (20) =	(m3) 106.5250 106.5250 106.5250 m3 per hour 0.00000 0.00000 0.00000 0.00000 0.00000 0.0000 0.0000	(6a) (6b) (6c) (6d) (6e) (6f) (7a) (7b) (7c) (8) (17) (18) (19)
Number of open of Number of open of Number of chimne Number of flues Number of flues Number of passiv Number of passiv Number of flueld Infiltration due Pressure test Measured/design Infiltration rat Number of sides Shelter factor Infiltration rat Wind speed	chimneys flues eys / flues a attached to attached to ed chimneys ex verts es gas fires e to chimneys ethod AP50 te sheltered te adjusted to	solid fue other hea act fans s s, flues a to include	el boiler ter and fans = shelter fa Mar 4.9000	re (6a)+(6b)+ ctor Apr 4.4000	(6c)+(6d)+ May 4.3000	(6e)+(6f)+(Jul 3.8000	(: 	(20) = 1 - (21) Sep 4.0000	2.5000 (3d)+(3e) 20.0000 (0.075 2)) = (18) Oct 4.3000	0 * 80 = 0 * 20 = 0 * 10 = 0 * 20 = 0 * 35 = 0 * 20 = 2 * 10 = 0 * 40 = Air change 0 / (5) = (19)] = x (20) =	(m3) 106.5250 106.5250 106.5250 m3 per hour 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.000	(6a) (6b) (6c) (6c) (6d) (6e) (7a) (7b) (7c) (8) (17) (18) (19) (20) (21)
Number of open of Number of open in Number of chimne Number of flues Number of flues Number of intern Number of intern Number of intern Number of intern Number of fluels Infiltration dust Pressure test Pressure test Pressure Test Measured/design Infiltration rat Number of sides Shelter factor Infiltration rat	chimneys flues eys / flues a attached to attached to ed chimneys mittent extra ve vents ess gas fires e to chimneys ethod AP50 te sheltered te adjusted 1 Jan 5.1000 1.2750	solid fue other hea act fans s s, flues a to include Feb 5.0000 1.2500	e shelter fa	re (6a)+(6b)+ ctor Apr 4.4000 1.1000	May 4.3000 1.0750	Jun 3.8000 0.9500	Jul 3.8000 0.9500	Aug 3.7000 0.9250	(20) = 1 - (21) Sep 4.0000 1.0000	2.5000 (3d)+(3e) 20.0000 [0.075 x]) = (18) Oct 4.3000 1.0750	0 * 80 = 0 * 20 = 0 * 10 = 0 * 20 = 0 * 35 = 0 * 20 = 2 * 10 = 0 * 40 = Air change 0 / (5) = 1 1 1 1 1 1 1 1 1 1 1 1 1	(m3) 106.5250 106.5250 106.5250 m3 per hour 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.000	(6a) (6b) (6c) (6c) (6d) (6e) (7a) (7b) (7c) (8) (17) (18) (19) (20) (21)
Number of open of Number of open of Number of open of Number of chimme Number of flues Number of blocke Number of passiv Number of passiv Number of flueld Infiltration due Pressure test Measured/design Infiltration rat Number of sides Shelter factor Infiltration rat Wind speed Wind speed Wind factor	chimneys flues eys / flues a attached to attached to ed chimneys mittent extra eve vents ess gas fires e to chimneys ethod AP50 te sheltered te adjusted 1 Jan 5.1000 1.2750 0.4326	solid fue other hea act fans s s, flues a to include Feb 5.0000 1.2500 0.4241	el boiler ter and fans = shelter fa Mar 4.9000	re (6a)+(6b)+ ctor Apr 4.4000 1.1000 0.3732	May 4.3000 1.0750 0.3647	(6e)+(6f)+(Jul 3.8000	Aug 3.7000 0.9250 0.3138	(20) = 1 - (21) Sep 4.0000 1.0000	2.5000 (3d)+(3e) 20.0000 (0.075 x)) = (18) Oct 4.3000 1.0750 0.3647	0 * 80 = 0 * 20 = 0 * 20 = 0 * 35 = 0 * 10 = 0 * 10 = 0 * 40 = 0 *	(m3) 106.5250 106.5250 106.5250 m3 per hour 0.0000 0.00	(6a) (6b) (6c) (6c) (6d) (6e) (6f) (7a) (7b) (7c) (8) (17) (18) (19) (20) (21) (22) (22a) (22b)

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3. Heat losses	and best 1	ogg naramot	 ter										
3. Heat losses 				Gross	Openings		tArea	U-value	Ах	J K	-value	АхК	
TER Opening Typ	pe (Uw = 1.	20)		m2	openings m2	2	m2 .5800	W/m2K 1.1450	W/I 6.389	K	kJ/m2K	kJ/K	
Heatloss Floor Cavity Wall	1	1		43.4000	5.5800	42	.6100 .8200	0.1300 0.1800	5.5393 6.807	3			(28a) (29a)
Total net area Fabric heat lo						86	.0100 (26)(30) + (32)	= 18.7362	2			(31) (33)
Party Wall 1						41	.5400	0.0000	0.000	0		40.555	(32)
Thermal mass pa	l Bridges	MP = Cm / T	rrA) in kJ/r	n2K				_		-1 -r-1:	_	434.8967	(35)
K1 Eler E2 Othe E3 Sil	er lintels	(including	other stee	l lintels)				3		0.0500 0.0500	Tot 0.17 0.17	05	
E4 Jami		normal)						9	9.8400 7.3600	0.0500 0.0500 0.1600	0.17 0.49 2.77	20	
E7 Par	ty floor be ty wall - G	tween dwell		locks of fl	ats)			17	7.3600 7.3600 7.4200	0.0700	1.21 1.39	52	
P3 Part E16 Co:	ty wall - I rner (norma	ntermediate 1)	e floor bet		ngs (in bloo	cks of flat	3)	17	7.4200 5.0000	0.0000	0.00 0.45	00	
E25 Sta E18 Pa:	aggered par rty wall be	ty wall bet tween dwell	lings					5	5.0000 5.0000	0.0600 0.0600	0.30 0.30	00	
Thermal bridges	bridges	Psi) calcul	lated using	Appendix K	i)					2)	(36a) =	7.2694	
Total fabric he		milated mor	nth]; /20\-	- 0 22 1	25\m = /5\				(3:	3) + (36)	+ (36a) =	26.0056	(37)
Ventilation hea	at 1088 cal Jan 20.8652	Feb 20.7375	Mar 20.6123	= 0.33 X (Apr 20.0244	25) m x (5) May 19.9144	Jun 19.4024	Jul 19.4024	Aug 19.3075	Sep 19.5996	Oct 19.9144	Nov 20.1369	Dec 20.3696	(38)
(38)M Heat transfer (coeff	46.7431	46.6180	46.0300	45.9200	45.4080	45.4080	45.3131	45.6052	45.9200	46.1426	46.3752	
Average = Sum(10.0000	20.5200	.0.4000	10.4000	.5.5151	.0.0002	.0.5200		46.0295	
HLP	Jan 1.1000	Feb 1.0970	Mar 1.0941	Apr 1.0803	May 1.0777	Jun 1.0657	Jul 1.0657	Aug 1.0634	Sep 1.0703	Oct 1.0777	Nov 1.0829	Dec 1.0884	
HLP (average) Days in mont	31	28	31	30	31	30	31	31	30	31	30	1.0803 31	
4. Water heatin													
Assumed occupat Hot water usage	e for mixer							_				1.4773	
Hot water usage	e for baths		60.5306	57.8972	55.9538	53.7865	52.5546	53.9206	55.4179	57.7449	60.4349	62.6107	
Hot water usage			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Average daily h	29.7591 hot water u	28.6769 se (litres/		26.5126	25.4305	24.3483	24.3483	25.4305	26.5126	27.5948	28.6769	29.7591 85.0007	
	Jan	Feb	Mar	3		T		_		_		_	
Daily hot water	r use		PIGL	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	r use 92.6106 146.6726	90.5839	88.1254	84.4098 115.5528	81.3842 109.5588	78.1348 96.0759	Jul 76.9029 93.0074	79.3510 98.2532	81.9305	85.3397 115.8051	89.1118 126.9562	92.3698 144.6288	(45)
_	r use 92.6106 146.6726 (annual) oss (46)m	90.5839 128.9903 = 0.15 x (4	88.1254 135.4455 45)m	84.4098 115.5528	81.3842 109.5588	78.1348 96.0759	76.9029 93.0074	79.3510 98.2532	81.9305 101.0285	85.3397 115.8051 Total = S	89.1118 126.9562 um(45)m =	92.3698 144.6288 1411.9751	(45)
Energy conte Energy content Distribution 10	r use 92.6106 146.6726 (annual) oss (46)m 22.0009	90.5839 128.9903	88.1254 135.4455 45)m	84.4098	81.3842	78.1348	76.9029	79.3510	81.9305 101.0285	85.3397 115.8051	89.1118 126.9562	92.3698 144.6288 1411.9751 21.6943	(45)
Energy conte Energy content Distribution 10 Water storage : Store volume a) If manufact	r use 92.6106 146.6726 (annual) oss (46)m 22.0009 loss: turer decla	90.5839 128.9903 = 0.15 x (4 19.3485	88.1254 135.4455 45)m 20.3168	84.4098 115.5528 17.3329	81.3842 109.5588 16.4338	78.1348 96.0759	76.9029 93.0074	79.3510 98.2532	81.9305 101.0285	85.3397 115.8051 Total = S	89.1118 126.9562 um(45)m =	92.3698 144.6288 1411.9751 21.6943 150.0000 1.3938	(45) (46) (47) (48)
Energy conte Energy content Distribution 10 Water storage : Store volume	r use 92.6106 146.6726 (annual) oss (46)m 22.0009 loss: turer decla factor from (54) in (55	90.5839 128.9903 = 0.15 x (4 19.3485 red loss fa	88.1254 135.4455 45)m 20.3168	84.4098 115.5528 17.3329	81.3842 109.5588 16.4338	78.1348 96.0759	76.9029 93.0074	79.3510 98.2532	81.9305 101.0285	85.3397 115.8051 Total = S	89.1118 126.9562 um(45)m =	92.3698 144.6288 1411.9751 21.6943 150.0000	(45) (46) (47) (48) (49)
Energy conte Energy content Distribution 10 Water storage: Store volume a) If manufact Temperature: Enter (49) or Total storage: If cylinder con	r use 92.6106 146.6726 (annual) oss (46)m 22.0009 loss: turer decla factor from (54) in (55 loss 23.3325 prains dedi	90.5839 128.9903 = 0.15 x (4 19.3485 red loss fa Table 2b)	88.1254 135.4455 45)m 20.3168 actor is known	84.4098 115.5528 17.3329 own (kWh/d	81.3842 109.5588 16.4338 (ay):	78.1348 96.0759 14.4114	76.9029 93.0074 13.9511 23.3325	79.3510 98.2532 14.7380	81.9305 101.0285 15.1543	85.3397 115.8051 Total = S 17.3708	89.1118 126.9562 um(45)m = 19.0434	92.3698 144.6288 1411.9751 21.6943 150.0000 1.3938 0.5400 0.7527 23.3325	(45) (46) (47) (48) (49) (55) (56)
Energy conte Energy content Distribution 10 Water storage: Store volume a) If manufact Temperature: Enter (49) or Total storage: If cylinder con	r use 92.6106 146.6726 (annual) oss (46)m 22.0009 loss: turer decla factor from (54) in (55 loss 23.3325 prains dedi	90.5839 128.9903 = 0.15 x (4 19.3485 red loss fa Table 2b)	88.1254 135.4455 45)m 20.3168 actor is known	84.4098 115.5528 17.3329 own (kWh/d	81.3842 109.5588 16.4338 (ay):	78.1348 96.0759 14.4114	76.9029 93.0074 13.9511 23.3325	79.3510 98.2532 14.7380	81.9305 101.0285 15.1543	85.3397 115.8051 Total = S 17.3708	89.1118 126.9562 um(45)m = 19.0434	92.3698 144.6288 1411.9751 21.6943 150.0000 1.3938 0.5400 0.7527 23.3325	(45) (46) (47) (48) (49) (55) (56) (57) (59)
Energy conte Energy content Distribution 10 Water storage: Store volume a) If manufac: Temperature: Enter (49) or Total storage: If cylinder con Primary loss Combi loss Total heat requ	r use 92.6106 146.6726 (annual) oss (46)m 22.0009 loss: turer decla factor from (54) in (55 loss 23.3325 ntains dedi 23.3325 23.2624 0.0000 uired for w	90.5839 128.9903 = 0.15 x (4 19.3485 red loss fa Table 2b) 21.0745 cated solar 21.0745 21.0112 0.0000 ater heatin	88.1254 135.4455 45)m 20.3168 actor is knot 23.3325 r storage 23.3325 23.2624 0.0000 ng calculati	84.4098 115.5528 17.3329 own (kWh/d 22.5798 22.5798 22.5120 0.0000 ed for each	81.3842 109.5588 16.4338 aay): 23.3325 23.3252 23.2624 0.0000 month	78.1348 96.0759 14.4114 22.5798 22.5798 22.5120 0.0000	76.9029 93.0074 13.9511 23.3325 23.3325 23.2624 0.0000	79.3510 98.2532 14.7380 23.3325 23.3325 23.2624 0.0000	81.9305 101.0285 15.1543 22.5798 22.5798 22.5120 0.0000	85.3397 115.8051 Total = S 17.3708 23.3325 23.3325 23.32624 0.0000	89.1118 126.9562 um(45) m = 19.0434 22.5798 22.5798 22.5798 22.5120 0.0000	92.3698 144.6288 1411.9751 21.6943 150.0000 1.3938 0.5400 0.7527 23.3325 23.3325 23.2624 0.0000	(45) (46) (47) (48) (49) (55) (56) (57) (59) (61)
Energy conte Energy content Distribution 10 Water storage: Store volume a) If manufact Temperature: Enter (49) or Total storage: If cylinder con Primary loss Combi loss Total heat requ	r use 92.6106 146.6726 (annual) oss (46)m 22.0009 loss: turer decla factor from (54) in (55) loss 23.3325 ntains dedi 23.3325 23.2624 0.0000 uig3.2675	90.5839 128.9903 = 0.15 x (4 19.3485 red loss fa Table 2b) 21.0745 cated solar 21.0745 21.0112 0.0000 ater heatin 171.0760	88.1254 135.4455 45)m 20.3168 actor is knot 23.3325 r storage 23.3325 r 23.2624 0.0000 ng calculatt 182.0404	84.4098 115.5528 17.3329 own (kWh/d 22.5798 22.5798 22.5120 0.0000 ed for each 160.6447	81.3842 109.5588 16.4338 aay): 23.3325 23.2624 0.0000 month 156.1537	78.1348 96.0759 14.4114 22.5798 22.5798 22.5120 0.0000 141.1677	76.9029 93.0074 13.9511 23.3325 23.3325 23.2624 0.0000 139.6023	79.3510 98.2532 14.7380 23.3325 23.3325 23.2624 0.0000 144.8481	81.9305 101.0285 15.1543 22.5798 22.5798 22.5120 0.0000 146.1204	85.3397 115.8051 Total = S 17.3708 23.3325 23.3325 23.2624 0.0000	89.1118 126.9562 um(45) m = 19.0434 22.5798 22.5798 22.5798 22.5120 0.0000 172.0480	92.3698 144.6288 1411.9751 21.6943 150.0000 1.3938 0.5400 0.7527 23.3325 23.3325 23.2624 0.0000	(45) (46) (47) (48) (49) (55) (56) (57) (59) (61)
Energy conte Energy content Distribution 16 Water storage: Store volume a) If manufact Temperature: Enter (49) or Total storage: If cylinder con Primary loss Combi loss Total heat required	r use 92.6106 146.6726 (annual) oss (46)m 22.0009 loss: turer decla factor from (54) in (55 loss 23.3325 ntains dedi 23.3325 23.2624 0.0000 uired for w 193.2675 -28.7331 -0.0000 0.00000	90.5839 128.9903 = 0.15 x (4 19.3485 red loss fa Table 2b) 21.0745 cated solar 21.0745 21.0112 0.0000 ater heatin 171.0760 -25.4118 -0.0000 0.00000	88.1254 135.4455 45)m 20.3168 actor is known 23.3325 r storage 23.3325 23.2624 0.0000 ng calculatt 182.0404 -26.6098 -0.0000 0.00000	84.4098 115.5528 17.3329 own (kWh/d 22.5798 22.5798 22.5120 0.0000 ed for each 160.6447 -22.0339 -0.0000 0.0000	81.3842 109.5588 16.4338 ay): 23.3325 23.2624 0.0000 month 156.1537 -20.5348 -0.0000	78.1348 96.0759 14.4114 22.5798 22.5798 22.5120 0.0000 141.1677 -17.5718 -0.0000 0.0000	76.9029 93.0074 13.9511 23.3325 23.2624 0.0000 139.6023 -16.4708 -0.0000 0.00000	79.3510 98.2532 14.7380 23.3325 23.3325 23.2624 0.0000 144.8481 -17.5150 -0.0000 0.0000	81.9305 101.0285 15.1543 22.5798 22.5798 22.5120 0.0000 146.1204 -18.1805 -0.0000 0.0000	85.3397 115.8051 Total = S 17.3708 23.3325 23.3325 23.2624 0.0000 162.4000 -21.4328 -0.0000 0.0000	89.1118 126.9562 um(45) m = 19.0434 22.5798 22.5798 22.5798 22.5120 0.0000 172.0480 -24.2807 -0.0000 0.0000	92.3698 144.6288 1411.9751 21.6943 150.0000 1.3938 0.5400 0.7527 23.3325 23.3255 23.2624 0.0000 191.2237 -28.2010 -0.0000 0.0000	(45) (46) (47) (48) (49) (55) (56) (57) (59) (61) (62) (63a) (63b) (63b) (63c)
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Energy conte Energy content Distribution 10 Water storage: Store volume a) If manufac: Temperature: Enter (49) or Total storage: If cylinder con Primary loss Combi loss Total heat required WWHRS PV diverter Solar input FGRRS Output from w/l	r use 92.6106 146.6726 (annual) 0ss (46)m : 22.0009 loss: turer decla factor from (54) in (55) loss 23.3325 ntains dedi 23.3325 23.2624 0.0000 uired for w 193.2675 -28.7331 -0.0000 0.0000 h 164.5344 ar (kWh/yea r(s)	90.5839 128.9903 = 0.15 x (4 19.3485 red loss fa Table 2b) 21.0745 cated solar 21.0745 21.0112 0.0000 ater heatin 171.0760 -25.4118 -0.0000 0.0000 145.6642 r)	88.1254 135.4455 45)m 20.3168 actor is known is	84.4098 115.5528 17.3329 own (kWh/d 22.5798 22.5798 22.5120 0.0000 df for each 160.6447 -22.0339 -0.0000 0.0000 0.0000 138.6107	81.3842 109.5588 16.4338 aay): 23.3325 23.3325 23.2624 0.0000 month 156.1537 -20.5348 -0.0000 0.0000 0.0000 135.6189	78.1348 96.0759 14.4114 22.5798 22.5798 22.5120 0.0000 141.1677 -17.5718 -0.0000 0.0000 0.0000 123.5959	76.9029 93.0074 13.9511 23.3325 23.3325 23.2624 0.0000 139.6023 -16.4708 -0.0000 0.0000 0.0000 123.1316	79.3510 98.2532 14.7380 23.3325 23.3325 23.2624 0.0000 144.8481 -17.5150 0.0000 0.0000 0.0000 127.3331 Total p	81.9305 101.0285 15.1543 22.5798 22.5798 22.5120 0.0000 146.1204 -18.1805 -0.0000 0.0000 0.0000 127.9399 per year (kWh,	85.3397 115.8051 Total = S 17.3708 23.3325 23.3325 23.2624 0.0000 162.4000 -21.4328 -0.0000 0.0000 0.0000 140.9673 /year) = S	89.1118 126.9562 um(45) m = 19.0434 22.5798 22.5798 22.5120 0.0000 172.0480 -24.2807 -0.0000 0.0000 0.0000 147.7673 um(64) m = 0.0000	92.3698 144.6288 1441.9751 21.6943 150.0000 1.3938 0.5400 0.7527 23.3325 23.2624 0.0000 191.2237 -28.2010 0.0000 0.0000 0.0000 163.0227 1693.6166 1694	(45) (46) (47) (48) (49) (55) (56) (57) (61) (63a) (63a) (63b) (63c) (63d) (63d) (64) (64) (64)
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Energy conte Energy content Distribution 10 Water storage: Store volume a) If manufact Temperature: Enter (49) or Total storage: If cylinder con Primary loss Combi loss Total heat requ WWHRS PV diverter Solar input FGRS Output from w/1 12Total per yea Electric showe: Heat gains from 5. Internal gains Metabolic gain: (66) m Lighting gains Appliances gain	r use 92.6106 146.6726 (annual) 0ss (46)m 22.0009 loss: turer decla factor from (54) in (55 loss 23.3325 ntains dedi 23.3325 23.2624 0.0000 uired for w 193.2675 -28.7331 -0.0000 h 164.5344 ar (kWh/yea ar (kWh/yea ar (s) 0.0000 m water hea 86.0446	90.5839 128.9903 = 0.15 x (4 19.3485 red loss fa Table 2b) 21.0745 cated solar 21.0745 21.0112 0.0000 ater heatin 171.0760 -25.4118 -0.0000 0.0000 0.0000 145.6642 r) 0.0000 ting, kWh/m 76.5579 ble 5 and 5 -, Watts Feb 73.8652 din Append 77.9074 ted in Append	88.1254 135.4455 45)m 20.3168 actor is known is	84.4098 115.5528 17.3329 own (kWh/d 22.5798 22.5798 22.5120 0.0000 ed for each 160.6447 -22.0339 -0.0000 0.0000 138.6107 0.0000 Tot 74.4948	81.3842 109.5588 16.4338 ay): 23.3325 23.2624 0.0000 month 156.1537 -0.0000 0.0000 135.6189 0.0000 al Energy us 73.7042	78.1348 96.0759 14.4114 22.5798 22.5798 22.5120 0.0000 141.1677 -17.5718 -0.0000 0.0000 123.5959 0.0000 sed by inst. 68.0187 Jun 73.8652 see Table 5 72.7136 see Table 5 72.7136	76.9029 93.0074 13.9511 23.3325 23.3325 23.2624 0.0000 139.6023 -16.4708 -0.0000 0.0000 0.0000 123.1316 0.0000 antaneous e: 68.2009 Jul 73.8652 70.3680 1e 5	79.3510 98.2532 14.7380 23.3325 23.3325 23.2624 0.0000 144.8481 -17.5150 -0.0000 0.0000 127.3331 Total r 0.0000 lectric shc 69.9451	81.9305 101.0285 15.1543 22.5798 22.5798 22.5120 0.0000 146.1204 -18.1805 -0.0000 0.0000 0.0000 127.9399 per year (kWh/y 69.6655	85.3397 115.8051 Total = S 17.3708 23.3325 23.3325 23.2624 0.0000 -21.4328 -0.0000 0.0000 140.9673 /year) = S 0.0000 year) = Su 75.7811	89.1118 126.9562 um(45) m = 19.0434 22.5798 22.5798 22.5120 0.0000 172.0480 -24.2807 -0.0000 0.0000 147.7673 um(64) m = 0.0000 m(64a) m = 78.2864	92.3698 144.6288 1441.9751 21.6943 150.0000 1.3938 0.5400 0.7527 23.3325 23.3252 23.2624 0.0000 191.2237 -28.2010 0.0000 0.0000 163.0227 1693.6166 1694 0.0000 85.3650 Dec 73.8652 70.3680	(45) (46) (47) (48) (49) (55) (56) (57) (63) (63a) (63b) (63c) (63d) (63d) (64) (64) (64) (64a) (65)
Energy conte Energy content Distribution 10 Water storage: Store volume a) If manufact Temperature: Enter (49) or Total storage: If cylinder con Primary loss Combi loss Total heat requ WWHRS PV diverter Solar input FGRS Output from w/1 12Total per yea Electric showe: Heat gains from 5. Internal gains Metabolic gain: (66) m Lighting gains Appliances gain	r use 92.6106 146.6726 (annual) 0058 (46)m : 22.0009 loss: turer decla factor from (54) in (55) loss 23.3325 ntains dedi 23.3325 23.2624 0.0000 uired for w 193.2675 -28.7331 -0.0000 h 164.5344 ar (kWh/yea r(s) 0.0000 m water hea 86.0446	90.5839 128.9903 = 0.15 x (4 19.3485 red loss fa Table 2b) 21.0745 cated solar 21.0745 21.0112 0.0000 ater heatin 171.0760 -25.4118 -0.0000 0.0000 145.6642 r) 0.0000 ting, kWh/m 76.5579 Watts Feb 73.8652 d in Appendi 77.9074 ted in Appen 129.4788 in Appendi in Appendi	88.1254 135.4455 45)m 20.3168 actor is known is	84.4098 115.5528 17.3329 DWN (kWh/d 22.5798 22.5798 22.5120 0.0000 ed for each 160.6447 -22.0339 -0.0000 0.0000 Tot 74.4948 Apr 73.8652 tion L9 or 72.7136 eation L13 118.9939	81.3842 109.5588 16.4338 ay): 23.3325 23.2624 0.0000 month 156.1537 -20.5348 -0.0000 0.0000 135.6189 0.0000 al Energy us 73.7042 May 73.8652 L9a), also s 70.3680 or L13a), also 109.9886 IL5al, also	78.1348 96.0759 14.4114 22.5798 22.5798 22.5120 0.0000 141.1677 -17.5718 -0.0000 0.0000 123.5959 0.0000 sed by inst. 68.0187 Jun 73.8652 see Table 5 72.7136 tso see Table 5 72.7136 tso see Table 5 72.7136	76.9029 93.0074 13.9511 23.3325 23.3325 23.2624 0.0000 139.6033 -16.4708 -0.0000 0.0000 123.1316 0.0000 antaneous e: 68.2009 Jul 73.8652 70.3680 1e 5 95.8706	79.3510 98.2532 14.7380 23.3325 23.3325 23.2624 0.0000 144.8481 -17.5150 -0.0000 0.0000 127.3331 Total r 0.0000 127.3351 0.0000 127.33652 70.3680 94.5408	81.9305 101.0285 15.1543 22.5798 22.5798 22.5120 0.0000 146.1204 -18.1805 -0.0000 0.0000 127.9399 per year (kWh/y 69.6655 Sep 73.8652 72.7136 97.8919	85.3397 115.8051 Total = S 17.3708 23.3325 23.3325 23.2624 0.0000 -21.4328 -0.0000 0.0000 140.9673 /year) = S 0.0000 year) = Su 75.7811 Oct 73.8652 70.3680 105.0258	89.1118 126.9562 um(45) m = 19.0434 22.5798 22.5798 22.5120 0.0000 172.0480 0.0000 0.0000 147.7673 um(64) m = 78.2864 Nov 73.8652 72.7136 114.0311	92.3698 144.6288 1411.9751 21.6943 150.0000 1.3938 0.5400 0.7527 23.3325 23.2624 0.0000 191.2237 -28.2010 -0.0000 0.0000 163.0227 1693.6166 1694 0.0000 85.3650 Dec 73.8652 70.3680 122.4948	(45) (46) (47) (48) (49) (55) (56) (57) (59) (61) (63a) (63b) (63c) (63d) (63d) (64) (64) (64) (64a) (65)
Energy conte Energy content Distribution 16 Water storage: Store volume a) If manufact Temperature: Enter (49) or Total storage: If cylinder con Primary loss Combi loss Total heat requ WWHRS PV diverter Solar input FGRRS Output from w/l 12Total per yee Electric showe: Heat gains from 5. Internal ga: Metabolic gain: (66) m Lighting gains Appliances gain Cooking gains Pumps, fans	r use 92.6106 146.6726 (annual) oss (46)m 22.0009 loss: turer decla factor from (54) in (55 loss 23.3325 ntains dedi 23.3325 ntains dedi 23.3325 ntains dedi 23.3325 0.0000 uired for w 193.2675 -28.7331 -0.0000 h 164.5344 ar (kWh/yea r(s) 0.0000 m water hea 86.0446	90.5839 128.9903 = 0.15 x (4 19.3485 red loss fa Table 2b) 21.0745 cated solar 21.0745 21.0112 0.0000 ater heatin 171.0760 -25.4118 -0.0000 0.0000 145.6642 r) 0.0000 ting, kWh/m 76.5579 ble 5 and 5	88.1254 135.4455 45)m 20.3168 actor is known and actor is known ac	84.4098 115.5528 17.3329 own (kWh/d 22.5798 22.5798 22.5120 0.0000 ed for each 160.6447 -22.0339 -0.0000 0.0000 138.6107 74.4948 Apr 73.8652 25.7136 18.9939 ion L15 or 30.3865 3.3865 3.0000	81.3842 109.5588 16.4338 ay): 23.3325 23.3325 23.2624 0.0000 month 156.1537 -20.5348 -0.0000 0.0000 135.6189 0.0000 al Energy us 73.7042 May 73.8652 L9a), also: 70.3680 70.3680 109.9886 L15a), also: 30.3865	78.1348 96.0759 14.4114 22.5798 22.5798 22.5798 22.5120 0.0000 141.1677 -17.5718 -0.0000 0.0000 0.0000 123.5959 0.0000 sed by inst. 68.0187 Jun 73.8652 see Table 5 72.7136 so see Table 5 72.7136 so see Table 5 30.38652	76.9029 93.0074 13.9511 23.3325 23.3325 23.2624 0.0000 139.6023 -16.4708 -0.0000 0.0000 0.0000 123.1316 0.0000 antaneous e: 68.2009 Jul 73.8652 70.3680 1e 5 95.8706 5 30.3865	79.3510 98.2532 14.7380 23.3325 23.3325 23.2624 0.0000 144.8481 -17.5150 0.0000 0.0000 127.3331 Total p 0.0000 127.3331	81.9305 101.0285 15.1543 22.5798 22.5798 22.5120 0.0000 146.1204 -18.1805 -0.0000 0.0000 0.0000 127.9399 per year (kWh/y 69.6655	85.3397 115.8051 Total = S 17.3708 23.3325 23.3325 23.2624 0.0000 162.4000 0.0000 0.0000 0.0000 140.9673 /year) = S 0.0000 year) = Su 75.7811 Oct 73.8652 70.3680 105.0258 30.3865	89.1118 126.9562 um(45) m = 19.0434 22.5798 22.5798 22.5120 0.0000 172.0480 -24.2807 -0.0000 0.0000 0.0000 147.7673 um(64) m = 0.0000 m(64a) m = 78.2864 Nov 73.8652 72.7136 114.0311 30.3865	92.3698 144.6288 1441.9751 21.6943 150.0000 1.3938 0.5400 0.7527 23.3325 23.2624 0.0000 191.2237 -28.2010 0.0000 0.0000 163.0227 1693.6166 1694 0.0000 0.0000 85.3650 Dec 73.8652 70.3680 122.4948 30.3865	(45) (46) (47) (48) (49) (55) (56) (57) (61) (62) (63a) (63b) (63c) (63d) (644) (644) (64a) (655) (666) (67) (68) (69)
Energy conte Energy content Distribution 10 Water storage: Store volume a) If manufact Temperature: Enter (49) or Total storage: If cylinder con Primary loss Combi loss Total heat requ WWHRS PV diverter Solar input FGHRS Output from w/1 12Total per yea Electric showe: Heat gains from 5. Internal gains Metabolic gains (66) m Lighting gains Appliances gain Cooking gains Pumps, fans Losses e.g. evo	r use 92.6106 146.6726 (annual) 0ss (46)m 22.0009 loss: turer decla factor from (54) in (55 loss 23.3325 ntains dedi 23.3325 ntains dedi 23.3325 0.0000 uired for w 193.2675 -28.7331 -0.0000 0.0000 h 164.5344 ar (kWh/yea r(s) 0.0000 m water hea 86.0446	90.5839 128.9903 = 0.15 x (4 19.3485 red loss fa Table 2b) 21.0745 cated solar 21.0745 21.0112 0.0000 ater heatin 171.0760 -25.4118 -0.0000 0.0000 145.6642 r) 0.0000 ting, kWh/m 76.5579	88.1254 135.4455 45)m 20.3168 actor is known is	84.4098 115.5528 17.3329 DWN (kWh/d) 22.5798 22.5798 22.5798 22.5120 0.0000 df for each 160.6447 -22.0339 -0.0000 0.0000 138.6107 0.0000 Tot 74.4948 Apr 73.8652 tion L9 or 72.7136 ation L13 118.9939 ion L15 or 30.3865 30.0000 15 5)	81.3842 109.5588 16.4338 ay): 23.3325 23.3325 23.2624 0.0000 month 156.1537 -20.5348 -0.0000 0.0000 135.6189 0.0000 al Energy us 73.7042 May 73.8652 L9a), also: 70.3680 70.3680 109.9886 L15a), also: 30.3865	78.1348 96.0759 14.4114 22.5798 22.5798 22.5798 22.5120 0.0000 141.1677 -17.5718 -0.0000 0.0000 0.0000 123.5959 0.0000 sed by inst. 68.0187 Jun 73.8652 see Table 5 72.7136 see Table 5 72.7136 see Table 5 0.0000	76.9029 93.0074 13.9511 23.3325 23.3325 23.2624 0.0000 139.6023 -16.4708 -0.0000 0.0000 0.0000 123.1316 0.0000 antaneous e: 68.2009 Jul 73.8652 70.3680 1e 5 95.8706 5 30.3865 0.0000	79.3510 98.2532 14.7380 23.3325 23.3325 23.2624 0.0000 144.8481 -17.5150 -0.0000 0.0000 127.3331 Total r 0.0000 lectric shc 69.9451 Aug 73.8652 70.3680 94.5408 30.3865 0.0000	81.9305 101.0285 15.1543 22.5798 22.5798 22.5120 0.0000 146.1204 -18.1805 -0.0000 0.0000 0.0000 127.9399 per year (kWh/ 69.6655 Sep 73.8652 72.7136 97.8919 30.3865	85.3397 115.8051 Total = S 17.3708 23.3325 23.3325 23.2624 0.0000 -21.4328 -0.0000 0.0000 140.9673 /year) = S 0.0000 year) = Su 75.7811 Oct 73.8652 70.3680 105.0258 30.3865 3.0000	89.1118 126.9562 um(45) m = 19.0434 22.5798 22.5798 22.5120 0.0000 172.0480 -24.2807 -0.0000 0.0000 147.7673 um(64) m = 78.2864 Nov 73.8652 72.7136 114.0311 30.3865 3.0000	92.3698 144.6288 1441.9751 21.6943 150.0000 1.3938 0.5400 0.7527 23.3325 23.2624 0.0000 191.2237 -28.2010 0.0000 0.0000 163.0227 1693.6166 1694 0.0000 85.3650 Dec 73.8652 70.3680 122.4948 30.3865 3.0000	(45) (46) (47) (48) (49) (55) (56) (57) (59) (61) (63a) (63a) (63b) (63d) (64) (64) (64) (65) (66) (67) (68) (69) (70)
Energy conte Energy content Distribution 10 Water storage: Store volume a) If manufact Temperature: Enter (49) or Total storage: If cylinder con Primary loss Combi loss Total heat requ WWHRS PV diverter Solar input FGRS Output from w/1 12Total per yea Electric showe: Heat gains from 5. Internal gain Metabolic gain: (66) m Lighting gains Appliances gain Cooking gains Pumps, fans Losses e.g. ev.	r use 92.6106 146.6726 (annual) 058 (46)m 22.0009 loss: turer decla factor from (54) in (55 loss 23.3325 ntains dedi 23.3325 ntains dedi 23.3325 0.0000 uired for w 193.2675 -28.7331 -0.0000 h 164.5344 ar (kWh/yea r(s) 0.0000 m water hea 86.0446	90.5839 128.9903 = 0.15 x (4 19.3485 red loss fa Table 2b) 21.0745 cated solar 21.0745 21.0112 0.0000 ater heatin 171.0760 -25.4118 -0.0000 0.0000 145.6642 r) 0.0000 ting, kWh/m 76.5579 ble 5 and 5	88.1254 135.4455 45)m 20.3168 actor is known and actor is known ac	84.4098 115.5528 17.3329 DWN (kWh/d 22.5798 22.5798 22.5798 22.5120 0.0000 0.0000 0.0000 138.6107 Apr 73.8652 173.8652 101.90 or 72.7136 181.9939 101.15 or 30.3865 3.0000 185.0000 185.0000 186.0000 197.7136 198.0000 198.0000 198.0000 198.0000 198.00000 198.00000 198.00000 198.00000 198.00000 198.00000 198.00000 198.00000 198.00000 198.00000 198.00000 198.00000 198.00000 198.00000 198.00000 198.00000 198.00000 198.000000000 198.000000000000000000000000000000000000	81.3842 109.5588 16.4338 ay): 23.3325 23.3325 23.2624 0.0000 month 156.1537 -20.5348 -0.0000 0.0000 135.6189 0.0000 al Energy us 73.7042 May 73.8652 L9a), also s 70.3680 or L13a), also s 109.9886 L15a), also s 30.3865 3.0000 -59.0922 99.0648	78.1348 96.0759 14.4114 22.5798 22.5798 22.5798 22.5120 0.0000 141.1677 -17.5718 -0.0000 0.0000 123.5959 0.0000 123.5959 0.0000 123.5959 0.0000 123.5959 0.0000 123.5959 0.0000 123.5959 0.0000 123.5959 0.0000 123.5959	76.9029 93.0074 13.9511 23.3325 23.3325 23.2624 0.0000 139.6023 -16.4708 -0.0000 0.0000 123.1316 0.0000 123.1316 0.0000 antaneous et 68.2009 Jul 73.8652 70.3680 185 95.8706 5 30.3865 0.0000 -59.0922 91.6679	79.3510 98.2532 14.7380 23.3325 23.3325 23.2624 0.0000 144.8481 -17.5150 -0.0000 0.0000 127.3331 Total r 0.0000 lectric sho 69.9451 Aug 73.8652 70.3680 94.5408 30.3865 0.0000 -59.0922 94.0122	81.9305 101.0285 15.1543 22.5798 22.5798 22.5120 0.0000 146.1204 -18.1805 -0.0000 0.0000 127.9399 per year (kWh/ 69.6655 Sep 73.8652 72.7136 97.8919 30.3865 0.0000 -59.0922	85.3397 115.8051 Total = S 17.3708 23.3325 23.3325 23.32624 0.0000 162.4000 -21.4328 -0.0000 0.0000 0.0000 140.9673 /year) = S 0.0000 year) = Su 75.7811 Oct 73.8652 70.3680 105.0258 30.3865 30.3865 30.000 -59.0922 101.8564	89.1118 126.9562 um(45) m = 19.0434 22.5798 22.5798 22.5120 0.0000 172.0480 -24.2807 -0.0000 0.0000 147.7673 um(64) m = 0.0000 m(64a) m = 78.2864 Nov 73.8652 72.7136 114.0311 30.3865 3.0000 -59.0922 108.7311	92.3698 144.6288 1441.9751 21.6943 150.0000 1.3938 0.54000 0.7527 23.3325 23.3325 23.32624 0.0000 191.2237 -28.2010 -0.0000 0.0000 0.0000 163.0227 1693.6166 1694 0.0000 0.0000 85.3650 Dec 73.8652 70.3680 122.4948 30.3865 3.0000 -59.0922 114.7379	(45) (46) (47) (48) (49) (55) (56) (57) (59) (61) (63a) (63a) (63b) (63c) (63d) (64) (64) (65) (66) (67) (68) (69) (70) (71) (72)

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6. Solar gains													
[Jan]				m2	Solar flux Table 6a W/m2	Speci or	g fic data Table 6b	Specific or Tab	FF data le 6c	Acces facto Table	or	Gains W	
Northeast Southeast			3.72 1.86	00 500	11.2829 36.7938		0.6300 0.6300	0	.7000 .7000	0.77		12.8274 20.9151	
Solar gains Total gains													
7. Mean intern													
Temperature du	ring heati	ng periods i	in the livir	ng area fro	m Table 9, 1							21.0000	(85)
Utilisation fa tau alpha	Jan 109.8228	Feb	Mar	Apr		Jun 113.3608 8.5574	Jul 113.3608 8.5574	Aug 113.5981 8.5732	Sep 112.8706 8.5247	Oct 112.0967 8.4731	Nov 111.5561 8.4371	Dec 110.9965 8.3998	
util living an			0.9884	0.9474	0.8130	0.5883	0.4237	0.4670	0.7282	0.9575	0.9946	0.9987	(86)
MIT Th 2	20.3815	20.4839	20.6323 20.0057	20.8379 20.0170	20.9659 20.0191	20.9979	20.9999	20.9997 20.0308	20.9889 20.0252	20.8436 20.0191		20.3677 20.0103	(87)
util rest of h	0.9973	0.9936	0.9817	0.9197	0.7452	0.5006	0.3303	0.3689	0.6342	0.9288	0.9910	0.9979	
MIT 2 Living area fi		19.4344	19.6228	19.8746	19.9983	20.0283	20.0290	20.0308		19.8875 Living area	a / (4) =		(91)
MIT Temperature ac adjusted MIT		19.9696 19.9696	20.1376	20.3659	20.4917	20.5227	20.5241	20.5249		20.3750		19.8408 0.0000 19.8408	
8. Space heat:	ing require	ment											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation Useful gains Ext temp.	394.9375 4.3000	428.3898		0.9308 447.6961 8.9000		0.5455 268.2411 14.6000	0.3779 178.1587 16.6000	0.4190 186.8500 16.4000	0.6826 288.4993 14.1000	0.9409 373.2316 10.6000			(95)
Heat loss rate Space heating	728.9678	704.4007	635.7579	527.7739	403.7174	268.9400	178.1855	186.9128	292.5324	448.8706	599.4086	725.3459	(97)
Space heating	248.5186 requirement	185.4793 t - total pe		57.6560 n/year)	10.9926	0.0000	0.0000	0.0000	0.0000	56.2754	156.8942	254.5080 1113.4893	(98a)
Solar heating Solar heating	0.0000	0.0000 on - total r		0.0000 Th/vear)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Space heating Space heating	kWh 248.5186 requirement	185.4793	143.1652	57.6560		0.0000 (kWh/year)	0.0000	0.0000	0.0000		156.8942) / (4) =	1113.4893	
Space heating	per mz									(900)) / (4) =	26.1321	(99)
9a. Energy rec	quirements	- Individual	l heating sy	stems, inc	luding micro	o-CHP							
Fraction of sy Fraction of sy Efficiency of Efficiency of Efficiency of	main space main space	rom main sys heating sys heating sys	stem(s) stem 1 (in 9 stem 2 (in 9	;) ;)	m (Table 11))						0.0000 1.0000 92.3000 0.0000 0.0000	(202) (206) (207)
Space heating	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating	248.5186	185.4793		57.6560	10.9926	0.0000	0.0000	0.0000	0.0000	56.2754	156.8942	254.5080	(98)
Space heating	92.3000 fuel (main	92.3000 heating sys	92.3000 stem)	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating	269.2509 efficiency	200.9527 (main heat)	155.1086 ing system 2		11.9096	0.0000	0.0000	0.0000	0.0000	60.9701	169.9829		
Space heating			0.0000 stem 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Space heating	0.0000 fuel (secon	0.0000 ndary) 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Water heating Water heating			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(220)
Efficiency of	164.5344	145.6642	155.4306	138.6107	135.6189	123.5959	123.1316	127.3331	127.9399	140.9673	147.7673	163.0227 79.8000	
(217)m Fuel for water	84.9822	84.6028	83.8759	82.2488	80.4111	79.8000	79.8000	79.8000	79.8000	82.1763	84.1944	85.0546	
Space cooling	193.6105 fuel requi:	172.1743 rement			168.6571		154.3002		160.3257	171.5426	175.5072		
(221)m Pumps and Fa Lighting	0.0000 7.3041 14.6211	6.5973 11.7296	0.0000 7.3041 10.5612	0.0000 7.0685 7.7376	0.0000 7.3041 5.9767	0.0000 7.0685 4.8830	0.0000 7.3041 5.4522	0.0000 7.3041 7.0869	0.0000 7.0685 9.2052	0.0000 7.3041 12.0778	0.0000 7.0685 13.6418	0.0000 7.3041 15.0274	(231)
Electricity ge (233a)m Electricity ge	-14.7805	-21.6607 wind turbing	-32.3614 nes (Appendi	-37.8882 .x M) (nega	-42.1984 tive quanti	ty)			-31.7939	-25.4780	-16.5556	-12.6876	(233a)
(234a)m Electricity ge	0.0000 enerated by	0.0000 hydro-elect	0.0000 tric generat	0.0000 ors (Appen	0.0000 dix M) (nega	0.0000 ative quant		0.0000	0.0000	0.0000	0.0000	0.0000	
(235a)m Electricity us									0.0000	0.0000	0.0000	0.0000	
(235c)m Electricity ge	0.0000 enerated by	0.0000 PVs (Append	0.0000 dix M) (nega	0.0000 tive quant	0.0000 ity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
(233b)m Electricity ge (234b)m		wind turbing			-52.8125 tive quanti 0.0000	ty)	0.0000	-44.2105 0.0000	-32.0726 0.0000	-18.5336 0.0000	-8.0780 0.0000	-4.7381 0.0000	

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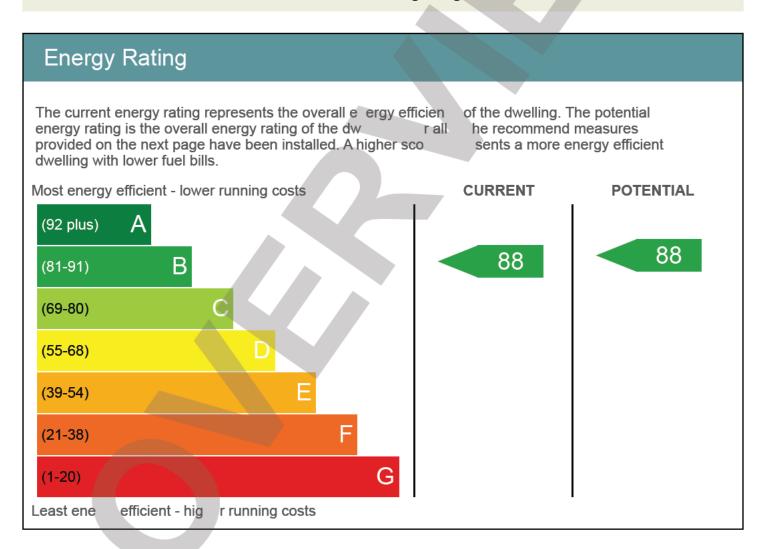
Electricity generated by hydro-electric generators (Appendix M) (negative quantity (235b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 Electricity used or net electricity generated by micro-CHP (Appendix N) (negative	0.0000 0.0000 if net generation)		0.0000	0.0000	(235b)
(235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 Annual totals kWh/year	0.0000 0.0000	0.0000 0.0000		0.0000	
Space heating fuel - main system 1 Space heating fuel - main system 2				1206.3806	
Space heating fuel - secondary Efficiency of water heater				0.0000 79.8000	(215)
Water heating fuel used Space cooling fuel				2056.0695	
Electricity for pumps and fans:					(/
Total electricity for the above, kWh/year Electricity for lighting (calculated in Appendix L)				86.0000 118.0005	
Energy saving/generation technologies (Appendices M , N and Q)				110.0000	(202)
PV generation Wind generation				-702.0353 0.0000	
Hydro-electric generation (Appendix N) Electricity generated - Micro CHP (Appendix N)				0.0000	(235a)
Appendix Q - special features					
Energy saved or generated Energy used				-0.0000 0.0000	(237)
Total delivered energy for all uses				2764.4153	(230)
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	1206.3806	0.2100		253.3399	
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel)		0.2100		253.3399 0.0000 431.7746	(373)
Total CO2 associated with community systems	1206.3806	0.2100 0.2100		0.0000	(373) (264) (265)
Total CO2 associated with community systems Water heating (other fuel) Space and water heating	1206.3806 2056.0695	0.2100 0.2100		0.0000 431.7746 685.1145	(373) (264) (265) (267)
Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies	1206.3806 2056.0695 86.0000 118.0005	0.2100 0.2100 0.1387 0.1443		0.0000 431.7746 685.1145 11.9293 17.0311	(373) (264) (265) (267)
Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported	1206.3806 2056.0695 86.0000	0.2100 0.2100 0.1387 0.1443		0.0000 431.7746 685.1145 11.9293 17.0311 -47.0017 -44.0019	(373) (264) (265) (267) (268)
Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year	1206.3806 2056.0695 86.0000 118.0005	0.2100 0.2100 0.1387 0.1443		0.0000 431.7746 685.1145 11.9293 17.0311 -47.0017 -44.0019 -91.0037 623.0712	(373) (264) (265) (267) (268) (269) (272)
Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total	1206.3806 2056.0695 86.0000 118.0005	0.2100 0.2100 0.1387 0.1443		0.0000 431.7746 685.1145 11.9293 17.0311 -47.0017 -44.0019 -91.0037	(373) (264) (265) (267) (268) (269) (272)
Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year	1206.3806 2056.0695 86.0000 118.0005	0.2100 0.2100 0.1387 0.1443		0.0000 431.7746 685.1145 11.9293 17.0311 -47.0017 -44.0019 -91.0037 623.0712	(373) (264) (265) (267) (268) (269) (272)
Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year	1206.3806 2056.0695 86.0000 118.0005 -351.4360 -350.5993	0.2100 0.2100 0.1387 0.1443 0.1337 0.1255		0.0000 431.7746 685.1145 11.9293 17.0311 -47.0017 -44.0019 -91.0037 623.0712 14.6200	(265) (267) (268) (268) (268) (268)
Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER)	1206.3806 2056.0695 86.0000 118.0005 -351.4360 -350.5993	0.2100 0.2100 0.1387 0.1443 0.1337 0.1255	Prima	0.0000 431.7746 685.1145 11.9293 17.0311 -47.0017 -44.0019 -91.0037 623.0712 14.6200	(265) (267) (268) (268) (268) (268)
Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) 13a. Primary energy - Individual heating systems including micro-CHP Space heating - main system 1	1206.3806 2056.0695 86.0000 118.0005 -351.4360 -350.5993	0.2100 0.2100 0.1387 0.1443 0.1337 0.1255 Primary energy factor kg CO2/kWh	Prima	0.0000 431.7746 685.1145 11.9293 17.0311 -47.0017 -44.0019 -91.0037 623.0712 14.6200 kWh/year 1363.2101	(373) (264) (265) (267) (268) (269) (272) (273)
Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel)	1206.3806 2056.0695 86.0000 118.0005 -351.4360 -350.5993 Energy kWh/year 1206.3806	0.2100 0.2100 0.1387 0.1443 0.1337 0.1255	Prima	0.0000 431.7746 685.1145 11.9293 17.0311 -47.0017 -44.0019 -91.0037 623.0712 14.6200 ary energy kWh/year 1363.2101 0.0000 0.0000 2323.3586	(265) (267) (268) (267) (268) (269) (272) (273) (273)
Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot	1206.3806 2056.0695 86.0000 118.0005 -351.4360 -350.5993 Energy kWh/year 1206.3806 2056.0695 86.0000	0.2100 0.2100 0.1387 0.1443 0.1337 0.1255 Primary energy factor kg CO2/kWh 1.1300 1.1300	Prima	0.0000 431.7746 685.1145 11.9293 17.0311 -47.0017 -44.0019 -91.0037 623.0712 14.6200 ary energy kWh/year 1363.2101 0.0000 2323.3586 3686.5686 130.1008	(265) (266) (267) (268) (268) (269) (272) (273) (273) (278) (278) (278) (278) (281)
Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting	1206.3806 2056.0695 86.0000 118.0005 -351.4360 -350.5993 Energy kWh/year 1206.3806 2056.0695	0.2100 0.2100 0.1387 0.1443 0.1337 0.1255 Primary energy factor kg CO2/kWh 1.1300 1.1300 1.5128	Prima	0.0000 431.7746 685.1145 11.9293 17.0311 -47.0017 -44.0019 -91.0037 623.0712 14.6200 ary energy kWh/year 1363.2101 0.0000 2323.3586 3686.5686	(265) (266) (267) (268) (268) (269) (272) (273) (273) (278) (278) (278) (278) (281)
Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy saving/generation technologies PV Unit electricity used in dwelling	1206.3806 2056.0695 86.0000 118.0005 -351.4360 -350.5993 Energy kWh/year 1206.3806 2056.0695 86.0000 118.0005	0.2100 0.2100 0.1387 0.1443 0.1337 0.1255 Primary energy factor kg C02/kWh 1.1300 1.1300 1.5128 1.5338	Prima	0.0000 431.7746 685.1145 11.9293 17.0311 -47.0017 -44.0019 -91.0037 623.0712 14.6200 ary energy kWh/year 1363.2101 0.0000 2323.3586 6366.5686 130.1008 180.9931	(265) (266) (267) (268) (268) (269) (272) (273) (273) (278) (278) (278) (278) (281)
Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total	1206.3806 2056.0695 86.0000 118.0005 -351.4360 -350.5993 Energy kWh/year 1206.3806 2056.0695 86.0000 118.0005	0.2100 0.2100 0.1387 0.1443 0.1337 0.1255 Primary energy factor kg C02/kWh 1.1300 1.1300 1.5128 1.5338	Prima	0.0000 431.7746 685.1145 11.9293 17.0311 -47.0017 -44.0019 -91.0037 623.0712 14.6200 ary energy kWh/year 1363.2101 0.0000 0.223.3586 3686.5686 130.1008 180.9931 -525.1295 -161.5115 -686.6441	(264) (267) (268) (267) (268) (269) (272) (273) (273) (273) (275) (473) (279) (281) (282)
Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported	1206.3806 2056.0695 86.0000 118.0005 -351.4360 -350.5993 Energy kWh/year 1206.3806 2056.0695 86.0000 118.0005	0.2100 0.2100 0.1387 0.1443 0.1337 0.1255 Primary energy factor kg C02/kWh 1.1300 1.1300 1.5128 1.5338	Prima	0.0000 431.7746 685.1145 11.9293 17.0311 -47.0017 -44.0019 -91.0037 623.0712 14.6200 ary energy kWh/year 1363.2101 0.0000 2323.3586 130.1008 180.9931 -525.1295 -161.5115	(264) (267) (268) (267) (268) (269) (272) (273) (273) (273) (275) (473) (279) (281) (282)

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Dwelling Address	Unit 1, Highland Square , Bristol
Report Date	05/03/2024
Property Type	Flat, Semi-Detached
Floor Area [m ²]	43

This document is not an Energy Performance Certificat EPC) s required by the Energy Performance of Buildings Reg io



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Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor Average		Good	Very Good		
Feature	Description	gy Performance				
Walls	Average thermal transmi	ttance 0.18 W/m²K		Very Good		
Floor	Average thermal transmi	ttance 0.12 W/m²K		Very Good		
Windows	High performance glazin	g		Good		
Main heating	eating Air source heat pump, radiators, electric					
Main heating controls	Time and temperature zo	one control		Very Good		
Secondary heating	None					
Hot water	er From main system		Average			
Lighting	Good lighting e iciency		ghting e iciency Good			
Air tightness	Air perm ity [AP5	Good				

Primary Energy e

The primary ener e for this operty per year is 37 kilowatt hour (kWh) per square metre

Estimat d C emissions of the dwelling

The estimed CO rating rovides an indication of the dwelling's impact on the environment in terms of carbon dio emissio; the higher the rating the less impact it has on the environment.

The estimated CO emissions for this dwellings is: 0.1 per year

With the recommended measures the potential CO emissions could be: per year

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Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.

To reach the dwelling's potential energy rating all of the recommended measures shown below would need to installed. Having these measures installed individually or in any other order may give a different result who pared work the cumulative potential rating.

Recommended measure	Typical	Potential Rating	lative	Cumulative
	Yearly	after	s	Potential
	Saving	measure installed	(per yea	Rating

Estimated energy use and potential savin s

Estimated energy cost for this property over a year

£265

Over a year you could save

£0

The estimated cost and savings show how much the average househ would spend in this property heating, lighting and hot water. It not based on how energy is ed by the people living at the propert

Contacting asses or and the accreditation scheme

As	ssessor contact details
Asse r name	
Assess accredita n number	
Email Address	

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Accreditation scheme contact details					
Accreditation scheme	Elmhurst Energy Systems Ltd				
Telephone					
Email Address					

Assessment details		
Related party disclosure	No related pa	
Date of assessment	05/03/202	
Date of certificate	05/03/202	
Type of assessment	SAP w dwellin	



Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Tue 05 Mar 2024 08:41:58

Project Information			
Assessed By		Building Type	Flat, Semi-detached
OCDEA Registration	EES/025661	Assessment Date	2024-03-05

Dwelling Details			
Assessment Type	As designed	Total Floor Area	62 m ²
Site Reference	Unit 3	Plot Reference	Residual
Address	Unit 1 Highland Square, Bristo	ol	

Client Details	
Name	Tebby & Son
Company	SF Tebby & Son
Address	Unit 11 Avon Gorge Industrial Estate , Bristol, BS2 9XX

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	11.67 kgCO ₂ /m ²	
Dwelling carbon dioxide emission rate	4.62 kgCO ₂ /m ²	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	61.38 kWh _{PE} /m ²	
Dwelling primary energy	48.68 kWh _{PE} /m ²	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	31.9 kWh/m ²	
Dwelling fabric energy efficiency	30.8 kWh/m ²	OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m²K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.18	Walls (1) (0.18)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	0.18	Exposed Floor (0.18)	OK
Roofs	0.16	0.11	Roof (1) (0.11)	ОК
Windows, doors,	1.6	1.31	W01 (1.31)	OK
and roof windows				
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))			
Name	Net area [m ²]	U-Value [W/m ² K]	
Exposed wall: Walls (1)	22.43	0.18	
Party wall: Party Wall (1)	95.62	0 (!)	
Party floor: Exposed Floor, Exposed Floor	7.88	0.18	
Exposed roof: Roof (1)	38.16	0.11	

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
W01, Windows	2.26	North East	0.7	1.31
W02, Windows	2.26	North East	0.7	1.31
W03, Windows	2.26	North East	0.7	1.31
W04, Windows	2.25	North East	0.7	1.31
W05, Windows	2.24	North East	0.7	1.31

2d Thermal brid	2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))			
Building part 1 -	Main Dwelling: Thermal bridging ca	alculated from linear thermal transm	ittances for each j	unction
Main element	Main element Junction detail Source Psi value Drawing / [W/mK] reference			_
External wall	E2: Other lintels (including other steel lintels)	Not government-approved scheme	0.023 (!)	

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E3: Sill	Calculated by person with suitable expertise	0.021 (!)	
External wall	E4: Jamb	Calculated by person with suitable expertise	0.016 (!)	
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.116	
External wall	E7: Party floor between dwellings (in blocks of flats)	Calculated by person with suitable expertise	0.038 (!)	
Party wall	P7: Exposed floor (normal)	Calculated by person with suitable expertise	0.185	
Party wall	P3: Intermediate floor between dwellings (in blocks of flats)	SAP table default	0 (!)	
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.043	
External wall	E25: Staggered party wall between dwellings	Calculated by person with suitable expertise	0.036 (!)	
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.046	
External wall	E21: Exposed floor (inverted)	SAP table default	0.32	
Party wall	P5: Roof (insulation at rafter level)	Calculated by person with suitable expertise	0.101	Calculate
External wall	E24: Eaves (insulation at ceiling level - inverted)	SAP table default	0.15	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	8 m ³ /hm ²	
Dwelling air permeability at 50Pa	4.5 m ³ /hm ² , Design value	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Heat pump with	radiators or underfloor heating - Electricity
Efficiency	231.7%
Emitter type	Radiators
Flow temperature	55°C
System type	Heat Pump
Manufacturer	Atlantic
Model	Logic Air 8kW
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	150 litres
Declared heat loss	2.09 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 -	type: N/A
Efficiency	
Manufacturer	
Model	

6 Controls										
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services										
Function										
Ecodesign class										
Manufacturer										
Model										

Water heating - type: Cylinder thermosta	at and HW separately	timed	
Manufacturer			
Model			
7 Lighting			
Minimum permitted light source efficacy	75 lm/W		
Lowest light source efficacy	80 lm/W		OK
External lights control	N/A		
8 Mechanical ventilation			
System type: N/A			
Maximum permitted specific fan power	N/A		
Specific fan power	N/A		N/A
Minimum permitted heat recovery	N/A		1
efficiency			
Heat recovery efficiency	N/A		N/A
Manufacturer/Model			
Commissioning			
9 Local generation			
N/A			
10 Heat networks			
N/A			
44 Commenting decommentary evidence			
11 Supporting documentary evidence N/A			
12 Declarations			
a. Assessor Declaration			
	infirmation that the co	ontents of this BREL Compliance Report	
		nformation submitted for this dwelling for	
		and that the supporting documentary	
evidence (SAP Conventions, Appendi			
documentary evidence required) has			
Compliance Report.	boon roviowed in the	ocarde of proparing this BILE	
			1
Signed:		Assessor ID:	
Name:		Date:	
b. Client Declaration			
N/A			



Property Reference	Unit 3	}							Issued	on Date	05/0	3/2024	1
Assessment Reference	Resid	ual				Prop T	ype Ref		Tebby an	d Son G	arage		
Property	Unit 1	, Highla	nd Square	, Bristol									
SAP Rating				83 B	DER		4.62		1	ER	•	1.67	
Environmental				97 A	% DER	< TER					(0.41	
CO ₂ Emissions (t/year)				0.26	DFEE		30.77		Т	FEE		31.91	
Compliance Check				See BREL	% DFEE < TFEE					3	3.56		
% DPER < TPER				20.69	DPER		48.68		T	PER	(31.38	
Assessor Details			l						F	\ssessor	·ID (J367-0	001
Client													
SUMMARY FOR INPL	JT DATA FO	R: Nev	v Build (<i>l</i>	As Designed)									
Orientation				Southwest									
Property Tenture				1									
Transaction Type				6									
Terrain Type				Urban									
1.0 Property Type				Flat, Semi-Detache									
Position of Flat				Top-floor flat									
Which Floor				1									
2.0 Number of Storeys				1									
3.0 Date Built				2024									
3.0 Property Age Band				L									
4.0 Sheltered Sides				3									
5.0 Sunlight/Shade													
6.0 Thermal Mass Parame	ater			Average or unknown Precise calculation									
Thermal Mass				N/A					k.	I/m²K			
7.0 Electricity Tariff				Standard									
Smart electricity meter	fitted			No									
Smart gas meter fitted				No									
7.0 Measurements													
				Baseme Ground flo 1st Stor 2nd Stor 3rd Stor 4th Stor 5th Stor 7th Stor	ent: or: ey: ey: ey: ey: ey: ey:	Loss Peri 0.00 m 15.24 m 0.00 m 0.00 m 0.00 m 0.00 m 0.00 m 0.00 m 0.00 m	meter	Int	ernal Floo 0.00 m 62.29 r 0.00 m 0.00 m 0.00 m 0.00 m 0.00 m 0.00 m	n ² n ² 1 ² 1 ² 1 ² 1 ²	Avera	9e Stor 0.00 2.50 0.00 0.00 0.00 0.00 0.00 0.00	m m m m m m
8.0 Living Area				23.99					m	2			
9.0 External Walls Description	Туре	Constr	ruction		U- V alue	Kappa G	iross Nei	t Area	Shelter	Shelter	Onenir	nas Are	a Calculat
Cavity Wall	Cavity Wall	Cavity		oard on dabs, dense block de structure	(W/m²K)	(kJ/m²K) Ar	ea(m²)	(m²) 2.43	Res 0.00	None	11.2	_	Type er Gross A
9.1 Party Walls	Type		Construc	tion				Value	Карра	Area	Shelter		helter
Description	·ype			sterboard on both sid	les, dense	cellular blo	(W		(kJ/m²K) 70.00	(m²) 95.62	Res 0.00		None
Description Party Wall 1	Filled Cav												
Party Wall 1	Filled Cav Edge Sea		cavity										
•		ling										appa /m²K)	Area (r

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Description	Туре	Construc	etion		U-Value (W/m²K)(a Code	Shelter Factor		on Openings
External Roof 1	External Flat Roof	Plasterbo	ard, insulated fla	at roof	0.11	9.00	38.16	(m ²) 38.1		0.00	Enter Gros Area	ss 0.00
10.1 Party Ceilings												
Description		Const	ruction								Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1		Precas	st concrete plank	s floor, screed	, carpeted						30.00	54.41
11.0 Heat Loss Floors												
Description	Туре	Storey Inde	x Constructi	on			Value //m²K)	SI	helter Code		helter Kap actor (kJ/m	pa Area(m² 1²K)
Exposed Floor	Exposed Floor - Solid	Lowest occu	pied Other				0.18		None		0.00 75.0	
11.1 Party Floors												
Description		Storey	Construction								Kappa	Area (m²)
Party Floor 1		Index Lowest occupied	Precast concre	te planks floor	, screed, carp	eted					(kJ/m²K) 30.00	54.41
12.0 Opening Types												
Description	Data Source	Type	Gla	zing		Glazin Gap	g Filliı Typ		G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Dou	ble Low-E Sof	t 0.05	Оар	Air Fi		0.63	Wood	0.70	1.31
13.0 Openings												
Name	Opening Ty	/pe	Location				ntation		Area (P	itch
W01 W02	Windows Windows		Cavity Wa Cavity Wa				th East th East		2.20 2.20			0
W03	Windows		Cavity Wa	ıll			th East		2.20			0
W04 W05	Windows Windows		Cavity Wa Cavity Wa				th East th East		2.2 2.2			0
14.0 Conservatory			None						7			
15.0 Draught Proofing			100									
			No						_			
16.0 Draught Lobby			INO									
17.0 Thermal Bridging			Calculate	Bridges								
17.1 List of Bridges			_									
Bridge Type E2 Other lintels (included)	ding other steel linte	de)	Source Type Non Gov Appro	oved Schemes	Length 5.51	Psi 0.02			Reference:			Imported No
E3 Sill	ung outer steer linke		Independently		5.51	0.02	0.0					No
E4 Jamb	D		Independently		20.84	0.02						No
E20 Exposed floor (no E7 Party floor between		s of flats)	Independently Independently		2.89 28.37	0.12 0.04	0.1 0.0					No No
P7 Partý Wall - Expos	ed floor (normal)	,	Independently	assessed	8.41	0.18	0.1	8				No
P3 Party wall - Interme (in blocks of flats)	ediate floor betweer	n dwellings	Table K1 - Defa	ault	19.89	0.00	0.0	0				No
È16 Comer (normal)			Independently		3.50	0.04	0.0					No
E25 Staggered party v E18 Party wall between		ngs	Independently Independently		1.00 5.00	0.04 0.05	0.0 0.0					No No
E21 Exposed floor (in	verted)		Table K1 - Defa	ault	5.37	0.32	0.3	2				No
P5 Party wall - Roof (i E24 Eaves (insulation	insulation at rafter le at ceiling level - inv	evel) erted)	Independently Table K1 - Defa		13.96 2.09	0.10 0.15	0.1 0.1		Calculate			No No
Y-value		,	0.09						W/m²K			
18.0 Pressure Testing			Yes								_	
Designed AP₅o			4.50						m³/(h.m ²	²) @ 50 I	Pa	
Property Tested?			Yes									
Test Method			Blower Do	ЮГ								
19.0 Mechanical Ventilat												
Mechanical Ventilation Mechanical Ventilation	on tilation System Pres	ent	No						7			
20.0 Fans, Open Fireplac		- CITC	140									
21.0 Fixed Cooling Syste			No									
22.0 Lighting												
No Fixed Lighting			No									
			Name		fficacy	I	Power		Capa	city	C	ount
			Lighting	I	80.00		15		120	JU		5

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24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	106764	70
Fuel Type	Electricity	
SAP Code	0	
In Winter	231.75	
In Summer	192.18	
Model Name	Logic Air 8kW	
Manufacturer	Atlantic	
System Type	Heat Pump	
Controls SAP Code	2207	
Delayed Start Stat	No	
HETAS approved System	No	
Oil Pump Inside	No	
FI Case	0.00	
Flue Type	None or Unknown	
Fan Assisted Flue	No	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	No	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	
Heat Source Fuel Type Heating U		trical Fuel Factor Efficiency type
	Heat Power Ratio	
Heat source 1 None Heat source 2 None		
Heat source 3 None Heat source 4 None		
Heat source 5 None		
Heat source 5 None 28.0 Water Heating		
Heat source 5 None 28.0 Water Heating Water Heating	Main Heating 1	
Heat source 5 None 28.0 Water Heating Water Heating SAP Code	Main Heating 1	
Heat source 5 None 28.0 Water Heating Water Heating		
Heat source 5 None 28.0 Water Heating Water Heating SAP Code	901 No No	
Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2	901 No	
Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1	901 No No	
Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2	901 No No	
Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System	901 No No No No	
Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System Solar Panel	901 No No No No No No	
Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System Solar Panel Water use <= 125 litres/person/day	901 No No No No Yes	
Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System Solar Panel Water use <= 125 litres/person/day Summer Immersion	901 No No No No No No No No No N	
Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System Solar Panel Water use <= 125 litres/person/day Summer Immersion Cold Water Source	901 No No No No Yes No From header tank	
Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System Solar Panel Water use <= 125 litres/person/day Summer Immersion Cold Water Source Bath Count	901 No No No No No No No From header tank 0	
Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System Solar Panel Water use <= 125 litres/person/day Summer Immersion Cold Water Source Bath Count Supplementary Immersion	901 No No No No No No From header tank 0 No	
Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System Solar Panel Water use <= 125 litres/person/day Summer Immersion Cold Water Source Bath Count Supplementary Immersion Immersion Only Heating Hot Water	901 No No No No No No Yes No From header tank 0 No No No From Peader tank 0 No No No No No No No No No	onnected Connected To
Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System Solar Panel Water use <= 125 litres/person/day Summer Immersion Cold Water Source Bath Count Supplementary Immersion Immersion Only Heating Hot Water 28.1 Showers Description Shower Type	901 No No No No No No From header tank 0 No No	onnected Connected To

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29.0 Hot Water Cy	linder			Hot Water	r Cylinder]				
Cylinder Stat				Yes							
Cylinder In Hea	ated Space			Yes							
Independent Ti	me Control			Yes							
Insulation Type	Insulation Type										
Cylinder Volum	Cylinder Volume								L		
Loss				2.09					kWh/day		
Pipes insulation	n			Fully insu	lated primary	pipework]		
In Airing Cupbo	pard			No]				
31.0 Thermal Stor	e			None]		
34.0 Small-scale i	lydro			None]		
Electricity Gen	erated			0.00]		
Apportioned				0.00					kWh/Year		
Connected to o	lwelling's elec	tricity meter		Yes							
Electricity Gen	Annual]							
Jan	Feb	Mar	Арг	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Tunical Cost	Tomical acrimus necessary	Ratings after improvement				
	Typical Cost	Typical savings per year	SAP rating	Environmental Impact			
Solar water heating			0	0			
_			0	0			
			0	0			

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Property Reference	е	Un	it 3						I.	ssued on Da	te	05/03/2024	
Assessment Refe	rence	Re	sidual					Prop Type Re	ef Te	bby and Son	Garage		
Property		Un	it 1, Highland	Square, Bristol									
SAP Rating					83 B		DER	4.62)	TER		11.67	
Environmental					97 A		% DER < TEI					60.41	
CO ₂ Emissions (t/	year)				0.26		DFEE	30.7		TFEE		31.91	
Compliance Chec					See BREL		% DFEE < TF					3.56	
% DPER < TPER					20.69		DPER	48.0	68	TPER		61.38	
										=			
Assessor Details Client										Asses	sor ID	U367-000)1
SAP 10 WORKSHEET CALCULATION OF I		uild (As D	esigned)			2022)							
1. Overall dwell	ing charac	teristics						Area	Store	y height		Volume	
Ground floor Total floor area Dwelling volume	a TFA = (la	1)+(1b)+(1c)+(ld)+(le)(ln)	6	2.2900		(m2) 62.2900 (3	(1b) x (a)+(3b)+(3c)+	(m) 2.5000 (3d)+(3e).		(m3) 155.7250 155.7250	(4)
2. Ventilation r	ate												
Number of open of Number of open f Number of chimne Number of flues Number of flues Number of blocke Number of passiv Number of fluele	lues ys / flues attached t attached t d chimneys ittent ext ve vents	o solid fu to other he tract fans	el boiler	fire							0 * 80 = 0 * 20 = 0 * 10 = 0 * 20 = 0 * 35 = 0 * 20 = 3 * 10 = 0 * 10 = 0 * 40 =	0.0000 0.0000 0.0000 0.0000 0.0000 30.0000 0.0000	(6b) (6c) (6d) (6e) (6f) (7a) (7b)
Infiltration due Pressure test Pressure Test Me Measured/design Infiltration rat Number of sides	ethod AP50 ce	ys, flues	and fans	= (6a)+(6b)	+(6c)+(6d)+(6e)+(6f)+	(6g)+(7a)+	7b)+(7c) =		30.0000	/ (5) =	0.1926 Yes Blower Door 4.5000 0.4176	(8)
Shelter factor Infiltration rat	e adjusted	l to includ	e shelter	factor					(20) = 1 - (21		(19)] = (20) =		
Wind speed Wind factor Adj infilt rate	Jan 5.1000 1.2750		Mar 4.9000 1.2250		May 4.3000 1.0750	Jun 3.8000 0.9500	Jul 3.8000 0.9500		Sep 4.0000 1.0000	Oct 4.3000 1.0750			
Effective ac	0.4127				0.3480 0.5605			0.2994 0.5448					
3. Heat losses a	and heat lo	ss paramet	er										
Element				Gross	Openings	Me	+7===	II emlus	AxU	K-	-value	AxK	
Windows (Uw = 1.	31)			m2	m2	11	.2700	W/M2K 1.2448	W/K 14.0286		to/mZK	kJ/K	(27)
Exposed Floor Cavity Wall				33.7000	11.2700	7 22	.8800 .4300	0.1800 0.1800	14.0286 1.4184 4.0374 4.1976	75 150	0.0000	591.0000 3364.5000	(28b) (29a)
External Roof 1 Total net area o	of external		Aum(A, m2)	38.1600		38 79	. /400				.0000	343.4400	(3I)
Fabric heat loss Party Wall 1 Party Floor 1 Party Ceiling 1 Internal Wall 1	s, W/K = Su	m (A x U)				54 54	(26) .6200 .4100 .4100 .7500	30) + (32) 0.0000	= 23.6820 0.0000	40 30	0.0000	6693.4000 2176.4000 1632.3000 13975.0000	(32d) (32b)
Heat capacity Cm								(28).	(30) + (32)	+ (32a)	.(32e) =		
Thermal mass par List of Thermal K1 Eleme E2 Other E3 Sill	rameter (TM Bridges	IP = Cm / T						I 5 5	ength Ps .5100	i-value 0.0230 0.0210	To 0.1: 0.1	461.9689 tal 267 157	
	sed floor floor bet		ings (in b	locks of fla	ts)			2	.8400 .8900 .3700	0.0160 0.1160 0.0380	0.3 0.3 1.0	352 781	

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P3 Part E16 Cor E25 Sta E18 Par E21 Exp P5 Part	ry wall - I rner (norma aggered par try wall be cosed floor ry wall - R res (insula 8 (Sum(L x oridges	al) Ety wall bet Etween dwell (inverted) Roof (insulation at ce:	e floor betw tween dwelli lings) ation at raf iling level	ings fter level) - inverted		cks of flats	3)	19. 3. 1. 5. 5.	4100 8900 5000 0000 0000 3700 9600 0940	0.1850 0.0000 0.0430 0.0360 0.0460 0.3200 0.1010 0.1500	1.55 0.00 0.15 0.03 0.23 1.71 1.41 0.31 (36a) =	000 005 060 000 84	
Ventilation hea													
(38)m	Jan 30.0707	Feb 29.9008	Mar 29.7342	Apr 28.9519	May 28.8055	Jun 28.1241	Jul 28.1241	Aug 27.9979	Sep 28.3866	Oct 28.8055	Nov 29.1016	Dec 29.4112	(38)
Heat transfer c Average = Sum(3	61.1567	60.9868	60.8202	60.0379	59.8915	59.2101	59.2101	59.0839	59.4726	59.8915	60.1876	60.4972 60.0372	(39)
HLP	Jan 0.9818	Feb 0.9791	Mar 0.9764	Apr 0.9638	May 0.9615	Jun 0.9506	Jul 0.9506	Aug 0.9485	Sep 0.9548	Oct 0.9615	Nov 0.9662	Dec 0.9712	(40)
HLP (average) Days in mont	31	28	31	30	31	30	31	31	30	31	30	0.9638 31	
4. Water heatin	ng energy r	equirements											
Assumed occupan												2.0456	(42)
Hot water usage	73.2343	72.1131	70.4608	67.9189	65.6414	62.4552	59.9352	62.8813	64.3630	67.5188	70.8052	73.1683	(42a)
Hot water usage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Average daily h	35.5788	34.2851	32.9913 /day)	31.6975	30.4037	29.1100	29.1100	30.4037	31.6975	32.9913	34.2851	35.5788 99.8608	
P-12- 1-1	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water Energy conte Energy content	108.8132 160.1918	106.3982 140.7863	103.4521 147.8309	99.6164 130.1239	96.0451 123.7639	91.5652 105.8921	89.0451 98.3975	93.2850 109.7981	96.0605 111.4254	100.5101 129.5174 Total = Si	105.0903 142.0330 um(45)m =	108.7471 159.7032 1559.4635	
Distribution lo		= 0.15 x (4	45)m 22.1746	19.5186	18.5646	15.8838	14.7596	16.4697	16.7138	19.4276	21.3050	23.9555	(46)
Water storage 1 Store volume a) If manufact	urer decla		actor is kno	own (kWh/d	ay):							150.0000 2.0900	(48)
Temperature f Enter (49) or (Total storage l	(54) in (55											0.5400 1.1286	
If cylinder con	34.9866	31.6008 cated solar	34.9866 r storage	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(56)
Primary loss Combi loss	34.9866 23.2624 0.0000	31.6008 21.0112 0.0000	34.9866 23.2624 0.0000	33.8580 22.5120 0.0000	34.9866 23.2624 0.0000	33.8580 22.5120 0.0000	34.9866 23.2624 0.0000	34.9866 23.2624 0.0000	33.8580 22.5120 0.0000	34.9866 23.2624 0.0000	33.8580 22.5120 0.0000	34.9866 23.2624 0.0000	(59)
Total heat requ	218.4408	193.3983	ng calculate 206.0799 0.0000	186.4939	182.0129	162.2621 0.0000	156.6465	168.0471	167.7954	187.7664	198.4030 0.0000	217.9522	
PV diverter Solar input	0.0000 0.0000 0.0000	0.0000 0.0000 0.0000	0.0000	0.0000 0.0000 0.0000	0.0000 0.0000 0.0000	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	0.0000	0.0000 0.0000 0.0000	(63b)
FGHRS Output from w/h		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
12Total per yea		193.3983 (r)	206.0799	186.4939	182.0129	162.2621	156.6465	168.0471 Total pe	167.7954 er year (kWh	187.7664 n/year) = St	198.4030 um(64)m =	217.9522 2245.2985 2245	(64)
Electric shower	0.0000	0.0000	0.0000	0.0000 Tot	0.0000 al Energy us	0.0000	0.0000	0.0000	0.0000 ver(s) (WWh	0.0000 (vear) = Su	0.0000 m(64a)m =	0.0000	
Heat gains from	water hea 99.8630	ting, kWh/r 88.9011	month 95.7530		87.7507								
5. Internal gai	ns (see Ta	ble 5 and 5	5a)										
Metabolic gains	(Table 5) Jan	, Watts Feb	Mar	Apr	Mav	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m Lighting gains	102.2793	102.2793	102.2793	102.2793	102.2793	102.2793	102.2793	102.2793	102.2793	102.2793	102.2793		(66)
Appliances gain	s (calcula	ted in Appe	endix L, equ	ation L13		lso see Tabl	le 5						
Cooking gains (calculated	l in Appendi	ix L, equati	on L15 or	153.3614 L15a), also	see Table 5	5						
Pumps, fans Losses e.g. eva	0.0000	0.0000	33.2279 0.0000	0.0000	33.2279 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	33.2279 0.0000	
Water heating g	-81.8234	-81.8234	-81.8234	-81.8234	-81.8234	-81.8234	-81.8234	-81.8234	-81.8234	-81.8234	-81.8234	-81.8234	(71)
	134.2244		128.7002	122.7253	117.9445	111.5349	106.6080	111.7031	114.0902	120.5158	128.2250	134.0060	(72)
		468.3437	450.2238	437.3676	416.9645	401.8195	385.9428	389.1837	399.3091	412.6159	435.9474	450.4639	(73)
6. Solar gains													
[Jan]			Aı	rea m2	Solar flux Table 6a W/m2	Specif or 1	g fic data Table 6b	Specific or Tabl	FF data Le 6c	Acces facto Table	ss or 6d	Gains W	
Northeast			11.27	700	11.2829		0.6300	0.				38.8614	(75)
Solar gains Total gains	38.8614 497.4276	79.1034 547.4471	142.5192 592.7430	234.0575 671.4251	314.6192 731.5837	335.4174 737.2369	313.7761 699.7189	250.1459 639.3296	173.6619 572.9710	96.6707 509.2866	48.8977 484.8451	31.7361 482.2001	(83) (84)

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7. Mean intern												21 0000	(OE)
Temperature du Utilisation fa						Jun	Jul	Aug.	Sep	Oct	Nov	21.0000 Dec	(85)
tau alpha util living ar	130.7027 9.7135	131.0669 9.7378	131.4258 9.7617	133.1384 9.8759	133.4638 9.8976	134.9997 10.0000	134.9997 10.0000	Aug 135.2880 10.0192	134.4039 9.9603	133.4638 9.8976	132.8072 9.8538	132.1276 9.8085	
avii iiving ai	0.9995	0.9985	0.9931	0.9395	0.7485	0.5137	0.3723	0.4251	0.7087	0.9720	0.9980	0.9996	(86)
Living Non living 24 / 16 24 / 9	20.4499 19.4667 0 3	20.5430 19.5876 0	20.6921 19.7779 0	20.8994 20.0289 0	20.9901 20.1102 0	20.9998 20.1247 0	21.0000 20.1247 0	21.0000 20.1264 0	20.9955 20.1195 0	20.8655 19.9997 0 0	20.6292 19.7069 0	20.4385 19.4596 0	
16 / 9 MIT Th 2 util rest of h	28 20.7186 20.0985	0 20.5430 20.1008	20.6921 20.1030	20.8994 20.1136	0 20.9901 20.1155	0 20.9998 20.1247	0 21.0000 20.1247	0 21.0000 20.1264	0 20.9955 20.1212	0 20.8655 20.1155	20.6292 20.1116	10 20.5171 20.1074	
MIT 2 Living area fr	0.9992 19.8466	0.9976 19.5876	0.9888 19.7779	0.9093 20.0289	0.6835 20.1102	0.4436 20.1247	0.2983 20.1247	0.3444 20.1264	0.6228 20.1195 fLA =	0.9505 19.9997 Living area	0.9966 19.7069	0.9994 19.5763 0.3851	(90)
MIT Temperature ad	20.1824	19.9556	20.1300	20.3642	20.4490	20.4617	20.4618	20.4629	20.4569	20.3332	20.0621	19.9386 0.0000	
adjusted MIT	20.1824	19.9556	20.1300	20.3642	20.4490	20.4617	20.4618	20.4629	20.4569	20.3332	20.0621	19.9386	(93)
8. Space heati	ng requirem	nent											
Utilisation Useful gains Ext temp.	4.3000	Feb 0.9974 546.0045 4.9000	Mar 0.9889 586.1736 6.5000	Apr 0.9189 616.9694 8.9000	May 0.7086 518.3787 11.7000	Jun 0.4706 346.9731 14.6000	Jul 0.3268 228.6571 16.6000	Aug 0.3755 240.0418 16.4000	Sep 0.6562 375.9925 14.1000	Oct 0.9569 487.3503 10.6000	Nov 0.9965 483.1445 7.1000	Dec 0.9994 481.8990 4.2000	(95)
Heat loss rate	971.3182	918.1905	828.9780	688.2849	523.9933	347.0713	228.6592	240.0500	378.0593	582.9339	780.1574	952.1428	(97)
Space heating Space heating Solar heating	352.8461 requirement		180.6465 er year (kW	51.3471 h/year)	4.1773	0.0000	0.0000	0.0000	0.0000	71.1142	213.8493	349.8614 1473.9509	(98a)
Solar heating Space heating	0.0000 contribution	0.0000 on - total p	0.0000 per year (k	0.0000 Wh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Space heating Space heating	352.8461 requirement	250.1090 t after sola		51.3471 tion - total	4.1773 per year	0.0000 (kWh/year)	0.0000	0.0000	0.0000	71.1142 (98c)	213.8493	349.8614 1473.9509 23.6627	
9a. Energy req	nivemente -		l heating e		uding micr								
Fraction of sp												0.0000	(201)
Fraction of sp					. (
Efficiency of Efficiency of Efficiency of	main space	heating sys	stem 1 (in stem 2 (in	%)								1.0000 231.7456 0.0000 0.0000	(206) (207)
Efficiency of Efficiency of Efficiency of	main space secondary/s	heating system heating system supplementar	stem 1 (in stem 2 (in	%)	May	Jun	Jul	Aug	Sep	Oct	Nov	231.7456 0.0000	(206) (207)
Efficiency of Efficiency of Efficiency of Space heating	main space secondary/s Jan requirement 352.8461	heating system heating system supplemental Feb t 250.1090	stem 1 (in stem 2 (in ry heating Mar 180.6465	%) system, % Apr 51.3471	May 4.1773	Jun 0.0000	Jul 0.0000	Aug 0.0000	Sep 0.0000	Oct 71.1142	Nov 213.8493	231.7456 0.0000 0.0000	(206) (207) (208)
Efficiency of Efficiency of Efficiency of Space heating	main space secondary/s Jan requirement 352.8461 efficiency 231.7456	heating symbol heatin	stem 1 (in stem 2 (in ry heating Mar 180.6465 ing system 231.7456	%) system, % Apr 51.3471	-			_	_			231.7456 0.0000 0.0000 Dec	(206) (207) (208) (98)
Efficiency of Efficiency of Efficiency of Space heating Space heating Space heating	main space secondary/s Jan requirement 352.8461 efficiency 231.7456 fuel (main 152.2558	heating symbol heatin	stem 1 (in stem 2 (in ry heating Mar 180.6465 ing system 231.7456 stem) 77.9503	%) system, % Apr 51.3471 1) 231.7456 22.1567	4.1773	0.0000	0.0000	0.0000	0.0000	71.1142	213.8493	231.7456 0.0000 0.0000 Dec 349.8614	(206) (207) (208) (98) (210)
Efficiency of Efficiency of Efficiency of Space heating	main space secondary/s Jan requirement 352.8461 efficiency 231.7456 fuel (main 152.2558 efficiency 0.0000	heating symbol heatin	stem 1 (in stem 2 (in ry heating Mar 180.6465 ing system 231.7456 stem) 77.9503 ing system 0.0000	%) system, % Apr 51.3471 1) 231.7456 22.1567	4.1773 231.7456	0.0000	0.0000	0.0000	0.0000	71.1142 231.7456	213.8493 231.7456	231.7456 0.0000 0.0000 Dec 349.8614 231.7456	(206) (207) (208) (98) (210) (211)
Efficiency of Efficiency of Efficiency of Space heating Space heating Space heating Space heating	main space secondary/s Jan requirement 352.8461 efficiency 231.7456 fuel (main 152.2558 efficiency 0.0000 fuel (main 0.0000 fuel (secondary)	heating symbol heatin	stem 1 (in stem 2 (in ry heating Mar 180.6465 ing system 231.7456 stem) 77.9503 ing system 0.0000 stem 2) 0.0000	%) system, % Apr 51.3471 1) 231.7456 22.1567 2) 0.0000 0.0000	4.1773 231.7456 1.8025 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 0.0000	0.0000 0.0000 0.0000 0.0000	71.1142 231.7456 30.6863 0.0000 0.0000	213.8493 231.7456 92.2776 0.0000 0.0000	231.7456 0.0000 0.0000 Dec 349.8614 231.7456 150.9679 0.0000	(206) (207) (208) (98) (210) (211) (212) (213)
Efficiency of Efficiency of Efficiency of Space heating Space heating Space heating Space heating Space heating Space heating	main space secondary/s Jan requirement 352.8461 efficiency 231.7456 fuel (main 152.2558 efficiency 0.0000 fuel (main 0.0000	heating symbol heatin	stem 1 (in stem 2 (in ry heating Mar 180.6465 ing system 231.7456 stem) 77.9503 ing system 0.0000 stem 2)	%) system, % Apr 51.3471 1) 231.7456 22.1567 2) 0.0000	4.1773 231.7456 1.8025 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	0.0000 0.0000 0.0000 0.0000	71.1142 231.7456 30.6863 0.0000	213.8493 231.7456 92.2776 0.0000	231.7456 0.0000 0.0000 Dec 349.8614 231.7456 150.9679 0.0000	(206) (207) (208) (98) (210) (211) (212) (213)
Efficiency of Efficiency of Efficiency of Space heating Space heating Space heating Space heating Space heating	main space secondary/s Jan requirement 352.8461 efficiency 231.7456 fuel (main 152.2558 efficiency 0.0000 fuel (main 0.0000 fuel (secor 0.0000	heating synheating synheating synheating synhementa: Feb 250.1090 (main heat: 231.7456 heating synheating sy	stem 1 (in stem 2 (in ry heating Mar 180.6465 ing system 231.7456 stem) 77.9503 ing system 0.0000 stem 2) 0.0000	%) system, % Apr 51.3471 1) 231.7456 22.1567 2) 0.0000 0.0000	4.1773 231.7456 1.8025 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 0.0000	0.0000 0.0000 0.0000 0.0000	71.1142 231.7456 30.6863 0.0000 0.0000	213.8493 231.7456 92.2776 0.0000 0.0000	231.7456 0.0000 0.0000 Dec 349.8614 231.7456 150.9679 0.0000	(206) (207) (208) (98) (210) (211) (212) (213) (215)
Efficiency of Efficiency of Efficiency of Efficiency of Efficiency of Space heating Efficiency of (217) m	main space secondary/s Jan requirement 352.8461 efficiency 231.7456 fuel (main 152.2558 efficiency 0.0000 fuel (main 0.0000 fuel (secon 0.0000 requirement 218.4408 water heate	heating synheating syn	stem 1 (in stem 2 (in ry heating	%) system, % Apr 51.3471 1) 231.7456 22.1567 2) 0.0000 0.0000 0.0000	4.1773 231.7456 1.8025 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 0.0000 0.0000 0.0000 0.0000	0.0000 0.0000 0.0000 0.0000 0.0000	71.1142 231.7456 30.6863 0.0000 0.0000	213.8493 231.7456 92.2776 0.0000 0.0000	231.7456 0.0000 0.0000 Dec 349.8614 231.7456 150.9679 0.0000 0.0000	(206) (207) (208) (98) (210) (211) (212) (213) (215)
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Electricity for												162.5750	(232)
Energy saving/ge PV generation Wind generation Hydro-electric g Electricity gene	generation (Appendix N	1)	es M ,N and	Q)							0.0000 0.0000 0.0000 0.0000	(234) (235a)
Appendix Q - spe Energy saved or		es										-0.0000	
Energy used Total delivered	energy for	all uses										0.0000 1966.9267	
12a. Carbon diox	ide emissio	ns - Indiv	vidual heat	ing systems	including m	icro-CHP							
								Energy		factor		Emissions	
Space heating - Total CO2 associ			ntretame					kWh/year 636.0211		0.1574		g CO2/year 100.1333 0.0000	(261)
Water heating (c Space and water	other fuel)	onandiroy c	, you can					1168.3306		0.1407		164.4015 264.5348	(264)
Pumps, fans and Energy for light	electric ke	ep-hot						0.0000 162.5750		0.0000 0.1443		0.0000 23.4646	(267)
Total CO2, kg/ye EPC Dwelling Car	ear	Emission	Rate (DER)									287.9994 4.6200	
13a. Primary ene	ergy - India	ridual heat	ing system	including	micro-CHP								
								Energy	Primary energy	y factor	Prim	ary energy	
Space heating -									kg			kWh/year 1006.7160	(275)
Total CO2 associ	other fuel)	ommunity s	systems					1168.3306		1.5203		0.0000 1776.2160	(473) (278)
Space and water Pumps, fans and Energy for light	electric ke	ep-hot						0.0000 162.5750		0.0000 1.5338		2782.9320 0.0000 249.3630	(281)
Total Primary en Dwelling Primary	nergy kWh/ye							162.5750		1.5550		3032.2950 48.6800	(286)
Dwelling limit	r chergy had	C (DILII)										40.0000	(207)
SAP 10 WORKSHEET	FOD New Bu	ild (As De	eimed)	Wareign 10	2 Fahruaru	2022)							
CALCULATION OF I	TARGET EMISS	SIONS		(veision 10.									
1. Overall dwell	-												
								Area (m2)		y height (m)		Volume (m3)	
Ground floor Total floor area	TFA = (la)	+(lb)+(lc)	+(ld)+(le)	(1n)	6	2.2900			(lb) x	2.5000	(2b) =		(1b) - (3b) (4)
Dwelling volume	(,	(, - (,	(22)	, , , , , ,				(3a)+(3b)+(3c)+	(3d) + (3e)	(3n) =	155.7250	(5)
2. Ventilation r													
Z. Vendilation i											n	3 per hour	
Number of open o	chimneys										0 * 80 =	0.0000	(6a)
Number of open f Number of chimne	eys / flues			ire							0 * 20 = 0 * 10 =	0.0000	(6c)
Number of flues Number of flues Number of blocke	attached to											0.0000	(6e)
Number of blocke Number of interm Number of passiv	nittent extr	act fans									2 * 10 =	20.0000	(7a)
Number of fluele		:s									0 * 10 = 0 * 40 =	0.0000	(7c)
Infiltration due	to chimney	s, flues a	and fans =	= (6a)+(6b)+	·(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000	Air change / (5) =	0.1284	(8)
Pressure test Pressure Test Me											В	Yes lower Door	
Measured/design Infiltration rat Number of sides	:e											5.0000 0.3784	
Shelter factor	Silcitorica								(20) = 1 -	[0.075 x	(19)1 =		
Infiltration rat	te adjusted	to include	shelter fa	actor							x (20) =	0.2933	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed Wind factor	5.1000 1.2750		4.9000 1.2250			3.8000 0.9500	3.8000 0.9500						
Adj infilt rate Effective ac	0.3739		0.3593		0.3153 0.5497	0.2786	0.2786		0.2933 0.5430				
DITCOULVE GO	3.3033	3.3072	0.3043	0.5520	0.0437	0.3300	0.3300	0.5500	0.3430	0.345/	0.3344	0.3394	(20)
3. Heat losses a	and heat los	s paramete	 r										
Element				Gross m2	Openings m2	Net	Area m2	U-value W/m2K	A x U W/K		-value kJ/m2K	A x K kJ/K	
					41144			,	, 10			20/10	

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TER Opening Type (Uw = 1. Exposed Floor Cavity Wall External Roof 1 Total net area of externa Fabric heat loss, W/K = S Party Wall 1 Thermal mass parameter (I	l elements um (A x U)	Aum (A, m2)	33.7000 38.1600	11.2700	7. 22. 38. 79.	.2700 .8800 .4300 .1600 .7400 (26)(3	1.1450 0.1300 0.1800 0.1100 30) + (32) = 0.0000	12.90- 1.02- 4.03 4.19 22.16- 0.000	14 74 76		470.7038	(27) (28b) (29a) (30) (31) (33) (32)
List of Thermal Bridges K1 Element E2 Other lintels E3 Sill E4 Jamb E20 Exposed floor E7 Party floor be P7 Party Wall - E P3 Party wall - E E16 Corner (norma E25 Staggered par E18 Party wall be E21 Exposed floor P5 Party wall - E E24 Exposed floor P5 Party wall - B E24 Exposed floor P5 Party wall - B E24 Exposed floor F5 Party wall - B E24 Exposed floor F5 Party wall - B E24 Exposed floor	(including tween dwell knosed floo ntermediate 1) ty wall bet tween dwell (inverted) loof (insula tion at cei	other steel lings (in bl or (normal) e floor betw tween dwelli lings ation at raf lling level	locks of flaveen dwellings	ngs (in bloo	cks of flat:	3)	5. 5. 20. 28. 8. 19. 3. 1. 5.	singth 1 5100 5100 8400 8900 3700 4100 8900 5000 0000 0000 3700 9600 0940	Psi-value 0.0500 0.0500 0.0500 0.3200 0.0700 0.1600 0.0900 0.0600 0.3200 0.0800 0.2400	Tot 0.27 0.27 1.04 0.92 1.98 1.34 0.00 0.31 0.06 0.30 1.71 1.11	a1 555 55 20 48 59 56 00 00 00 00 84 68 26 9.8621	
Total fabric heat loss			0.00 11	05) (5)				(3	33) + (36) -	(36a) = + (36a) =	0.0000 32.0260	(37)
Ventilation heat loss cal Jan (38)m 29.2875 Heat transfer coeff	Feb 29.1480	Mar 29.0112	Apr 28.3689	25) m x (5) May 28.2487	Jun 27.6893	Jul 27.6893	Aug 27.5857	Sep 27.9048	Oct 28.2487	Nov 28.4918	Dec 28.7460	(38)
61.3135 Average = Sum(39)m / 12 =	61.1740	61.0373	60.3949	60.2748	59.7153	59.7153	59.6117	59.9308	60.2748	60.5179	60.7720 60.3944	(39)
Jan HLP 0.9843 HLP (average)	Feb 0.9821	Mar 0.9799	Apr 0.9696	May 0.9676	Jun 0.9587	Jul 0.9587	Aug 0.9570	Sep 0.9621	Oct 0.9676	Nov 0.9716	Dec 0.9756 0.9696	(40)
Days in mont 31	28	31	30	31	30	31	31	30	31	30	31	
4. Water heating energy r												
Assumed occupancy Hot water usage for mixer											2.0456	
75.1325 Hot water usage for baths 0.0000		72.3581	0.0000	0.0000	0.0000	0.0000	64.4565 0.0000	0.0000	0.0000	72.2437	74.8447	
Hot water usage for other 35.5788	uses 34.2851	32.9913	31.6975	30.4037	29.1100	29.1100	30.4037	31.6975	32.9913	34.2851	35.5788	(42c)
Average daily hot water u	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	101.6141 Dec	(43)
Daily hot water use 110.7114		105.3494	100.9076	97.2907	93.4062	91.9336	94.8602	97.9439	102.0194	106.5288	110.4235	(44)
Energy conte 175.3398 Energy content (annual)	108.2885 154.2014	105.3494 161.9182	_	_			_	_	102.0194 138.4393			
Energy conte 175.3398 Energy content (annual) Distribution loss (46)m 26.3010 Water storage loss:	108.2885 154.2014 = 0.15 x (4	105.3494 161.9182	100.9076	97.2907	93.4062	91.9336	94.8602	97.9439	102.0194 138.4393	106.5288 151.7698	110.4235 172.8966 1687.9455 25.9345	(45) (46)
110.7114 Energy conte 175.3398 Energy content (annual) Distribution loss (46)m 26.3010 Water storage loss: Store volume a) If manufacturer decla Temperature factor from	108.2885 154.2014 = 0.15 x (4 23.1302 ared loss fa	105.3494 161.9182 15)m 24.2877	100.9076 138.1375 20.7206	97.2907 130.9720 19.6458	93.4062 114.8538	91.9336 111.1857	94.8602 117.4568	97.9439 120.7747	102.0194 138.4393 Total = St	106.5288 151.7698 um(45)m =	110.4235 172.8966 1687.9455 25.9345 150.0000 1.3938 0.5400	(45) (46) (47) (48) (49)
110.7114 Energy conte 175.3398 Energy content (annual) Distribution loss (46)m 26.3010 Water storage loss: Store volume a) If manufacturer decla Temperature factor from Enter (49) or (54) in (55 Total storage loss	108.2885 154.2014 = 0.15 x (4 23.1302 ared loss fa Table 2b	105.3494 161.9182 15)m 24.2877	100.9076 138.1375 20.7206 own (kWh/da	97.2907 130.9720 19.6458 ay):	93.4062 114.8538 17.2281	91.9336 111.1857 16.6779	94.8602 117.4568 17.6185	97.9439 120.7747 18.1162	102.0194 138.4393 Total = St 20.7659	106.5288 151.7698 um(45)m = 22.7655	110.4235 172.8966 1687.9455 25.9345 150.0000 1.3938 0.5400 0.7527	(45) (46) (47) (48) (49) (55)
110.7114 Energy conte 175.3398 Energy content (annual) Distribution loss (46)m 26.3010 Water storage loss: Store volume a) If manufacturer decla Temperature factor from Enter (49) or (54) in (55) Total storage loss 23.3325 If cylinder contains dedi	108.2885 154.2014 = 0.15 x (4 23.1302 ared loss fa Table 2b 0) 21.0745 cated solar	105.3494 161.9182 i5)m 24.2877 actor is knot	100.9076 138.1375 20.7206 own (kWh/da 22.5798	97.2907 130.9720 19.6458 ay):	93.4062 114.8538 17.2281 22.5798	91.9336 111.1857 16.6779	94.8602 117.4568 17.6185	97.9439 120.7747 18.1162	102.0194 138.4393 Total = St 20.7659	106.5288 151.7698 um(45)m = 22.7655	110.4235 172.8966 1687.9455 25.9345 150.0000 1.3938 0.5400 0.7527 23.3325	(45) (46) (47) (48) (49) (55) (56)
110.7114 Energy conte 175.3398 Energy content (annual) Distribution loss (46)m 26.3010 Water storage loss: Store volume a) If manufacturer decla Temperature factor from Enter (49) or (54) in (55 Total storage loss 23.3325 If cylinder contains dedic Primary loss 23.2624 Combi loss 0.0000	108.2885 154.2014 = 0.15 x (4 23.1302 ared loss fa Table 2b) 21.0745 cated solar 21.0745 21.0112 0.0000	105.3494 161.9182 15)m 24.2877 actor is kmo 23.3325 c storage 23.3325 23.2624 0.0000	100.9076 138.1375 20.7206 own (kWh/da 22.5798 22.5798 22.5798 22.5120 0.0000	97.2907 130.9720 19.6458 aay): 23.3325 23.3325 23.2624 0.0000	93.4062 114.8538 17.2281 22.5798 22.5798 22.5120	91.9336 111.1857 16.6779 23.3325 23.3325 23.2624	94.8602 117.4568 17.6185 23.3325 23.3325	97.9439 120.7747 18.1162 22.5798 22.5798 22.5120	102.0194 138.4393 Total = St 20.7659 23.3325 23.3325 23.3325 23.2624	106.5288 151.7698 um(45)m = 22.7655 22.5798 22.5798 22.5798 22.5120	110.4235 172.8966 1687.9455 25.9345 150.0000 1.3938 0.5400 0.7527 23.3325 23.3325 23.2624	(45) (46) (47) (48) (49) (55) (56) (57) (59)
110.7114 Energy conte 175.3398 Energy content (annual) Distribution loss (46)m 26.3010 Water storage loss: Store volume a) If manufacturer decla Temperature factor from Enter (49) or (54) in (55 Total storage loss 23.3325 If cylinder contains dedi 23.3325 Primary loss 23.2624 Combi loss 0.0000 Total heat required for w 10000 Total heat required for w 10000 1000 1000 1000 1000 1000 1000 1	108.2885 154.2014 = 0.15 x (4 23.1302 ared loss fa in Table 2b) 21.0745 cated solar 21.0745 21.0112 0.0000 outer heatin 196.2871	105.3494 161.9182 15)m 24.2877 actor is knot 23.3325 c storage 23.3325 23.2624 0.0000 g calculate 208.5131	100.9076 138.1375 20.7206 0wn (kWh/da 22.5798 22.5798 22.5120 0.0000 dd for each 183.2294 -26.3393	97.2907 130.9720 19.6458 ay): 23.3325 23.2624 0.0000 month 177.5669 -24.5473	93.4062 114.8538 17.2281 22.5798 22.5798 22.5120 0.0000 159.9456 -21.0053	91.9336 111.1857 16.6779 23.3325 23.3325 23.2624 0.0000 157.7806	94.8602 117.4568 17.6185 23.3325 23.3325 23.2624 0.0000 164.0517 -20.9374	97.9439 120.7747 18.1162 22.5798 22.5798 22.5120 0.0000 165.8665 -21.7329	102.0194 138.4393 Total = St 20.7659 23.3325 23.3325 23.3325 23.2624 0.0000 185.0342 -25.6207	106.5288 151.7698 151.7698 151.7698 152.7655 22.7655 22.5798 22.5798 22.5120 0.0000 196.8616 -29.0251	110.4235 172.8966 1687.9455 25.9345 150.0000 1.3938 0.5400 0.7527 23.3325 23.3325 23.2624 0.0000 219.4915	(45) (46) (47) (48) (49) (55) (56) (57) (59) (61) (62)
110.7114 Energy conte 175.3398 Energy content (annual) Distribution loss (46)m 26.3010 Water storage loss: Store volume a) If manufacturer decla Temperature factor from Enter (49) or (54) in (55) Total storage loss 23.3325 If cylinder contains dedic Primary loss 23.2624 Combi loss 0.0000 Total heat required for w 221.9347 WWHRS PV diverter -0.0000 Solar input 0.0000	108.2885 154.2014 = 0.15 x (4 23.1302 ared loss fa Table 2b)) 21.0745 cated solar 21.0745 21.0112 0.0000 rater heatin 196.2871 -30.3772 -0.0000 0.00000	105.3494 161.9182 15)m 24.2877 actor is known 23.3325 c storage 23.3325 23.2624 0.0000 ng calculate 208.5131 -31.8092 -0.0000 0.00000	100.9076 138.1375 20.7206 own (kWh/da 22.5798 22.5798 22.5120 0.0000 cd for each 183.2294 -26.3393 -0.0000 0.0000	97.2907 130.9720 19.6458 ay): 23.3325 23.3325 23.2624 0.0000 month 177.5669 -24.5473 -0.0000 0.0000	93.4062 114.8538 17.2281 22.5798 22.5798 22.5120 0.0000 159.9456 -21.0053 -0.0000 0.00000	91.9336 111.1857 16.6779 23.3325 23.3325 23.2624 0.0000 157.7806 -19.6891 -0.0000 0.00000	94.8602 117.4568 17.6185 23.3325 23.3325 23.2624 0.0000 164.0517 -20.9374 -0.0000 0.00000	97.9439 120.7747 18.1162 22.5798 22.5798 22.5120 0.0000 165.8665 -21.7329 -0.0000 0.0000	102.0194 138.4393 Total = Si 20.7659 23.3325 23.3325 23.2624 0.0000 185.0342 -25.6207 -0.0000 0.00000	106.5288 151.7698 151.7698 13m(45) m = 22.7655 22.5798 22.5798 22.5120 0.0000 196.8616 -29.0251 -0.0000 0.0000	110.4235 172.8966 1687.9455 25.9345 150.0000 1.3938 0.5400 0.7527 23.3325 23.3255 23.2624 0.0000 219.4915 -33.7114 -0.0000 0.0000	(45) (46) (47) (48) (49) (55) (56) (57) (59) (61) (62) (63a) (63b) (63c)
110.7114	108.2885 154.2014 = 0.15 x (4 23.1302 ared loss fa i Table 2b) 21.0745 cated solar 21.0745 21.0112 0.0000 vater heatin 196.2871 -30.3772 -0.0000 0.0000 0.0000	105.3494 161.9182 15)m 24.2877 actor is knot 23.3325 c storage 23.3325 23.2624 0.0000 g calculate 208.5131 -31.8092 -0.0000 0.0000	100.9076 138.1375 20.7206 own (kWh/da 22.5798 22.5798 22.5120 0.0000 ed for each 183.2294 -26.3393 -0.0000 0.0000 0.0000	97.2907 130.9720 19.6458 aay): 23.3325 23.3325 23.2624 0.0000 month 177.5669 -24.5473 -0.0000 0.0000 0.0000	93.4062 114.8538 17.2281 22.5798 22.5798 22.5120 0.0000 159.9456 -21.0053 -0.0000 0.0000 0.0000	91.9336 111.1857 16.6779 23.3325 23.3325 23.2624 0.0000 157.7806 -19.6891 -0.0000 0.0000 0.0000	94.8602 117.4568 17.6185 23.3325 23.3325 23.2624 0.0000 164.0517 -20.9374 -0.0000 0.0000 0.0000	97.9439 120.7747 18.1162 22.5798 22.5798 22.5120 0.0000 165.8665 -21.7329 -0.0000 0.0000 0.0000	102.0194 138.4393 Total = Si 20.7659 23.3325 23.3325 23.2624 0.0000 185.0342 -25.6207 -0.0000 0.0000 0.0000	106.5288 151.7698 um(45) m = 22.7655 22.5798 22.5798 22.5798 22.5120 0.0000 196.8616 -29.0251 -0.0000 0.0000 0.0000	110.4235 172.8966 1687.9455 25.9345 150.0000 1.3938 0.5400 0.7527 23.3325 23.3325 23.32624 0.0000 219.4915 -33.7114 -0.0000 0.0000 185.7801	(45) (46) (47) (48) (49) (55) (56) (57) (59) (61) (62) (63a) (63b) (63c) (63d) (64)
110.7114	108.2885 154.2014 = 0.15 x (4 23.1302 ared loss fa 1 Table 2b) 21.0745 cated solar 21.0745 21.0112 0.0000 arter heatin 196.2871 -30.3772 -0.0000 0.0000 0.0000 165.9100	105.3494 161.9182 15)m 24.2877 actor is knot 23.3325 c storage 23.3325 23.2624 0.0000 g calculate 208.5131 -31.8092 -0.0000 0.0000	100.9076 138.1375 20.7206 own (kWh/da 22.5798 22.5798 22.5120 0.0000 ed for each 183.2294 -26.3393 -0.0000 0.0000 0.0000	97.2907 130.9720 19.6458 aay): 23.3325 23.3325 23.2624 0.0000 month 177.5669 -24.5473 -0.0000 0.0000 0.0000	93.4062 114.8538 17.2281 22.5798 22.5798 22.5120 0.0000 159.9456 -21.0053 -0.0000 0.0000 0.0000	91.9336 111.1857 16.6779 23.3325 23.3325 23.2624 0.0000 157.7806 -19.6891 -0.0000 0.0000 0.0000	94.8602 117.4568 17.6185 23.3325 23.3325 23.2624 0.0000 164.0517 -20.9374 -0.0000 0.0000 0.0000	97.9439 120.7747 18.1162 22.5798 22.5798 22.5120 0.0000 165.8665 -21.7329 -0.0000 0.0000 0.0000	102.0194 138.4393 Total = St 20.7659 23.3325 23.3325 23.2624 0.0000 185.0342 -25.6207 -0.0000 0.0000	106.5288 151.7698 um(45) m = 22.7655 22.5798 22.5798 22.5798 22.5120 0.0000 196.8616 -29.0251 -0.0000 0.0000 0.0000	110.4235 172.8966 1687.9455 25.9345 150.0000 1.3938 0.5400 0.7527 23.3325 23.3325 23.32624 0.0000 219.4915 -33.7114 -0.0000 0.0000 185.7801	(45) (46) (47) (48) (49) (55) (56) (57) (59) (61) (62) (63a) (63b) (63c) (63d) (63d) (64) (64)
110.7114 Energy conte 175.3398 Energy content (annual) Distribution loss (46)m 26.3010 Water storage loss: Store volume a) If manufacturer decla Temperature factor from Enter (49) or (54) in (55 Total storage loss 23.3325 If cylinder contains dedic Combi loss 0.0000 Total heat required for w 221.9347 WWHRS -34.3475 PV diverter -0.0000 Solar input 0.0000 FGRRS 0.0000 Output from w/h 187.5872 12Total per year (kWh/yea Electric shower(s)	108.2885 154.2014 = 0.15 x (4 23.1302 (red loss fa (Table 2b)) 21.0745 cated solar 21.0745 21.0112 0.0000 rater heatin 196.2871 -30.3772 -0.0000 0.0000 165.9100 (r) 0.0000	105.3494 161.9182 15)m 24.2877 actor is known is storage 23.3325 23.2624 0.0000 ag calculate 208.5131 -31.8092 -0.0000 0.0000 176.7038	100.9076 138.1375 20.7206 0wn (kWh/da 22.5798 22.5798 22.5120 0.0000 ed for each 183.2294 -26.3393 -0.0000 0.0000 0.0000 156.8901	97.2907 130.9720 19.6458 aay): 23.3325 23.3325 23.2624 0.0000 month 177.5669 -24.5473 -0.0000 0.0000 153.0196	93.4062 114.8538 17.2281 22.5798 22.5798 22.5120 0.0000 159.9456 -21.0053 -0.0000 0.0000 0.0000 138.9404	91.9336 111.1857 16.6779 23.3325 23.3325 23.2624 0.0000 157.7806 -19.6891 -0.0000 0.0000 0.0000 138.0915	94.8602 117.4568 17.6185 23.3325 23.3325 23.2624 0.0000 164.0517 -20.9374 -0.0000 0.0000 0.0000	97.9439 120.7747 18.1162 22.5798 22.5798 22.5120 0.0000 165.8665 -21.7329 -0.0000 0.0000 0.0000 144.1336 rr year (kWI	102.0194 138.4393 Total = St 20.7659 23.3325 23.3325 23.2624 0.0000 185.0342 -25.6207 -0.0000 0.0000 0.0000 159.4136 n/year) = St	106.5288 151.7698 1m(45) m = 22.7655 22.5798 22.5798 22.5120 0.0000 196.8616 -29.0251 -0.0000 0.0000 0.0000 167.8365 1m(64) m =	110.4235 172.8966 1687.9455 25.9345 150.0000 1.3938 0.5400 0.7527 23.3325 23.2624 0.0000 219.4915 -33.7114 -0.0000 0.0000 185.7801 1917.4206	(45) (46) (47) (48) (55) (56) (57) (59) (61) (62) (63a) (63b) (63c) (63d) (64) (64) (64)
110.7114 Energy conte 175.3398 Energy content (annual) Distribution loss (46)m 26.3010 Water storage loss: Store volume a) If manufacturer decla Temperature factor from Enter (49) or (54) in (55 Total storage loss 23.3325 If cylinder contains dedi 23.3325 Primary loss 23.2624 Combi loss 0.0000 Total heat required for w 221.9347 WWHRS -34.3475 PV diverter -0.0000 Solar input 0.0000 FGRRS 0.0000 Output from w/h 187.5872 12Total per year (kWh/yea Electric shower(s) 0.0000 Heat gains from water hea	108.2885 154.2014 = 0.15 x (4 23.1302 ared loss farted loss farted solar 21.0745 21.0745 21.0745 21.012 0.0000 arter heatin 196.2871 -30.3772 -0.0000 0.0000 0.0000 165.9100 arter loss farted solar 21.0745 0.0000 0.0000 0.0000 control 165.9100 arter loss farted solar 21.0745 0.0000 0.0000 arter loss farted solar 21.0745 0.0000 0.0000 arter loss farted solar 21.0745 0.0000 0.0000 arter loss farted solar 21.0745 0.0000 0.0000 arter loss farted solar 21.0745 0.0000 arter loss farted solar 21.0745 0.0000 arter loss farted solar 21.0745 0.0000 0.0000 0.0000 arter loss farted solar 21.0745 0.0000 0.0000 0.0000 arter loss farted solar 21.0745 0.0000 0.0000 0.0000 arter loss farted solar 21.0745 0.0000 arter loss farted solar 21.0745 0.0000 0.0000 arter loss farted solar 21.0745 0.0000 arter loss farted solar 21.0745 0.0000 arter loss farted solar 21.0745 0.0000 arter loss farted solar 21.0745 arter loss farted solar 21.0745	105.3494 161.9182 15)m 24.2877 24.2877 24.2877 25.23.3325 25.25.23.2624 0.0000 0.0000 0.0000 176.7038	100.9076 138.1375 20.7206 20.7206 22.5798 22.5798 22.5120 0.0000 20.0000 20.0000 0.0000 156.8901 0.0000 Total	97.2907 130.9720 19.6458 ay): 23.3325 23.2624 0.0000 month 177.5669 -24.5473 -0.0000 0.0000 153.0196	93.4062 114.8538 17.2281 22.5798 22.5798 22.5120 0.0000 159.9456 -21.0053 -0.0000 0.0000 0.0000 138.9404	91.9336 111.1857 16.6779 23.3325 23.3325 23.2624 0.0000 157.7806 -19.6891 -0.0000 0.0000 0.0000 138.0915	94.8602 117.4568 17.6185 23.3325 23.3325 23.2624 0.0000 164.0517 -0.0000 0.0000 0.0000 143.1143 Total pe	97.9439 120.7747 18.1162 22.5798 22.5798 22.5120 0.0000 165.8665 -21.7329 -0.0000 0.0000 0.0000 144.1336 r year (kWI	102.0194 138.4393 Total = St 20.7659 23.3325 23.3325 23.2624 0.0000 185.0342 -25.6207 -0.0000 0.0000 159.4136 n/year) = St	106.5288 151.7698 151.7698 151.7698 151.7698 152.7655 22.5798 22.5798 22.5798 22.5120 0.0000 196.8616 -29.0251 -0.0000 0.0000 167.8365 152.64) m = 0.0000	110.4235 172.8966 1687.9455 25.9345 150.0000 1.3938 0.5400 0.7527 23.3325 23.2624 0.0000 219.4915 -33.7114 -0.0000 0.0000 185.7801 1917.4206 1917	(45) (46) (47) (48) (49) (55) (56) (57) (59) (61) (62) (63a) (63b) (63c) (63d) (64) (64) (64) (64a)
110.7114 Energy conte 175.3398 Energy content (annual) Distribution loss (46)m	108.2885 154.2014 = 0.15 x (4 23.1302 red loss fa Table 2b) 21.0745 cated solar 21.0745 21.0112 0.0000 red red heatin 196.2871 -30.3772 -0.0000 0.0000 165.9100 cr) 0.0000 cr) 0.0000 cr) 0.0000 cr) 0.0000 cr) 0.0000	105.3494 161.9182 15)m 24.2877 10tor is known is	100.9076 138.1375 20.7206 20.7206 20.7206 22.5798 22.5798 22.5120 0.0000 d for each 183.2294 -26.3393 -0.0000 0.0000 156.8901 0.0000 Tota 82.0042	97.2907 130.9720 19.6458 ay): 23.3325 23.3325 23.2624 0.0000 month 177.5669 -24.5473 -0.0000 0.0000 153.0196 0.0000 al Energy us 80.8241	93.4062 114.8538 17.2281 22.5798 22.5798 22.5120 0.0000 159.9456 -21.0053 -0.0000 0.0000 138.9404 0.0000 138.9404	91.9336 111.1857 16.6779 23.3325 23.3325 23.2624 0.0000 157.7806 -19.6891 -0.0000 0.0000 0.0000 138.0915	94.8602 117.4568 17.6185 23.3325 23.3325 23.2624 0.0000 164.0517 -20.9374 -0.0000 0.0000 143.1143 Total pe	97.9439 120.7747 18.1162 22.5798 22.5798 22.5120 0.0000 165.8665 -21.7329 -0.0000 0.0000 0.0000 144.1336 r year (kWI	102.0194 138.4393 Total = St 20.7659 23.3325 23.3325 23.2624 0.0000 185.0342 -25.6207 -0.0000 0.0000 159.4136 n/year) = St	106.5288 151.7698 151.7698 151.7698 151.7698 152.7655 22.5798 22.5798 22.5798 22.5120 0.0000 196.8616 -29.0251 -0.0000 0.0000 167.8365 152.64) m = 0.0000	110.4235 172.8966 1687.9455 25.9345 150.0000 1.3938 0.5400 0.7527 23.3325 23.2624 0.0000 219.4915 -33.7114 -0.0000 0.0000 185.7801 1917.4206 1917	(45) (46) (47) (48) (49) (55) (56) (57) (59) (61) (62) (63a) (63b) (63c) (63d) (64) (64) (64) (64a)
110.7114 Energy conte 175.3398 Energy content (annual) Distribution loss (46)m 26.3010 Water storage loss: Store volume a) If manufacturer decla Temperature factor from Enter (49) or (54) in (55 Total storage loss 23.3325 If cylinder contains dedi 23.3325 Primary loss 23.2624 Combi loss 0.0000 Total heat required for w 221.9347 WWHRS -34.3475 PV diverter -0.0000 Solar input 0.0000 FGRRS 0.0000 Output from w/h 187.5872 12Total per year (kWh/yea Electric shower(s) 0.0000 Heat gains from water hea	108.2885 154.2014 = 0.15 x (4 23.1302 ared loss fa 1 Table 2b) 21.0745 cated solar 21.0745 21.0112 0.0000 uster heatin 196.2871 -30.3772 -0.0000 0.0000 165.9100 ir) 0.0000 ting, kWh/m 84.9405	105.3494 161.9182 15)m 24.2877 24.2877 24.2877 24.2877 25.23.2624 0.0000 20.0000 0.0000 176.7038 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 0.0000 0.0000 0.0000 0.0000 0.0000	100.9076 138.1375 20.7206 20.7206 20.7206 22.5798 22.5798 22.5120 0.0000 20.0000 20.0000 156.8901 0.0000 Tota 82.0042	97.2907 130.9720 19.6458 ay): 23.3325 23.3325 23.2624 0.0000 month 177.5669 -24.5473 -0.0000 0.0000 153.0196 0.0000 al Energy us 80.8241	93.4062 114.8538 17.2281 22.5798 22.5798 22.5120 0.0000 159.9456 -21.0053 -0.0000 0.0000 0.0000 138.9404 0.0000 sed by insta	91.9336 111.1857 16.6779 23.3325 23.3325 23.2624 0.0000 157.7806 -19.6891 -0.0000 0.0000 138.0915 0.0000 antaneous e: 74.2452	94.8602 117.4568 17.6185 23.3325 23.3325 23.2624 0.0000 164.0517 -0.09374 -0.0000 0.0000 143.1143 Total pe	97.9439 120.7747 18.1162 22.5798 22.5798 22.5120 0.0000 165.8665 -21.7329 -0.0000 0.0000 0.0000 144.1336 r year (kWI	102.0194 138.4393 Total = St 20.7659 23.3325 23.3325 23.2624 0.0000 185.0342 -25.6207 -0.0000 0.0000 159.4136 n/year) = St	106.5288 151.7698 151.7698 151.7698 151.7698 152.7655 22.5798 22.5798 22.5798 22.5120 0.0000 196.8616 -29.0251 -0.0000 0.0000 167.8365 152.64) m = 0.0000	110.4235 172.8966 1687.9455 25.9345 150.0000 1.3938 0.5400 0.7527 23.3325 23.2624 0.0000 219.4915 -33.7114 -0.0000 0.0000 185.7801 1917.4206 1917	(45) (46) (47) (48) (49) (55) (56) (57) (59) (61) (62) (63a) (63b) (63c) (63d) (64) (64) (64) (64a)
110.7114	108.2885 154.2014 = 0.15 x (4 23.1302 ared loss fa Table 2b) 21.0745 cated solar 21.0745 21.0112 0.0000 are heatin 196.2871 -30.3772 -0.0000 0.0000 165.9100 are 10000 are 100000 are 10000 are 100000 are 10000 are 100000 are 100000 are 10000 are 100000 are 100000 are 100000 are 100000 are 10000	105.3494 161.9182 15)m 24.2877 24.2877 actor is known is storage 23.3325 23.2624 0.0000 ag calculate 208.5131 -31.8092 -0.0000 176.7038 0.0000 176.7038	100.9076 138.1375 20.7206 20.7206 20.7206 22.5798 22.5798 22.5120 0.0000 0.0000 156.3393 -0.0000 0.0000 156.8901 0.0000 Tota 82.0042	97.2907 130.9720 19.6458 ay): 23.3325 23.3325 23.2624 0.0000 month 177.5669 -24.5473 -0.0000 0.0000 153.0196 0.0000 al Energy us 80.8241	93.4062 114.8538 17.2281 22.5798 22.5798 22.5120 0.0000 159.9456 -21.0053 -0.0000 0.0000 138.9404 0.0000 138.9404 74.2624	91.9336 111.1857 16.6779 23.3325 23.3325 23.2624 0.0000 157.7806 -19.6891 -0.0000 0.0000 138.0915 0.0000 antaneous et	94.8602 117.4568 17.6185 23.3325 23.3325 23.2624 0.0000 164.0517 -20.9374 -0.0000 0.0000 143.1143 Total pe 0.0000 164.0517 164.05	97.9439 120.7747 18.1162 22.5798 22.5798 22.5120 0.0000 165.8665 -21.7329 -0.0000 0.0000 0.0000 144.1336 er year (kWh 76.2310	102.0194 138.4393 Total = Si 20.7659 23.3325 23.3325 23.2624 0.0000 185.0342 -25.6207 -0.0000 0.0000 159.4136 n/year) = Si 0.0000 /year) = Si 83.3070	106.5288 151.7698 151.7698 1m(45) m = 22.7655 22.5798 22.5798 22.5120 0.0000 196.8616 -29.0251 -0.0000 0.0000 0.0000 167.8365 1m(64) m = 0.0000 n(64a) m = 86.5369	110.4235 172.8966 1687.9455 25.9345 150.0000 1.3938 0.5400 0.7527 23.3325 23.3325 23.2624 0.0000 219.4915 -33.7114 -0.0000 0.0000 185.7801 1917.4206 1917 0.0000 0.0000 94.7640 Dec	(45) (46) (47) (48) (49) (55) (56) (57) (59) (61) (62) (63a) (63b) (63c) (63d) (64) (64) (64) (64a) (65)
110.7114	108.2885 154.2014 = 0.15 x (4 23.1302 ared loss fa iTable 2b) 21.0745 cated solar 21.0745 21.0112 0.0000 inter heatin 196.2871 -30.3772 -0.0000 0.0000 0.0000 iting, kWh/m 84.9405 ble 5 and 5 -, Watts Feb 102.2793 d in Append	105.3494 161.9182 15)m 24.2877 24.2877 24.2877 24.2877 25.23.2624 0.0000 20.0000 0.0000 176.7038 0.0000 176.7038 0.0000 176.7038 0.0000 176.7038 0.0000 176.7038	100.9076 138.1375 20.7206 20.7206 22.5798 22.5798 22.5120 0.0000 20.0000 20.0000 156.8901 0.0000 Tota 82.0042 Apr 102.2793 cion L9 or 1	97.2907 130.9720 19.6458 ay): 23.3325 23.3325 23.2624 0.0000 month 177.5669 -24.5473 -0.0000 0.0000 153.0196 0.0000 al Energy us 80.8241 May 102.2793 L9a), also s	93.4062 114.8538 17.2281 22.5798 22.5798 22.5120 0.0000 159.9456 -21.0053 -0.0000 0.0000 138.9404 0.0000 sed by insta 74.2624	91.9336 111.1857 16.6779 23.3325 23.3325 23.2624 0.0000 157.7806 -19.6891 -0.0000 0.0000 138.0915 0.0000 antaneous et 74.2452	94.8602 117.4568 17.6185 23.3325 23.3325 23.2624 0.0000 164.0517 -0.0000 0.0000 0.0000 143.1143 Total pe 0.0000 164.3303	97.9439 120.7747 18.1162 22.5798 22.5798 22.5120 0.0000 165.8665 -21.7329 0.0000 0.0000 144.1336 rr year (kWh 76.2310	102.0194 138.4393 Total = St 20.7659 23.3325 23.3325 23.2624 0.0000 185.0342 -25.6207 -0.0000 0.0000 0.0000 0.0000 vyear) = St 83.3070 Oct 102.2793	106.5288 151.7698 151.7698 151.7698 151.7698 151.7698 151.7698 151.7698 151.7698 151.7698 151.7698 161	110.4235 172.8966 1687.9455 25.9345 150.0000 1.3938 0.5400 0.7527 23.3325 23.32524 0.0000 219.4915 -33.7114 -0.0000 0.0000 185.7801 1917.4206 1917 0.0000 0.0000 94.7640 Dec 102.2793	(45) (46) (47) (48) (49) (55) (56) (57) (59) (61) (62) (63a) (63b) (63c) (63d) (64) (64) (64) (64a) (65)
110.7114	108.2885 154.2014 = 0.15 x (4 23.1302 red loss fa Table 2b) 21.0745 cated solar 21.0745 21.0112 0.0000 red re heatin 196.2871 -30.3772 -0.0000 0.0000 165.9100 r) 0.0000 ting, kWh/m 84.9405 Matts Feb 102.2793 din Append 101.8293 ted in Append 180.5374	105.3494 161.9182 15)m 24.2877 24.2877 24.2877 24.2877 24.2877 24.2877 24.2877 23.3325 23.2624 0.0000 20.0000 176.7038 0.0000 176.7038 0.0000 176.7038 0.0000 176.7038 0.0000 176.7038 0.0000 176.7038	100.9076 138.1375 20.7206 20.7206 20.7206 22.5798 22.5798 22.5120 0.0000 0.0000 156.8901 0.0000 156.8901 0.0000 156.8901 Apr 102.2793 200 1.9 or 1 95.0407 125.9178	97.2907 130.9720 19.6458 ay): 23.3325 23.3325 23.2624 0.0000 month 177.5669 -24.5473 -0.0000 0.0000 153.0196 0.0000 al Energy us 80.8241 May 102.2793 L9a), a1so s 91.9748 or L13a), a1so s 1153.3614	93.4062 114.8538 17.2281 22.5798 22.5798 22.5120 0.0000 159.9456 -21.0053 -0.0000 0.0000 138.9404 0.0000 sed by insta 74.2624 74.2624 Jun 102.2793 see Table 5 95.0407 Iso see Table 141.5601	91.9336 111.1857 16.6779 23.3325 23.3325 23.2624 0.0000 157.7806 -19.6891 -0.0000 0.0000 138.0915 0.0000 antaneous e: 74.2452 Jul 102.2793 91.9748 les 5 133.6761	94.8602 117.4568 17.6185 23.3325 23.3325 23.2624 0.0000 164.0517 -20.9374 -0.0000 0.0000 143.1143 Total pe 0.0000 164.0517 164.05	97.9439 120.7747 18.1162 22.5798 22.5798 22.5120 0.0000 165.8665 -21.7329 -0.0000 0.0000 144.1336 rr year (kWN, 76.2310	102.0194 138.4393 Total = St 20.7659 23.3325 23.3325 23.2624 0.0000 185.0342 -25.6207 -0.0000 0.0000 159.4136 n/year) = St 0.0000 /year) = St 83.3070 Oct 102.2793 91.9748	106.5288 151.7698 151	110.4235 172.8966 1687.9455 25.9345 150.0000 1.3938 0.5400 0.7527 23.3325 23.3325 23.2624 0.0000 219.4915 -33.7114 -0.0000 0.0000 185.7801 1917.4206 1917 0.0000 0.0000 94.7640 Dec	(45) (46) (47) (48) (49) (55) (56) (57) (59) (61) (62) (63a) (63d) (63d) (64) (64) (64a) (65)
110.7114	108.2885 154.2014 = 0.15 x (4 23.1302 red loss fa 1 Table 2b) 21.0745 cated solar 21.0745 21.0112 0.0000 atter heatin 196.2871 -30.3772 -0.0000 0.0000 0.0000 165.9100 r) 0.0000 atting, kWh/m 84.9405 Watts Feb 102.2793 din Appendi 101.8293 red in Appendi 101.8293 red in Appendi 133.2279	105.3494 161.9182 15)m 24.2877 24.2877 24.2877 24.2877 25.23.2624 0.0000 20.0000 0.0000 176.7038 0.0000 176.7038 0.0000 176.7038 0.0000 176.7038 0.0000 176.7038 0.0000 176.7038	100.9076 138.1375 20.7206 20.7206 20.7206 20.7206 22.5798 22.5798 22.5120 0.0000 20.0000 20.0000 156.8901 0.0000 Total 82.0042 Apr 102.2793 210n L9 or 1 95.0407 21510n L13 or 1 165.9178 21.15 or 1 33.2279	97.2907 130.9720 19.6458 ay): 23.3325 23.3325 23.2624 0.0000 month 177.5669 -24.5473 -0.0000 0.0000 153.0196 0.0000 al Energy us 80.8241 May 102.2793 193), also s 91.9748 153.3614 Ll5a), also s 33.2279	93.4062 114.8538 17.2281 22.5798 22.5798 22.5120 0.0000 159.9456 -21.0053 -0.0000 0.0000 0.0000 138.9404 0.0000 sed by insta 74.2624 74.2624 Jun 102.2793 see Table 5 95.0407 120 so see Table 5 95.0407 120 so see Table 5 95.0407 120 so see Table 5 93.2279	91.9336 111.1857 16.6779 23.3325 23.3325 23.2624 0.0000 157.7806 -19.6891 -0.0000 0.0000 138.0915 0.0000 antaneous e: 74.2452 Jul 102.2793 91.9748 1e 5 133.6761	94.8602 117.4568 17.6185 23.3325 23.32524 0.0000 164.0517 -20.9374 -0.0000 0.0000 143.1143 Total pe 0.0000 143.123 76.3303 76.3303 91.9748 131.8220 33.2279	97.9439 120.7747 18.1162 22.5798 22.5798 22.5120 0.0000 165.8665 -21.7329 -0.0000 0.0000 144.1336 rr year (kWN 76.2310 Sep 102.2793 95.0407 136.4944 33.2279	102.0194 138.4393 Total = St 20.7659 23.3325 23.3325 23.3325 23.2624 0.0000 185.0342 -25.6207 -0.0000 0.0000 0.0000 159.4136 n/year) = St 0.0000 /year) = St 83.3070 Oct 102.2793 91.9748 146.4415 33.2279	106.5288 151.7698 151.7698 151.7698 151.7698 151.7698 151.7698 151.7698 151.7698 151.7698 151.7698 162.5798 162.5798 162.5798 162.5120 162.0000 167.8365 1664) m = 168.5369 169.0000 160000 160000 167.8365 1664) m = 168.5369	110.4235 172.9966 1687.9455 25.9345 150.0000 1.3938 0.5400 0.7527 23.3325 23.2624 0.0000 219.4915 -33.7114 -0.0000 0.0000 185.7801 1917.4206 1917 0.0000 94.7640 Dec 102.2793 91.9748 170.7992 33.2279	(45) (46) (47) (48) (49) (55) (56) (57) (59) (61) (62) (63a) (63b) (63c) (63d) (64) (64) (64) (64a) (65)
110.7114 Energy conte 175.3398 Energy content (annual) Distribution loss (46)m	108.2885 154.2014 = 0.15 x (4 23.1302 fred loss far fable 2b) 21.0745 cated solar 21.0745 21.012 0.0000 atter heatin 196.2871 -30.3772 -0.0000 0.0000 0.0000 0.0000 165.9100 r) 0.0000 atting, kWh/m 84.9405 din Appendi 101.8293 din Appendi 101.8293 din Appendi 33.2279 3.0000 negative va	105.3494 161.9182 15)m 24.2877 24.2877 24.2877 24.2877 25.23.2624 0.0000 20.0000 0.0000 176.7038 0.0000 176.7038 0.0000 176.7038 0.0000 176.7038 0.0000 176.7038 0.0000 176.7038 0.0000 176.7038	100.9076 138.1375 20.7206 20.7206 20.7206 22.5798 22.5798 22.5120 0.0000 20.0000 20.0000 156.3991 0.0000 156.8901 Apr 102.2793 2ion L9 or 1 95.0407 1etion L13 or 1 165.9178 1on L15 or 1 33.2279 33.2279 33.2279 33.2279 33.2279 33.0000 1e 5)	97.2907 130.9720 19.6458 ay): 23.3325 23.3325 23.2624 0.0000 month 177.5669 -24.5473 -0.0000 0.0000 153.0196 0.0000 al Energy us 80.8241 May 102.2793 L9a), also s 91.9748 or L13a), also s 91.9748 or L13a), also s 33.2279 3.0000	93.4062 114.8538 17.2281 22.5798 22.5798 22.5798 22.5120 0.0000 159.9456 -21.0053 -0.0000 0.0000 0.0000 138.9404 0.0000 138.9404 0.0000 sed by insta 74.2624 Jun 102.2793 see Table 5 95.0407 Iso see Table 5 33.2279 0.0000	91.9336 111.1857 16.6779 23.3325 23.3325 23.2624 0.0000 157.7806 -19.6891 -0.0000 0.0000 0.0000 138.0915 0.0000 138.0915 74.2452	94.8602 117.4568 17.6185 23.3325 23.3252 23.2624 0.0000 164.0517 -20.9374 -0.0000 0.0000 143.1143 Total pe 0.0000 164.3124 91.0000 176.3303 176.3303	97.9439 120.7747 18.1162 22.5798 22.5798 22.5798 22.5120 0.0000 165.8665 -21.7329 -0.0000 0.0000 144.1336 r year (kWh 76.2310 Sep 102.2793 95.0407 136.4944 33.2279 0.0000	102.0194 138.4393 Total = St 20.7659 23.3325 23.3325 23.2624 0.0000 185.03422 -25.6207 -0.0000 0.0000 159.4136 n/year) = St 0.0000 year) = Sur 83.3070 Oct 102.2793 91.9748 146.4415 33.2279 3.0000	106.5288 151.7698 151	110.4235 172.8966 1687.9455 25.9345 150.0000 1.3938 0.5400 0.7527 23.3325 23.2624 0.0000 219.4915 -33.7114 -0.0000 0.0000 185.7801 1917.4206 1917 0.0000 94.7640 Dec 102.2793 91.9748 170.7992 33.2279 3.0000	(45) (46) (47) (48) (49) (55) (56) (57) (59) (61) (62) (63a) (63d) (63d) (64) (64) (64a) (65)
110.7114	108.2885 154.2014 = 0.15 x (4 23.1302 ared loss fa Table 2b) 21.0745 cated solar 21.0745 21.0112 0.0000 ater heatin 196.2871 -30.3772 -0.0000 0.0000 165.9100 ar) 0.0000 ting, kWh/m 84.9405 Watts Feb 102.2793 din Appendi 101.8293 ted in Appendi 33.2279 3.0000 negative va -81.8234 e 5)	105.3494 161.9182 15)m 24.2877 24.2877 24.2877 24.2877 24.2877 25.23.3325 23.2624 0.0000 27.293 28.293.325 20.0000 27.293 28.293.325 29.293 29	100.9076 138.1375 20.7206 DWN (kWh/do 22.5798 22.5798 22.5798 22.5120 0.0000 df for each 183.2294 -26.3393 -0.0000 Total 82.0042 Apr 102.2793 cion L9 or 102.2793 cion L9 or 102.2793 cion L9 or 102.2793 cion L9 or 103.32279 33.2279 33.2279 33.2279 33.2279 33.2279 3.0000 Le 5) -81.8234	97.2907 130.9720 19.6458 ay): 23.3325 23.3325 23.2624 0.0000 month 177.5669 -24.5473 -0.0000 0.0000 153.0196 0.0000 al Energy us 80.8241 May 102.2793 193), also s 91.9748 153.3614 Ll5a), also s 33.2279	93.4062 114.8538 17.2281 22.5798 22.5798 22.5798 22.5120 0.0000 159.9456 -21.0053 -0.0000 0.0000 138.9404 0.0000 138.9404 0.0000 138.9404 102.2793 see Table 5 95.0407 Lso see Table 141.5601 see Table 5 95.0407 Lso see Table 33.2279 0.0000 -81.8234	91.9336 111.1857 16.6779 23.3325 23.3252 23.2624 0.0000 157.7806 -19.6891 -0.0000 0.0000 138.0915 0.0000 antaneous e: 74.2452 Jul 102.2793 91.9748 1e 5 133.6761 5 33.2279 0.0000 -81.8234	94.8602 117.4568 17.6185 23.3325 23.3252 23.2624 0.0000 164.0517 -20.9374 -0.0000 0.0000 143.1143 Total pe 0.0000 164.3124 91.0000 176.3303 176.3303 176.3303	97.9439 120.7747 18.1162 22.5798 22.5798 22.5798 22.5120 0.0000 165.8665 -21.7329 -0.0000 0.0000 144.1336 ryear (kWh, 76.2310 Sep 102.2793 95.0407 136.4944 33.2279 0.0000 -81.8234	102.0194 138.4393 Total = St 20.7659 23.3325 23.3252 23.32624 0.0000 185.0327 -0.0000 0.0000 159.4136 n/year) = St 83.3070 Oct 102.2793 91.9748 146.4415 33.2279 3.0000 -81.8234	106.5288 151.7698 151.7698 151.7698 151.7698 151.7698 151.7698 151.7698 151.7698 151.7698 151.7698 151.7698 151.7698 151.7698 151.7698 161.8365 171	110.4235 172.9966 1687.9455 25.9345 150.0000 1.3938 0.5400 0.7527 23.3325 23.2624 0.0000 219.4915 -33.7114 -0.0000 0.0000 185.7801 1917.4206 1917 0.0000 94.7640 Dec 102.2793 91.9748 170.7992 33.2279	(45) (46) (47) (48) (49) (55) (56) (57) (59) (61) (63a) (63a) (63b) (63d) (64) (64) (64a) (65) (66) (67) (68) (69) (70) (71)
110.7114	108.2885 154.2014 = 0.15 x (4 23.1302 red loss fa Table 2b) 21.0745 cated solar 21.0745 21.0112 0.0000 dier heatin 196.2871 -30.3772 -0.0000 0.0000 0.0000 165.9100 r) 0.0000 ting, kWh/m 84.9405 water feb 102.2793 din Appendi 101.8293 ted in Appendi 33.2279 3.0000 negative va -81.8234 e 5) 126.3996	105.3494 161.9182 15)m 24.2877 24.2877 24.2877 24.2877 24.2877 24.2877 24.2877 24.2877 25.23.2624 0.0000 26.208.5131 -31.8092 -0.0000 0.0000 176.7038 0.0000 176.7038 0.0000 176.7038 0.0000 176.7038 0.0000 176.7038 0.0000 176.7038 0.0000 176.7038 0.0000 176.7038 0.0000 176.7038 0.0000 176.7038	100.9076 138.1375 20.7206 20.7206 20.7206 20.7206 22.5798 22.5798 22.5120 0.0000 20.0000 156.8901 0.0000 156.8901	97.2907 130.9720 19.6458 ay): 23.3325 23.3325 23.32624 0.0000 month 177.5669 -24.5473 -0.0000 0.0000 153.0196 0.0000 al Energy us 80.8241 May 102.2793 L9a), also s 91.9748 or L13a), also 1133, also 1133, also 1133, also 33.2279 3.0000 -81.8234 108.6346	93.4062 114.8538 17.2281 22.5798 22.5798 22.5798 22.5120 0.0000 159.9456 -21.0053 -0.0000 0.0000 138.9404 0.0000 138.9404 0.0000 3ed by insta 74.2624 Jun 102.2793 see Table 5 95.0407 Iso see Ta	91.9336 111.1857 16.6779 23.3325 23.3325 23.3325 23.2624 0.0000 157.7806 -19.6891 -0.0000 0.0000 138.0915 0.0000 138.0915 0.0000 antaneous e: 74.2452 Jul 102.2793 91.9748 1es 5 133.6761 5 33.2279 0.0000 -81.8234 99.7919	94.8602 117.4568 17.6185 23.3325 23.3325 23.2624 0.0000 164.0517 -20.9374 -0.0000 0.0000 143.1143 Total pe 0.0000 164.3143 Total pe 102.2793 91.9748 131.8220 33.2279 0.0000 -81.8234	97.9439 120.7747 18.1162 22.5798 22.5798 22.5798 22.5120 0.0000 165.8665 -21.7329 -0.0000 0.0000 144.1336 rr year (kWh 0.0000 rer(s) (kWh, 76.2310 Sep 102.2793 95.0407 136.4944 33.2279 0.0000 -81.8234 105.8765	102.0194 138.4393 Total = St 20.7659 23.3325 23.3325 23.32624 0.0000 185.0342 -25.6207 -0.0000 0.0000 159.4136 n/year) = St 0.0000 (year) = Sus 83.3070 Oct 102.2793 91.9748 146.4415 33.2279 3.0000 -81.8234 111.9718	106.5288 151.7698 151.7698 1m(45) m = 22.7655 22.5798 22.5798 22.5798 22.5120 0.0000 196.8616 -29.0251 -0.0000 0.0000 0.0000 167.8365 1m(64) m = 0.0000 n(64a) m = 86.5369 Nov 102.2793 95.0407 158.9980 33.2279 3.0000 -81.8234 120.1902	110.4235 172.8966 1687.9455 25.9345 150.0000 1.3938 0.54000 0.7527 23.3325 23.3325 23.32624 0.0000 219.4915 -33.7114 -0.0000 0.0000 185.7801 1917.4206 1917 0.0000 94.7640 Dec 102.2793 91.9748 170.7992 33.2279 3.0000 -81.8234 127.3710	(45) (46) (47) (48) (49) (55) (56) (57) (59) (61) (63a) (63b) (63c) (63d) (64) (64) (64) (65) (65)

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6. Solar gain	 IS												
[Jan]			Solar flux Table 6a W/m2	Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W			
Northeast			11.2	700	11.2829		0.6300	0	.7000	0.770	00	38.8614	(75)
Solar gains Total gains	38.8614 494.6661	79.1034 544.5535	142.5192 589.5075	234.0575 665.5945	314.6192 725.2738	335.4174 728.8441	313.7761 692.9028	250.1459 630.2210	173.6619 564.7573	96.6707 503.7426	48.8977 479.8103	31.7361 478.5650	
7. Mean inter			ng season)										
Temperature d	uring heatin	ng periods i	in the livir	ng area fro	m Table 9, 1							21.0000	(85)
tau alpha util living a	Jan 132.8334 9.8556	Feb	Mar 133.4346	Apr 134.8537	May 135.1226	Jun 136.3885 10.0926	Jul 136.3885 10.0926	Aug 136.6255 10.1084	Sep 135.8981 10.0599	Oct 135.1226 10.0082	Nov 134.5798 9.9720	Dec 134.0169 9.9345	
util living u		0.9987	0.9939	0.9454	0.7587	0.5240	0.3792	0.4351	0.7234	0.9758	0.9984	0.9997	(86)
MIT Th 2	20.4536 20.0964	20.5448 20.0983	20.6912 20.1001	20.8950 20.1088	20.9894 20.1104	20.9997 20.1179	21.0000 20.1179	21.0000 20.1193	20.9949 20.1150	20.8601 20.1104	20.6258 20.1071	20.4396 20.1037	
util rest of MIT 2 Living area f	0.9993 19.4685 raction		0.9900 19.7735	0.9165 20.0200	0.6930 20.1047	0.4520 20.1178	0.3032 20.1179	0.3518 20.1193		0.9562 19.9889 Living area		0.9995 19.4567 0.3851	(90) (91)
MIT Temperature a adjusted MIT	djustment		20.1270	20.3570	20.4454	20.4575	20.4576	20.4585	20.4527	20.3244	20.0552	19.8352 0.0000 19.8352	
													(/
9 Space heat	ing require												
8. Space heat													
Utilisation Useful gains Ext temp.	494.2955		Mar 0.9901 583.6779 6.5000	Apr 0.9256 616.0822 8.9000	May 0.7184 521.0376 11.7000	Jun 0.4798 349.6713 14.6000	Jul 0.3325 230.3576 16.6000	Aug 0.3839 241.9237 16.4000	Sep 0.6699 378.3432 14.1000	Oct 0.9620 484.5791 10.6000	Nov 0.9971 478.4129 7.1000	Dec 0.9995 478.3039 4.2000	(95)
Heat loss rat	953.2984	921.0131	831.7523	691.9449	527.1266	349.7815	230.3599	241.9331	380.7225	586.1386	784.0198	950.1860	(97)
Space heating Space heating	341.4981	253.8172 t - total pe		54.6211 n/year)	4.5302	0.0000	0.0000	0.0000	0.0000	75.5602	220.0370	351.0803 1485.7114	(98a)
Solar heating Solar heating	0.0000	0.0000 on - total n	0.0000 er vear (ki	0.0000 Wh/vear)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Space heating	kWh 341.4981	253.8172	184.5673	54.6211		0.0000	0.0000	0.0000	0.0000	75.5602	220.0370	351.0803	(98c)
Space heating Space heating		t alter sola	ar contribu	tion - tota	ı per year ((kwn/year)				(98c)	/ (4) =	1485.7114 23.8515	(99)
9a. Energy re													
Fraction of s Fraction of s	pace heat fr	rom main sys	stem(s)		m (Table 11)							0.0000	(202)
Efficiency of Efficiency of Efficiency of	main space	heating sys	stem 2 (in 9	b)								92.3000 0.0000 0.0000	(207)
Space heating	Jan requirement	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating	341.4981 efficiency	253.8172 (main heati	ing system 1		4.5302	0.0000	0.0000	0.0000	0.0000	75.5602	220.0370	351.0803	
Space heating				92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	
Space heating	efficiency		ing system 2		4.9081	0.0000	0.0000	0.0000	0.0000	81.8637	238.3933	380.3687	
Space heating				0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Space heating	0.0000 fuel (secor	0.0000 ndary) 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	. ,
Water heating Water heating	requirement	:											
Efficiency of	water heate		176.7038	156.8901	153.0196	138.9404	138.0915	143.1143	144.1336	159.4136	167.8365	185.7801 79.8000	(216)
(217)m Fuel for wate		85.0102 Wh/month 195.1648	84.1576 209.9678	81.9448 191.4583	80.0332 191.1951	79.8000 174.1107	79.8000 173.0470	79.8000 179.3412	79.8000 180.6186	82.4884 193.2557	84.6680 198.2289	85.4645 217.3769	
Space cooling (221)m			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Pumps and Fa Lighting Electricity g	7.3041 19.1106	6.5973 15.3312	7.3041 13.8040	7.0685 10.1134	7.3041 7.8119	7.0685 6.3824	7.3041 7.1263	7.3041 9.2630	7.0685 12.0317	7.3041 15.7863	7.0685 17.8306	7.3041 19.6417	(231)
(233a)m Electricity g	-21.2892	-31.0349	-46.1166	-53.6723	-59.4691	-56.1057 (y)	-55.4350	-51.5549	-44.9629	-36.3112	-23.7709	-18.2896	(233a)
(234a)m Electricity g	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 ity)	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
(235a)m Electricity u	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 eneration)	0.0000	0.0000	0.0000	0.0000	
(235c)m Electricity g	0.0000 generated by	0.0000 PVs (Append	0.0000 lix M) (nega	0.0000 ative quant	0.0000 ity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(235c)
(233b)m Electricity g	-9.1125 generated by	-19.4417 wind turbin	-39.1457 nes (Appendi	-59.5300 ix M) (nega	-79.4240 tive quantit	·γ)		-66.6255	-48.4011	-28.0276	-12.2401	-7.1845	
(234b)m Electricity g (235b)m	0.0000	hydro-elect 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(234b) (235b)
Electricity u	sed or net e	electricity	generated h	oy micro-CH	P (Appendix	N) (negati	ve if net g	eneration)					

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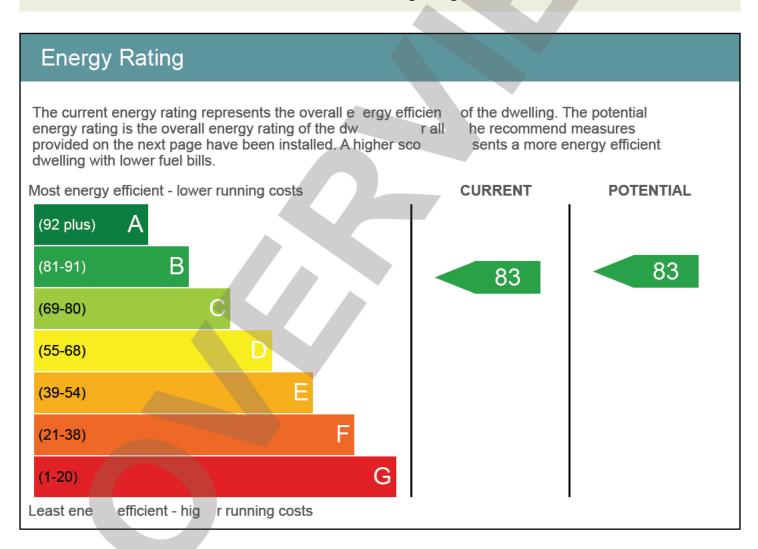
(235d)m Annual totals Space heating Space heating Space heating Efficiency of Water heating	fuel - main : fuel - main : fuel - secon water heater	system 1 system 2 dary	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 1609.6548 0.0000 0.0000 79.8000 2323.4590	(211) (213) (215)
Space cooling	fuel											0.0000	(221)
Electricity for Total electric Electricity for	city for the	above, kWh/y		L)								86.0000 154.2331	
Energy saving, PV generation Wind generation Hydro-electric Electricity ge Appendix Q - s	on c generation enerated - Mic	(Appendix N) cro CHP (App		M ,N and (2)							-1026.2798 0.0000 0.0000 0.0000	(234) (235a)
Energy saved of Energy used Total delivere	or generated											-0.0000 0.0000 3147.0672	(237)
12a. Carbon di					including mi								
								Energy	Fmissio	n factor		Emissions	
Space heating Total CO2 asso			stems					kWh/year 1609.6548	kg	CO2/kWh 0.2100	k	g CO2/year 338.0275 0.0000	
Water heating								2323.4590		0.2100		487.9264	
Space and wate Pumps, fans ar Energy for lig	nd electric k	eep-hot						86.0000 154.2331		0.1387 0.1443		825.9539 11.9293 22.2606	(267)
Energy saving PV Unit electr PV Unit electr Total Total CO2, kg/ EPC Target Car	ricity used in ricity exports /year	n dwelling ed						-498.0124 -528.2674		0.1339 0.1255		-66.6712 -66.3173 -132.9885 727.1553 11.6700	(272)
13a. Primary e													
									imarv energ	v factor	Prim	arv energy	
Space heating Total CO2 asso			stems					Energy Pr kWh/year 1609.6548	kg	CO2/kWh 1.1300	LLIM	kWh/year 1818.9100 0.0000	(2/3)
Water heating	(other fuel)							2323.4590		1.1300		2625.5087	(278)
Space and wate Pumps, fans ar Energy for lig	nd electric k	eep-hot						86.0000 154.2331		1.5128 1.5338		4444.4187 130.1008 236.5679	(281)
Energy saving PV Unit electr PV Unit electr Total Total Primary Target Primary	ricity used in ricity exporte energy kWh/ye	n dwelling ed ear						-498.0124 -528.2674		1.4947 0.4608		-744.3976 -243.4215 -987.8191 3823.2683 61.3800	(286)

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Dwelling Address	Unit 1, Highland Square , Bristol
Report Date	05/03/2024
Property Type	Flat, Semi-Detached
Floor Area [m ²]	62

This document is not an Energy Performance Certificat EPC) s required by the Energy Performance of Buildings Reg io



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Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good
Feature	Description			gy Performance
Walls	Average thermal transmi	ttance 0.18 W/m²K		Very Good
Roof	Average thermal transmi	ttance 0.11 W/m²K		Very Good
Floor	Average thermal transmi	ttance 0.18 W/m²K		Very Good
Windows	High performance glazing			Good
Main heating	Air source heat pump, radiators, electric			Average
Main heating controls	Time and temperature z contro			Very Good
Secondary heating	None			
Hot water	From main sys m			Average
Lighting	Good ligh g efficien			Good
Air tightness	Air perme 50] =	4.5 h.m² (assumed)		Good

Primary Energy use

The primary energy use for this property per year is 45 kilowatt hour (kWh) per square metre

Estim ted CO₂ missions of the dwelling

The estimated ing provides an indication of the dwelling's impact on the environment in terms of carbon dioxide emissions; the higher the rating the less impact it has on the environment.

The estimated CO emissions for this dwellings is: 0.3 per year

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With the recommended measures the potential CO emissions could be:

(

per year

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelli

To reach the dwelling's potential energy rating all of the recommended measures shown would d to be installed.

Having these measures installed individually or in any other order may give a different result omp d with the cumulative potential rating.

Recommended measure	Typical	Potential Rati	C ulative	Cumulative
	Yearly	after	avings	Potential
	Saving	measure insta	(per year)	Rating

Estimated energy use and potential aving

Estimated energy cost for this property over a year

£457

Over a year you could save

£0

The estimated cost and saving how how much the average hou ld would spend in this property heating, lighting and hot water. It not based on how e is used by the people living at the pr

Containg the ssessor and the accreditation scheme

Assessor contact details			
Assessor name			
Assessor's accreditation number			
Email Address			

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Accreditation scheme contact details			
Accreditation scheme Elmhurst Energy Systems Ltd			
Telephone			
Email Address			

Assessment details			
Related party disclosure	No related pa		
Date of assessment	05/03/202		
Date of certificate	05/03/202		
Type of assessment	SAP w dwellin		



Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Tue 05 Mar 2024 08:41:59

Project Information				
Assessed By		Building Type	Flat, Semi-detached	
OCDEA Registration	EES/025661	Assessment Date	2024-03-05	

Dwelling Details				
Assessment Type	As designed	Total Floor Area	62 m ²	
Site Reference	Unit 3	Plot Reference	PV	
Address	Unit 1 Highland Square, Bristo	ol		

Client Details	
Name	Tebby & Son
Company	SF Tebby & Son
Address	Unit 11 Avon Gorge Industrial Estate , Bristol, BS2 9XX

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission	rate			
Fuel for main heating system	Electricity			
Target carbon dioxide emission rate	11.67 kgCO ₂ /m ²			
Dwelling carbon dioxide emission rate	2.88 kgCO ₂ /m ²	OK		
1b Target primary energy rate and dwelling primary energy				
Target primary energy	61.38 kWh _{PE} /m ²			
Dwelling primary energy	34.3 kWh _{PE} /m ²	OK		
1c Target fabric energy efficiency and dwelling fabric energy efficiency				
Target fabric energy efficiency 31.9 kWh/m ²				
Dwelling fabric energy efficiency	30.8 kWh/m ²	OK		

2a Fabric U-values					
Element	Maximum permitted average U-Value [W/m²K]	Dwelling average U-Value [W/m²K]	Element with highest individual U-Value		
External walls	0.26	0.18	Walls (1) (0.18)	OK	
Party walls	0.2	0	Party Wall (1) (0)	N/A	
Curtain walls	1.6	0	N/A	N/A	
Floors	0.18	0.18	Exposed Floor (0.18)	OK	
Roofs	0.16	0.11	Roof (1) (0.11)	OK	
Windows, doors, and roof windows	1.6	1.31	W01 (1.31)	OK	
Rooflights	2.2	N/A	N/A	N/A	

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))				
Name	Net area [m ²]	U-Value [W/m ² K]		
Exposed wall: Walls (1)	22.43	0.18		
Party wall: Party Wall (1)	95.62	0 (!)		
Party floor: Exposed Floor, Exposed Floor	7.88	0.18		
Exposed roof: Roof (1)	38.16	0.11		

2c Openings (better than typically expected values are flagged with a subsequent (!))					
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]	
W01, Windows	2.26	North East	0.7	1.31	
W02, Windows	2.26	North East	0.7	1.31	
W03, Windows	2.26	North East	0.7	1.31	
W04, Windows	2.25	North East	0.7	1.31	
W05, Windows	2.24	North East	0.7	1.31	

2d Thermal brid	2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))											
Building part 1 - Main Dwelling: Thermal bridging calculated from linear thermal transmittances for each junction												
Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference								
External wall	E2: Other lintels (including other steel lintels)	Not government-approved scheme	0.023 (!)									

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E3: Sill	Calculated by person with suitable expertise	0.021 (!)	
External wall	E4: Jamb	Calculated by person with suitable expertise	0.016 (!)	
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.116	
External wall	E7: Party floor between dwellings (in blocks of flats)	Calculated by person with suitable expertise	0.038 (!)	
Party wall	P7: Exposed floor (normal)	Calculated by person with suitable expertise	0.185	
Party wall	P3: Intermediate floor between dwellings (in blocks of flats)	SAP table default	0 (!)	
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.043	
External wall	E25: Staggered party wall between dwellings	Calculated by person with suitable expertise	0.036 (!)	
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.046	
External wall	E21: Exposed floor (inverted)	SAP table default	0.32	
Party wall	P5: Roof (insulation at rafter level)	Calculated by person with suitable expertise	0.101	Calculate
External wall	E24: Eaves (insulation at ceiling level - inverted)	SAP table default	0.15	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))								
Maximum permitted air permeability at 50Pa	8 m ³ /hm ²							
Dwelling air permeability at 50Pa	4.5 m ³ /hm ² , Design value	OK						
Air permeability test certificate reference								

4 Space heating	
Main heating system 1: Heat pump wit	h radiators or underfloor heating - Electricity
Efficiency	231.7%
Emitter type	Radiators
Flow temperature	55°C
System type	Heat Pump
Manufacturer	Atlantic
Model	Logic Air 8kW
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water							
Cylinder/store - type: Cylinder							
Capacity	150 litres						
Declared heat loss	2.09 kWh/day						
Primary pipework insulated	Yes						
Manufacturer							
Model							
Commissioning							
Waste water heat recovery system 1 -	type: N/A						
Efficiency							
Manufacturer							
Model							

6 Controls									
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services									
Function									
Ecodesign class									
Manufacturer									
Model									

Water heating - type: Cylinder thermosta	at and HW saparately	timed	
Manufacturer	l and nivi separately	timed	
Model			
7 Lighting			
Minimum permitted light source efficacy	75 lm/W		
Lowest light source efficacy	80 lm/W		OK
External lights control	N/A		
8 Mechanical ventilation			
System type: N/A			
Maximum permitted specific fan power	N/A		
Specific fan power	N/A		N/A
Minimum permitted heat recovery	N/A		
efficiency			
Heat recovery efficiency	N/A		N/A
Manufacturer/Model			
Commissioning			
9 Local generation			
Technology type: Photovoltaic system	(1)		
Peak power	1.045 kWp		
Orientation	South West		
Pitch	45°		
Overshading	None or very little		
Manufacturer	Trono or vory maio		
MCS certificate			
10 Heat networks			
N/A			
11 Supporting documentary evidence			
N/A			
12 Declarations			
a. Assessor Declaration			
	nfirmation that the co	ontents of this BREL Compliance Report	
		of this BREE compliance Report of the street	
		and that the supporting documentary	
evidence (SAP Conventions, Appendi			
documentary evidence required) has			
Compliance Report.	been reviewed in the	course or preparing this bitch	
Соттриансе ттерогт.			
Signed:		Assessor ID:	
- 3			
Name:		Date:	
b. Client Declaration			
N/A			



Property Reference	Unit 3							Issued	on Date	05/0	3/2024	ļ
Assessment Reference	PV				Prop 1	Type R	lef	Tebby ar	nd Son G	arage		
Property	Unit 1, Hi	ghland Square	, Bristol									
SAP Rating			83 B	DER		2.88		1	ΓER	1	1.67	
Environmental			98 A	% DER	< TER					7	5.32	
CO ₂ Emissions (t/year)			0.15	DFEE		30.7	7	1	TFEE .	3	1.91	
Compliance Check			See BREL	% DFE	E < TFEE					3	.56	
% DPER < TPER			44.11	DPER		34.30)	1	[PER	6	1.38	
Assessor Details								,	Assessor	· ID U	367-0	001
Client												
SUMMARY FOR INPU	T DATA FOR:	New Build (As Designed)									
Orientation			Southwest									
Property Tenture			1									
Transaction Type			6									
Terrain Type			Urban									
1.0 Property Type			Flat, Semi-Detached	i								
Position of Flat			Top-floor flat									
Which Floor			1									
2.0 Number of Storeys			1									
3.0 Date Built			2024									
3.0 Property Age Band			L									
4.0 Sheltered Sides			3									
5.0 Sunlight/Shade			Average or unknow	n								
6.0 Thermal Mass Parame	ter		Precise calculation	•								
Thermal Mass			N/A					k.	J/m²K			
7.0 Electricity Tariff			Standard									
Smart electricity meter f	itted		No									
Smart gas meter fitted			No									
7.0 Measurements												
			Baseme Ground flo 1st Stor 2nd Stor 3rd Stor 4th Stor 5th Stor 7th Stor	nt: or: ey: ey: ey: ey: ey:	0.00 m 15.24 m 0.00 m 0.00 m 0.00 m 0.00 m 0.00 m 0.00 m 0.00 m 0.00 m		In	ternal Flo 0.00 n 62.29 i 0.00 n	1 ² 11 ² 1 ² 1 ² 1 ² 1 ² 1 ²	Averag	0.00 2.50 0.00 0.00 0.00 0.00 0.00 0.00	m m m m m m
8.0 Living Area			23.99					m) ²			
9.0 External Walls Description	Type Co	onstruction		U-Value	Kappa (Gross I	Nett Area	Shelter	Shelter	Openin	gs Area	n Calculati
Cavity Wall	Cavity Wall Ca		ooard on dabs, dense block, side structure	(W/m²K)	(kJ/m²K) Ar		(m²) 22.43	Res 0.00	None	11.27		Type er Gross A
9.1 Party Walls												
Description	Туре	Constru	ction					Kappa (kJ/m ² K)	Area (m²)	Shelter Res	S	helter
Party Wall 1	Filled Cavity v Edge Sealing		asterboard on both sid	les, dense	cellular blo		0.00	70.00	95.62	0.00	ı	None
9.2 Internal Walls Description		Construct	tion							Ka	ppa	Area (r
Internal Wall 1			ck, dense plaster							(kJ/	m²K) 0.00	139.7
milemai vvali i		Delise DIO	un, delise piastei							10	0.00	138.7

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Description	Туре	Construc	ction		U-Value (W/m²K)(Kappa kJ/m²K)A			a Code	Shelter Factor	Calculatio	nOpenings
External Roof 1	External Flat Roof	Plasterbo	ard, in	sulated flat roof	0.11	9.00	38.16	(m ²) 38.1		0.00	Enter Gros Area	s 0.00
10.1 Party Ceilings												
Description		Const	ructio	n							Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1		Preca	st cond	rete planks floor, scree	d, carpeted						30.00	54.41
11.0 Heat Loss Floors												
Description	Туре	Storey Inde	x	Construction			/alue /m²K)	S	helter Code		helter Kap actor (kJ/m	pa Area(m²) ²K)
Exposed Floor	Exposed Floor - Solid	Lowest occu	pied	Other			.18		None		0.00 75.0	
11.1 Party Floors												
Description		Storey	Cons	truction							Kappa	Area (m²)
Party Floor 1		Index Lowest occupied		ast concrete planks floo	r, screed, carp	peted					(kJ/m²K) 30.00	54.41
12.0 Opening Types												
Description	Data Source	Type		Glazing		Glazin			G-value	Frame	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window		Double Low-E So	ft 0.05	Gap	Typ Air Fi		0.63	Type Wood	0.70	1.31
13.0 Openings												
Name	Opening Ty	/pe		Location			ntation		Area (itch
W01 W02	Windows Windows			Cavity Wall Cavity Wall			h East h East		2.20 2.20			0 0
W03	Windows			Cavity Wall		Nort	h East		2.20	6		0
W04 W05	Windows Windows			Cavity Wall Cavity Wall			h East h East		2.2 2.2			0 0
44.0.00================================				None					7			
14.0 Conservatory				100					<u></u> %			
15.0 Draught Proofing									70			
16.0 Draught Lobby			L	No								
17.0 Thermal Bridging			(Calculate Bridges								
17.1 List of Bridges												
Bridge Type E2 Other lintels (include	ting other steel linte	ale)		ce Type Gov Approved Scheme:	Length 5.51	Psi 0.02	Adjus 0.0		Reference:			Imported No
E3 Sill	ang outer elect mile	,,,,	Indep	endently assessed	5.51	0.02	0.0	2				No
E4 Jamb E20 Exposed floor (no	rmal)			endently assessed endently assessed	20.84 2.89	0.02 0.12	0.0 0.1					No No
E7 Party floor between		s of flats)		endently assessed	28.37	0.12	0.0					No
P7 Party Wall - Expose		. طبیعالنمیم		endently assessed	8.41	0.18	0.1					No
P3 Party wall - Interme (in blocks of flats)	ediate floor betweer	n aweilings	lable	K1 - Default	19.89	0.00	0.0	U				No
È16 Comer (normal) E25 Staggered party v	uall batusan duallin			endently assessed	3.50	0.04 0.04	0.0					No
E18 Party wall betwee		igs	Inder	endently assessed endently assessed	1.00 5.00	0.04	0.0					No No
E21 Exposed floor (inv				K1 - Default	5.37	0.32	0.3					No
P5 Party wall - Roof (ii E24 Eaves (insulation				endently assessed K1 - Default	13.96 2.09	0.10 0.15	0.1 0.1		Calculate			No No
Y-value			(0.09					W/m²K			
18.0 Pressure Testing			,	/es								
Designed AP₅₀				1.50					m³/(h.m²	²) @ 50 F	Pa	
Property Tested?			Ī	Yes					j `	, 0		
Test Method			Ī	Blower Door					Ī			
19.0 Mechanical Ventilat	ion											
Mechanical Ventilation												
Mechanical Vent	ilation System Pres	ent		No								
20.0 Fans, Open Fireplac	es, Flues											
21.0 Fixed Cooling Syste	em			No								
22.0 Lighting												
No Fixed Lighting				No								
				Name Lighting 1	Efficacy 80.00	F	Power 15		Capa 120	i city 00	C	ount 5
				- J					.20	-		

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24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	106764	70
Fuel Type	Electricity	
SAP Code	0	
In Winter	231.75	
In Summer	192.18	
Model Name	Logic Air 8kW	
Manufacturer	Atlantic	
System Type	Heat Pump	
Controls SAP Code	2207	
Delayed Start Stat	No	
HETAS approved System	No	
Oil Pump Inside	No	
FI Case	0.00	
Flue Type	None or Unknown	
Fan Assisted Flue	No	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	No	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	
Heat Source Fuel Type Heating U		trical Fuel Factor Efficiency type
	Heat Power Ratio	
Heat source 1 None Heat source 2 None		
Heat source 3 None Heat source 4 None		
Heat source 5 None		
Heat source 5 None 28.0 Water Heating		
Heat source 5 None 28.0 Water Heating Water Heating	Main Heating 1	
Heat source 5 None 28.0 Water Heating Water Heating SAP Code	Main Heating 1	
Heat source 5 None 28.0 Water Heating Water Heating		
Heat source 5 None 28.0 Water Heating Water Heating SAP Code	901 No No	
Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2	901 No	
Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1	901 No No	
Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2	901 No No	
Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System	901 No No No No	
Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System Solar Panel	901 No No No No No No	
Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System Solar Panel Water use <= 125 litres/person/day	901 No No No No Yes	
Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System Solar Panel Water use <= 125 litres/person/day Summer Immersion	901 No No No No No No No No No N	
Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System Solar Panel Water use <= 125 litres/person/day Summer Immersion Cold Water Source	901 No No No No Yes No From header tank	
Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System Solar Panel Water use <= 125 litres/person/day Summer Immersion Cold Water Source Bath Count	901 No No No No No No No From header tank 0	
Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System Solar Panel Water use <= 125 litres/person/day Summer Immersion Cold Water Source Bath Count Supplementary Immersion	901 No No No No No No From header tank 0 No	
Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System Solar Panel Water use <= 125 litres/person/day Summer Immersion Cold Water Source Bath Count Supplementary Immersion Immersion Only Heating Hot Water	901 No No No No No No Yes No From header tank 0 No No No From Peader tank 0 No No No No No No No No No	onnected Connected To
Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System Solar Panel Water use <= 125 litres/person/day Summer Immersion Cold Water Source Bath Count Supplementary Immersion Immersion Only Heating Hot Water 28.1 Showers Description Shower Type	901 No No No No No No From header tank 0 No No	onnected Connected To

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29.0 Hot Water 0	Cylinder			Hot Water	Cylinder	г						
Cylinder Stat				Yes								
Cylinder In H	eated Space			Yes								
Independent	Time Control			Yes								
Insulation Typ	pe			Measured	Loss							
Cylinder Volu	ime			150.00						L		
Loss				2.09						kWh/da	ay	
Pipes insulati	ion			Fully insula	ated prin	nary pipewor	k					
In Airing Cupl	board			No								
31.0 Thermal Sto	ore			None								
32.0 Photovoltai	ic Unit			One Dwelli	ing							
Export Capab	ole Meter?			Yes								
Connected To	o Dwelling			No								
Diverter				No								
Battery Capa	city [kWh]			0.00								
PV Cel	ls kWp	Orientation	Elevation	Overs	hading	FGHRS	MCS	Certificate	Over Facto	shading or	MCS Certificate Reference	Panel Manufacturer
1.04		South West	4 5°	None (Or Little	No	No		1.00		Reference	
34.0 Small-scale	Hydro			None								
Electricity Ge	nerated			0.00								
Apportioned				0.00						kWh/Ye	еаг	
Connected to	dwelling's elect	tricity meter		Yes								
Electricity Ge	neration			Annual								
Jan	Feb	Mar	Apr	May	Jun	Jul	A	ug	Sep	Oct	t Nov	Dec
Recommendation Lower cost rown None Further mean		/e even higher	standards									
			T	ypical Cost		Typical sav	ings per y	ear	SAP ra		fter improvem	ent mental Impact
	Solar water	heating							0 0	y	LIIVIIOII	0 0

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Property Reference		Uni	t 3							Issued on Dat	te	05/03/2024	
Assessment Refer	rence	PV						Prop Type R	ef Te	ebby and Son (Garage		
Property		Uni	t 1, Highland	Square , Bristol									
SAP Rating					83 B		DER	2.8	8	TER		11.67	
Environmental					98 A		% DER < TE	R				75.32	
CO ₂ Emissions (t/)					0.15		DFEE	30.	77	TFEE		31.91	
Compliance Check	k				See BREL		% DFEE < TI					3.56	
% DPER < TPER					44.11		DPER	34.	30	TPER		61.38	
Assessor Details										Asses	sor ID	U367-000)1
SAP 10 WORKSHEET CALCULATION OF D	WELLING EN	MISSIONS FOR				2022)							
Ground floor Total floor area Dwelling volume	TFA = (1a	a) + (lb) + (lc))+(ld)+(le)(ln)	6	2.2900		Area (m2) 62.2900			2b) =		(1b) - (3 (4) (5)
2. Ventilation r	ate										1	m3 per hour	
Number of open of Number of open f Number of chimne Number of flues Number of flues Number of blocke Number of interm Number of passiv Number of fluele	lues ys / flues attached t attached t d chimneys ittent ext e vents	to solid fue to other hea s tract fans	el boiler	fire							3 * 10 =	0.0000 0.0000 0.0000 0.0000 0.0000 30.0000 0.0000	(6b) (6c) (6d) (6e) (6f) (7a) (7b)
Infiltration due Pressure test Pressure Test Me Measured/design Infiltration rat Number of sides	thod AP50	eys, flues a	and fans	= (6a)+(6b)	+(6c)+(6d)+(6e)+(6f)+	(6g)+(7a)+	(7b)+(7c) =			/ (5) =	es per hour 0.1926 Yes Blower Door 4.5000 0.4176	(17)
Shelter factor Infiltration rat	e adjusted	d to include	e shelter :	factor					(20) = 1 - (2)	[0.075 x 1) = (18) x			
Wind speed Wind factor Adj infilt rate	Jan 5.1000 1.2750		Mar 4.9000 1.2250			Jun 3.8000 0.9500		Aug 3.7000 0.9250		Oct 4.3000 1.0750	Nov 4.5000 1.1250		
-	0.4127			0.3560 0.5634	0.3480 0.5605			0.2994 0.5448		0.3480 0.5605			
3. Heat losses a													
Element				Gross m2		Ne	tlres	II_value	AxI	J K-	value	A x K	
Windows (Uw = 1. Exposed Floor	31)			me	ш	11	.2700 .8800	1.2448	14.028	6 4 75	0000	501 0000	(27)
Cavity Wall External Roof 1				33.7000 38.1600	11.2700	22	.4300 .1600	0.1800	14.0286 1.4184 4.0374 4.1976	4 150	.0000	3364.5000	(29a)
Total net area o Fabric heat loss Party Wall 1 Party Floor 1 Party Ceiling 1 Internal Wall 1	f external		Aum (A, m2)	30.1000		79 95 54 54	.7400		= 23.6820	70 70 40 30	.0000	6693.4000 2176.4000 1632.3000	(31) (33) (32) (32d) (32b)
Heat capacity Cm	ı = Sum(A >	k k)						(28)	(30) + (32)				
Thermal mass par List of Thermal K1 Eleme E2 Other E3 Sill E4 Jamb E20 Expo	eameter (The Bridges ent lintels esed floor	MP = Cm / The (including of (normal)	other stee		ts)			I 5 5 20	Length P: 5.5100 5.5100 0.8400 2.8900	0.0230 0.0230 0.0210 0.0160 0.1160 0.0380	To 0.1: 0.1 0.3: 0.3:	461.9689 tal 267 157 334 352	

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P3 Part E16 Cor E25 Sta E18 Par E21 Exp P5 Part	y wall - I rner (norma aggered par rty wall be cosed floor ry wall - R res (insula 6 (Sum(L x oridges	ntermediate 1) ty wall bet tween dwell (inverted) oof (insulation at cen	tween dwelli lings) ation at raf iling level	ngs (ter level) - inverted		ks of flats	3)	19. 3. 1. 5. 5.	4100 8900 5000 0000 0000 3700 9600 0940	0.1850 0.0000 0.0430 0.0360 0.0460 0.3200 0.1010 0.1500	1.55 0.00 0.15 0.03 0.23 1.71 1.41 0.31	000 005 060 000 84	
Ventilation hea		culated mor	nthly (38)m	= 0.33 x (25)m x (5)								(=-,
(38) m	Jan 30.0707	Feb 29.9008	Mar 29.7342	Apr 28.9519	May 28.8055	Jun 28.1241	Jul 28.1241	Aug 27.9979	Sep 28.3866	Oct 28.8055	Nov 29.1016	Dec 29.4112	(38)
Heat transfer c Average = Sum(3	61.1567	60.9868	60.8202	60.0379	59.8915	59.2101	59.2101	59.0839	59.4726	59.8915	60.1876	60.4972 60.0372	(39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9818	0.9791	0.9764 31	0.9638	0.9615	0.9506	0.9506	0.9485	0.9548	0.9615	0.9662	0.9712 0.9638 31	(40)
Days in mont	21	26	31	30	31	30	31	31	30	31	30	31	
4. Water heatin			s (kWh/year)										
Assumed occupan Hot water usage		showers										2.0456	(42)
Hot water usage			70.4608	67.9189	65.6414	62.4552	59.9352	62.8813	64.3630	67.5188	70.8052	73.1683	
Hot water usage	0.0000 for other 35.5788	0.0000 uses 34.2851	0.0000 32.9913	0.0000 31.6975	0.0000 30.4037	0.0000	0.0000 29.1100	0.0000 30.4037	0.0000 31.6975	0.0000 32.9913	0.0000 34.2851	0.0000 35.5788	
Average daily h				31.0373	30.4037	23.1100	23.1100	30.4037	31.0373	52.5515	04.2001	99.8608	
Daily hot water	Jan use	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte		106.3982 140.7863	103.4521 147.8309	99.6164 130.1239	96.0451 123.7639	91.5652 105.8921	89.0451 98.3975	93.2850 109.7981	96.0605 111.4254	100.5101 129.5174	105.0903	108.7471 159.7032	
Energy content Distribution lo		= 0.15 x (4	45)m 22.1746	19.5186	18.5646	15.8838	14.7596	16.4697	16.7138	19.4276	um(45)m = 21.3050	1559.4635 23.9555	(46)
Water storage 1 Store volume												150.0000	
a) If manufact Temperature f Enter (49) or (Total storage 1	actor from (54) in (55	Table 2b	actor is kno	own (kWh/d	ay):							2.0900 0.5400 1.1286	(49)
If cylinder con	34.9866	31.6008 cated solar	34.9866 r storage	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(56)
Primary loss	34.9866 23.2624	31.6008 21.0112	34.9866 23.2624	33.8580 22.5120	34.9866 23.2624	33.8580 22.5120	34.9866 23.2624	34.9866 23.2624	33.8580 22.5120	34.9866 23.2624	33.8580 22.5120	34.9866 23.2624	(59)
Combi loss Total heat requ						0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
WWHRS PV diverter	218.4408 0.0000 -0.0000	0.0000 -0.0000	206.0799 0.0000 -0.0000	0.0000 -0.0000	182.0129 0.0000 -0.0000	0.0000 -0.0000	0.0000 -0.0000	168.0471 0.0000 -0.0000	0.0000 -0.0000	187.7664 0.0000 -0.0000	198.4030 0.0000 -0.0000	217.9522 0.0000 -0.0000	(63a)
Solar input FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
Output from w/h	1 218.4408	193.3983	206.0799	186.4939	182.0129	162.2621	156.6465	168.0471				217.9522	
12Total per yea Electric shower		r)						TOTAL PE	er year (kwi	h/year) = Si	um(64)m =	2245.2985 2245	
	0.0000	0.0000	0.0000	0.0000 Tot	0.0000 al Energy us	0.0000 ed by insta	0.0000 antaneous e	0.0000 lectric show	0.0000 ver(s) (kWh	0.0000 /year) = Sur	0.0000 m(64a)m =	0.0000	
Heat gains from				88.3622	87.7507	80.3051	79.3164	83.1071	82.1450	89.6637	92.3220	99.7005	(65)
5. Internal gai	ns (see Ta	ble 5 and 5	5a)										
Metabolic gains	(Table 5)	, Watts	Mar					Aug	Sep	Oct	Nov	Dec	
(66)m Lighting gains	102.2793	102.2793	102.2793	102.2793	102.2793	102.2793	102.2793	102.2793	102.2793	102.2793			(66)
Appliances gain	s (calcula	ted in Appe	endix L, equ	ation L13	91.9748 or Ll3a), al	so see Tabl	le 5		95.0407	91.9748	95.0407	91.9748	
Cooking gains (calculated	in Appendi	ix L, equati	on L15 or		see Table 5	5					170.7992	
Pumps, fans Losses e.g. eva	0.0000	0.0000	0.0000	0.0000	33.2279 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	33.2279 0.0000	33.2279 0.0000	
	-81.8234	-81.8234			-81.8234	-81.8234	-81.8234	-81.8234	-81.8234	-81.8234	-81.8234	-81.8234	(71)
Total internal	134.2244	132.2932	128.7002	122.7253	117.9445	111.5349	106.6080	111.7031	114.0902	120.5158	128.2250	134.0060	(72)
		468.3437	450.2238	437.3676	416.9645	401.8195	385.9428	389.1837	399.3091	412.6159	435.9474	450.4639	(73)
6. Solar gains													
[Jan]				rea m2	Solar flux Table 6a W/m2	Specif	g fic data Table 6b	Specific or Tabl	FF data le 6c	Acces facto Table	or	Gains W	
Northeast			11.27	700	11.2829		0.6300	0.		0.77		38.8614	(75)
Solar gains									173.6619	96.6707	48.8977	31.7361	(83)
Total gains	497.4276	547.4471	592.7430	671.4251	731.5837	737.2369	699.7189	639.3296	572.9710	509.2866	484.8451	482.2001	

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7. Mean intern												21 0000	(OE)
Temperature du Utilisation fa						Jun	Jul	Aug.	Sep	Oct	Nov	21.0000 Dec	(85)
tau alpha util living ar	130.7027 9.7135	131.0669 9.7378	131.4258 9.7617	133.1384 9.8759	133.4638 9.8976	134.9997 10.0000	134.9997 10.0000	Aug 135.2880 10.0192	134.4039 9.9603	133.4638 9.8976	132.8072 9.8538	132.1276 9.8085	
uoii iiving ui	0.9995	0.9985	0.9931	0.9395	0.7485	0.5137	0.3723	0.4251	0.7087	0.9720	0.9980	0.9996	(86)
Living Non living 24 / 16 24 / 9	20.4499 19.4667 0 3	20.5430 19.5876 0	20.6921 19.7779 0	20.8994 20.0289 0	20.9901 20.1102 0	20.9998 20.1247 0 0	21.0000 20.1247 0	21.0000 20.1264 0	20.9955 20.1195 0	20.8655 19.9997 0 0	20.6292 19.7069 0	20.4385 19.4596 0	
16 / 9 MIT Th 2	28 20.7186 20.0985	0 20.5430 20.1008	20.6921 20.1030	0 20.8994 20.1136	20.9901 20.1155	0 20.9998 20.1247	21.0000 20.1247	0 21.0000 20.1264	0 20.9955 20.1212	0 20.8655 20.1155	20.6292 20.1116	20.5171 20.1074	
util rest of h MIT 2 Living area fr	0.9992 19.8466	0.9976 19.5876	0.9888 19.7779	0.9093 20.0289	0.6835 20.1102	0.4436 20.1247	0.2983 20.1247	0.3444 20.1264	0.6228 20.1195 fLA =	0.9505 19.9997 Living area	0.9966 19.7069	0.9994 19.5763 0.3851	(90)
MIT Temperature ad	20.1824	19.9556	20.1300	20.3642	20.4490	20.4617	20.4618	20.4629	20.4569	20.3332	20.0621	19.9386	
adjusted MIT	20.1824	19.9556	20.1300	20.3642	20.4490	20.4617	20.4618	20.4629	20.4569	20.3332	20.0621	19.9386	(93)
8. Space heati	ng require	nent											
Utilisation Useful gains Ext temp.	4.3000	Feb 0.9974 546.0045 4.9000	Mar 0.9889 586.1736 6.5000	Apr 0.9189 616.9694 8.9000	May 0.7086 518.3787 11.7000	Jun 0.4706 346.9731 14.6000	Jul 0.3268 228.6571 16.6000	Aug 0.3755 240.0418 16.4000	Sep 0.6562 375.9925 14.1000	Oct 0.9569 487.3503 10.6000	Nov 0.9965 483.1445 7.1000	Dec 0.9994 481.8990 4.2000	(95)
Heat loss rate	971.3182	918.1905	828.9780	688.2849	523.9933	347.0713	228.6592	240.0500	378.0593	582.9339	780.1574	952.1428	(97)
Space heating Space heating Solar heating	352.8461 requirement		180.6465 er year (kW	51.3471 h/year)	4.1773	0.0000	0.0000	0.0000	0.0000	71.1142	213.8493	349.8614 1473.9509	(98a)
Solar heating Space heating	0.0000 contribution	0.0000 on - total p	0.0000 per year (k	0.0000 Wh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Space heating Space heating	352.8461 requirement	250.1090 t after sol		51.3471 tion - total	4.1773 per year	0.0000 (kWh/year)	0.0000	0.0000	0.0000	71.1142 (98c)	213.8493	349.8614 1473.9509 23.6627	
9a. Energy req	ni remente		l heating e		uding micr								
Fraction of sp												0.0000	(201)
Fraction of sp					. ,	-,							\/
Efficiency of Efficiency of Efficiency of	main space	heating sys	stem 1 (in stem 2 (in	%)								1.0000 231.7456 0.0000 0.0000	(206) (207)
Efficiency of Efficiency of	main space secondary/s	heating system heating system supplementar	stem 1 (in stem 2 (in	%)	May	Jun	Jul	Aug	Sep	Oct	Nov	231.7456 0.0000	(206) (207)
Efficiency of Efficiency of Space heating	main space secondary/s Jan requirement 352.8461	heating system heating system supplementar Feb t 250.1090	stem 1 (in stem 2 (in ry heating Mar 180.6465	%) system, % Apr 51.3471	May 4.1773	Jun 0.0000	Jul 0.0000	Aug 0.0000	Sep 0.0000	Oct 71.1142	Nov 213.8493	231.7456 0.0000 0.0000	(206) (207) (208)
Efficiency of Efficiency of Space heating Space heating	Jan requirement 352.8461 efficiency 231.7456	heating symbol heatin	stem 1 (in stem 2 (in ry heating Mar 180.6465 ing system 231.7456	%) system, % Apr 51.3471 1)	-			_	_			231.7456 0.0000 0.0000 Dec	(206) (207) (208) (98)
Efficiency of Efficiency of Space heating Space heating Space heating	main space secondary/s Jan requirement 352.8461 efficiency 231.7456 fuel (main 152.2558	heating symbol heatin	stem 1 (in stem 2 (in ry heating	%) system, % Apr 51.3471 1) 231.7456 22.1567	4.1773	0.0000	0.0000	0.0000	0.0000	71.1142	213.8493	231.7456 0.0000 0.0000 Dec 349.8614	(206) (207) (208) (98) (210)
Efficiency of Efficiency of Space heating Space heating	main space secondary/s Jan requirement 352.8461 efficiency 231.7456 fuel (main 152.2558 efficiency 0.0000	heating symbol heatin	stem 1 (in stem 2 (in ry heating Mar 180.6465 ing system 231.7456 stem) 77.9503 ing system 0.0000	%) system, % Apr 51.3471 1) 231.7456 22.1567	4.1773 231.7456	0.0000	0.0000	0.0000	0.0000	71.1142 231.7456	213.8493 231.7456	231.7456 0.0000 0.0000 Dec 349.8614 231.7456	(206) (207) (208) (98) (210) (211)
Efficiency of Efficiency of Space heating Space heating Space heating Space heating	main space secondary/s Jan requirement 352.8461 efficiency 231.7456 fuel (main 152.2558 efficiency 0.0000 fuel (main 0.0000 fuel (secondary)	heating symbol heating symbol heating symplementa: Feb t 250.1090 (main heat: 231.7456 heating symbol heating s	stem 1 (in stem 2 (in stem 2 (in ry heating	%) system, % Apr 51.3471 1) 231.7456 22.1567 2) 0.0000 0.0000	4.1773 231.7456 1.8025 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 0.0000	0.0000 0.0000 0.0000 0.0000	71.1142 231.7456 30.6863 0.0000 0.0000	213.8493 231.7456 92.2776 0.0000 0.0000	231.7456 0.0000 0.0000 Dec 349.8614 231.7456 150.9679 0.0000	(206) (207) (208) (98) (210) (211) (212) (213)
Efficiency of Efficiency of Space heating Space heating Space heating Space heating Space heating Space heating	main space secondary/s Jan requirement 352.8461 efficiency 231.7456 fuel (main 152.2558 efficiency 0.0000 fuel (main 0.0000	heating symbol heatin	stem 1 (in stem 2 (in ry heating Mar 180.6465 ing system 231.7456 stem) 77.9503 ing system 0.0000 stem 2)	%) system, % Apr 51.3471 1) 231.7456 22.1567 2) 0.0000	4.1773 231.7456 1.8025 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	0.0000 0.0000 0.0000 0.0000	71.1142 231.7456 30.6863 0.0000	213.8493 231.7456 92.2776 0.0000	231.7456 0.0000 0.0000 Dec 349.8614 231.7456 150.9679 0.0000	(206) (207) (208) (98) (210) (211) (212) (213)
Efficiency of Efficiency of Space heating Space heating Space heating Space heating Space heating	main space secondary/s Jan requirement 352.8461 efficiency 231.7456 fuel (main 152.2558 efficiency 0.0000 fuel (main 0.0000 fuel (secon 0.0000	heating synheating synheating synplementa: Feb 250.1090 (main heat: 231.7456 heating syn 107.9240 (main heat: 0.0000 heating syn 0.0000 dary) 0.0000	stem 1 (in stem 2 (in stem 2 (in ry heating	%) system, % Apr 51.3471 1) 231.7456 22.1567 2) 0.0000 0.0000	4.1773 231.7456 1.8025 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 0.0000	0.0000 0.0000 0.0000 0.0000	71.1142 231.7456 30.6863 0.0000 0.0000	213.8493 231.7456 92.2776 0.0000 0.0000	231.7456 0.0000 0.0000 Dec 349.8614 231.7456 150.9679 0.0000	(206) (207) (208) (98) (210) (211) (212) (213) (215)
Efficiency of Efficiency of Space heating Space heating Space heating Space heating Space heating Space heating Water heating Water heating Efficiency of (217)m	main space secondary/s Jan requirement 352.8461 efficiency 231.7456 fuel (main 152.2558 efficiency 0.0000 fuel (main 0.0000 fuel (secon 0.0000 requirement 218.4408 water heate 192.1801	heating symbol heatin	stem 1 (in stem 2 (in ry heating Mar 180.6465 ing system 231.7456 stem) 77.9503 ing system 0.0000 stem 2) 0.0000 c.0000	%) system, % Apr 51.3471 1) 231.7456 22.1567 2) 0.0000 0.0000 0.0000	4.1773 231.7456 1.8025 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 0.0000 0.0000 0.0000 0.0000	0.0000 0.0000 0.0000 0.0000 0.0000	71.1142 231.7456 30.6863 0.0000 0.0000	213.8493 231.7456 92.2776 0.0000 0.0000	231.7456 0.0000 0.0000 Dec 349.8614 231.7456 150.9679 0.0000 0.0000	(206) (207) (208) (98) (210) (211) (212) (213) (215)
Efficiency of Efficiency of Efficiency of Space heating Space heating Space heating Space heating Space heating Space heating Water heating Water heating Efficiency of (217)m Fuel for water	main space secondary/s Jan requirement 352.8461 efficiency 231.7456 fuel (main 152.2558 efficiency 0.0000 fuel (main 0.0000 fuel (secon 0.0000 requirement 218.4408 water heatt 192.1801 heating, 1 113.6647	heating synheating synheating synheating synpplementaring synthesis (main heat: 231.7456 heating synthesis (main heat: 0.0000 heating synthesis (main heat: 0.00000 heating synthesis (main heat: 0.0000 heating synthesis (main heat: 0.	stem 1 (in stem 2 (in stem 2 (in ry heating Mar 180.6465 ing system 231.7456 stem) 77.9503 ing system 0.0000 stem 2) 0.0000 stem 2) 0.0000 100000 100000 100000 10000 10000 10000 100000 10000 10000 10000 10000 10000 10000 10000 10000 10000 10000 1	%) system, % Apr 51.3471 1) 231.7456 22.1567 2) 0.0000 0.0000 0.0000	4.1773 231.7456 1.8025 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 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 0.0000	71.1142 231.7456 30.6863 0.0000 0.0000 0.0000	213.8493 231.7456 92.2776 0.0000 0.0000 0.0000	231.7456 0.0000 0.0000 Dec 349.8614 231.7456 150.9679 0.0000 0.0000 217.9522 192.1801	(206) (207) (208) (98) (210) (211) (212) (213) (215) (64) (216) (217)
Efficiency of Efficiency of Efficiency of Efficiency of Space heating Space heating Space heating Space heating Space heating Space heating Water heating Water heating Efficiency of (217)m Fuel for water Space cooling (221)m	main space secondary/s Jan requirement 352.8461 efficiency 231.7456 fuel (main 152.2558 efficiency 0.0000 fuel (main 0.0000 requirement 218.4408 water heate 192.1801 heating, 1 113.6647 fuel requir 0.0000	heating synheating synheating synheating synpplementa: Feb 250.1090 (main heat: 231.7456 heating syn 107.9240 (main heat: 0.0000 heating syn 0.0000 to 193.3983 er 192.1801 kWh/month 100.6339 rement 0.0000	stem 1 (in stem 2 (in stem 2 (in ry heating	%) system, % Apr 51.3471 1) 231.7456 22.1567 2) 0.0000 0.0000 0.0000 186.4939 192.1801 97.0412 0.0000	4.1773 231.7456 1.8025 0.0000 0.0000 0.0000 182.0129 192.1801 94.7096 0.0000	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 162.2621 192.1801 84.4323 0.0000	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 156.6465 192.1801 81.5103 0.0000	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 168.0471 192.1801 87.4426 0.0000	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 167.7954 192.1801 87.3116 0.0000	71.1142 231.7456 30.6863 0.0000 0.0000 0.0000 187.7664 192.1801 97.7034 0.0000	213.8493 231.7456 92.2776 0.0000 0.0000 0.0000 198.4030 192.1801 103.2381 0.0000	231.7456 0.0000 0.0000 Dec 349.8614 231.7456 150.9679 0.0000 0.0000 217.9522 192.1801 192.1801 113.4104 0.0000	(206) (207) (208) (98) (210) (211) (212) (213) (215) (64) (216) (217) (219) (221)
Efficiency of Efficiency of Efficiency of Efficiency of Space heating Space heating Space heating Space heating Space heating Space heating Water heating Water heating Efficiency of (217) m Fuel for water Space cooling (221) m Pumps and Fa Lighting	main space secondary/s Jan requirement 352.8461 efficiency 231.7456 fuel (main 152.2558 efficiency 0.0000 fuel (secon 0.0000 fuel (secon 0.0000 requirement 218.4408 water heatt 192.1801 heating, 113.6647 fuel require 0.0000 0.0000 0.0000 0.01442	heating symbol heating symbol heating symplementa: Feb t 250.1090 (main heat: 231.7456 heating symbol heating	stem 1 (in stem 2 (in stem 2 (in ry heating war l80.6465 ing system 231.7456 stem) 77.9503 ing system 0.0000 o.0000 stem 2) 0.0000 c.0000 l92.1801 l07.2327 0.0000 0.0000 l4.5507	%) system, % Apr 51.3471 1) 231.7456 22.1567 2) 0.0000 0.0000 186.4939 192.1801 97.0412 0.0000 0.0000 10.6604	4.1773 231.7456 1.8025 0.0000 0.0000 0.0000 182.0129 192.1801 94.7096 0.0000 0.0000 0.2344	0.0000 0.0000 0.0000 0.0000 0.0000 162.2621 192.1801 84.4323 0.0000	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 156.6465 192.1801 81.5103	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 168.0471 192.1801 87.4426	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 167.7954 192.1801 87.3116	71.1142 231.7456 30.6863 0.0000 0.0000 0.0000 187.7664 192.1801 97.7034	213.8493 231.7456 92.2776 0.0000 0.0000 0.0000 198.4030 192.1801 103.2381	231.7456 0.0000 0.0000 Dec 349.8614 231.7456 150.9679 0.0000 0.0000 217.9522 192.1801 192.1801 113.4104	(206) (207) (208) (98) (210) (211) (212) (213) (215) (64) (216) (217) (219) (221) (231)
Efficiency of Efficiency of Efficiency of Efficiency of Space heating Space heating Space heating Space heating Space heating Space heating Water heating Water heating Efficiency of (217)m Fuel for water Space cooling (221)m Pumps and Fa Lighting Electricity ge (233a)m	main space secondary/s Jan requirement 352.8461 efficiency 231.7456 fuel (main 152.2558 efficiency 0.0000 fuel (secondary 0.0000 fuel (se	heating symbol heating symbol heating symplementa: Feb t 250.1090 (main heat: 231.7456 heating symbol heating	stem 1 (in stem 2 (in stem 2 (in ry heating mar law.6465 ing system 231.7456 stem) 77.9503 ing system 2.00000 co.0000	%) system, %	4.1773 231.7456 1.8025 0.0000 0.0000 0.0000 182.0129 192.1801 94.7096 0.0000 0.2000 8.2344	0.0000 0.0000 0.0000 0.0000 0.0000 162.2621 192.1801 84.4323 0.0000 6.7276	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 156.6465 192.1801 81.5103 0.0000 0.0000	0.0000 0.0000 0.0000 0.0000 0.0000 168.0471 192.1801 87.4426 0.0000	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 167.7954 192.1801 87.3116 0.0000 0.0000	71.1142 231.7456 30.6863 0.0000 0.0000 187.7664 192.1801 97.7034 0.0000	213.8493 231.7456 92.2776 0.0000 0.0000 198.4030 192.1801 103.2381 0.0000 0.0000	231.7456 0.0000 0.0000 Dec 349.8614 231.7456 150.9679 0.0000 0.0000 217.9522 192.1801 192.1801 113.4104 0.0000 0.0000	(206) (207) (208) (98) (210) (211) (212) (213) (215) (64) (216) (217) (219) (221) (231) (232)
Efficiency of Efficiency of Efficiency of Efficiency of Space heating Space heating Space heating Space heating Space heating Space heating Water heating Water heating Efficiency of (217)m Fuel for water Space cooling (221)m Pumps and Fa Lighting Electricity ge	main space secondary/s Jan requirement 352.8461 efficiency 231.7456 fuel (main 152.2558 efficiency 0.0000 fuel (main 0.0000 fuel (secon 0.0000 requirement 218.4408 water heatt 192.1801 heating, 1; 113.6647 fuel requirement 113.6647 fuel requirement 200.0000 20.1442 uerated by -19.9262	heating synheating synheating synheating synpplementa: Feb 250.1090 (main heat: 231.7456 heating sy: 107.9240 (main heat: 0.0000 heating sy: 0.0	stem 1 (in stem 2 (in ry heating 2 (in ry heating Mar 180.6465 ing system 231.7456 stem) 77.9503 ing system 0.0000 0.0000 206.0799 192.1801 107.2327 0.0000 0.0000 14.5507 dix M) (neg -46.0646 nes (Append 0.0000 0.0000 1	%) system, %	4.1773 231.7456 1.8025 0.0000 0.0000 0.0000 182.0129 192.1801 94.7096 0.0000 0.0000 8.2344 1ty) -60.2298 zive quantii 0.0000	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 162.2621 192.1801 84.4323 0.0000 0.0000 6.7276 -57.1594	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 156.6465 192.1801 81.5103 0.0000 0.0000 7.5117	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 168.0471 192.1801 87.4426 0.0000 0.0000 9.7640	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 167.7954 192.1801 87.3116 0.0000 0.0000 12.6825	71.1142 231.7456 30.6863 0.0000 0.0000 0.0000 187.7664 192.1801 97.7034 0.0000 0.0000 16.6401	213.8493 231.7456 92.2776 0.0000 0.0000 198.4030 192.1801 103.2381 0.0000 0.0000 18.7950	231.7456 0.0000 0.0000 Dec 349.8614 231.7456 150.9679 0.0000 0.0000 217.9522 192.1801 192.1801 113.4104 0.0000 0.0000 20.7040	(206) (207) (208) (98) (210) (211) (212) (213) (215) (64) (216) (217) (219) (221) (231) (232) (233a)
Efficiency of Efficiency of Efficiency of Efficiency of Space heating Space heating Space heating Space heating Space heating Space heating Water heating Water heating Efficiency of (217)m Fuel for water Space cooling (221)m Pumps and Fa Lighting Electricity ge (233a)m Electricity ge (234a)m	main space secondary/s Jan requirement 352.8461 efficiency 231.7456 fuel (main 152.2558 efficiency 0.0000 fuel (main 0.0000 fuel (secon 0.0000 requirement 218.4408 water heate 192.1801 heating, 1 113.6647 fuel requirement 200000 20.1442 enerated by -19.9262 enerated by 0.0000 e	heating synheating synheating synheating synyplementa: Feb t 250.1090 (main heat: 231.7456 heating synheating synheatin	stem 1 (in stem 2 (in	%) system, % Apr 51.3471 1) 231.7456 22.1567 2) 0.0000 0.0000 186.4939 192.1801 97.0412 0.0000 10.6604 ative quanti -53.8770 ix M) (negat 0.0000 tors (Append 0.0000 by micro-CHF	4.1773 231.7456 1.8025 0.0000 0.0000 0.0000 182.0129 192.1801 94.7096 0.0000 8.2344 tty) -60.2298 tive quanti 0.0000 gix M) (neg 0.0000	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 162.2621 192.1801 84.4323 0.0000 6.7276 -57.1594 .ty) 0.0000 jative quant: 0.0000 (x)) (negatire quant:	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 156.6465 192.1801 81.5103 0.0000 7.5117 -56.3107 0.0000 ity) 0.0000 ve if net gr	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 168.0471 192.1801 87.4426 0.0000 9.7640 -52.0310 0.0000 eneration)	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 167.7954 192.1801 87.3116 0.0000 12.6825 -44.2184 0.0000 0.0000	71.1142 231.7456 30.6863 0.0000 0.0000 187.7664 192.1801 97.7034 0.0000 0.0000 16.6401 -35.0746 0.0000 0.0000	213.8493 231.7456 92.2776 0.0000 0.0000 198.4030 192.1801 103.2381 0.0000 0.0000 18.7950 -22.4734 0.0000 0.0000	231.7456 0.0000 0.0000 Dec 349.8614 231.7456 150.9679 0.0000 0.0000 217.9522 192.1801 192.1801 113.4104 0.0000 0.0000 20.77040 -16.9844	(206) (207) (208) (98) (210) (211) (212) (213) (215) (64) (217) (219) (221) (231) (232) (233a) (234a)
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Efficiency of Efficiency of Efficiency of Efficiency of Efficiency of Space heating Space heating Space heating Space heating Space heating Space heating Water heating Efficiency of (217)m Fuel for water Space cooling (221)m Pumps and Fa Lighting Electricity ge (233a)m Electricity ge (235a)m Electricity us (235c)m Electricity ge (233b)m Electricity ge (233b)m Electricity ge (235b)m Electricity ge (235b)m Electricity ge (235b)m Electricity us (235d)m Annual totals Space heating	main space secondary/s Jan requirement 352.8461 efficiency 231.7456 fuel (main 152.2558 efficiency 0.0000 fuel (main 0.0000 fuel (secon 0.0000 fuel (secon 0.0000 fuel (secon 0.0000 fuel 138.4408 water heatt 192.1801 fuel requirement 136.4408 fuel requirement 192.1801 fuel requirement 192.1801 fuel requirement 192.1801 fuel requirement 192.1801 fuel requirement 199.9262 fuel reduction 199	heating synheating synheating synheating synyphementa: Feb t 250.1090 (main heat: 231.7456 heating synheating synheatin	stem 1 (in stem 2 (in stem 2 (in ry heating war leads to stem) Mar 180.6465 ing system 231.7456 stem) 77.9503 ing system 0.0000 206.0799 192.1801 107.2327 0.0000 0.0000 14.5507 dix M) (neg -46.0646 nes (Append 0.0000 tric genera 0.0000 dix M) (neg -23.6671 nes (Append 0.0000 tric genera 0.0000 dric genera 0.0000 dric genera 0.0000 generated i 0.0000 tric genera 0.0000	%) system, % Apr 51.3471 1) 231.7456 22.1567 2) 0.0000 0.0000 0.0000 186.4939 192.1801 97.0412 0.0000 10.6604 artive quanti -53.8770 ix M) (negat 0.0000 by micro-CHE 0.0000 by micro-CHE 1.38.7053 ix M) (negat 0.0000 tors (Append 0.0000 by micro-CHE 0.0000	4.1773 231.7456 1.8025 0.0000 0.0000 0.0000 182.0129 192.1801 94.7096 0.0000 8.2344 tty) -60.2298 cive quanti 0.0000 cix M) (nec 0.0000 c) (Appendix M) (nec 0.0000) c) (Appendix M) (nec	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 162.2621 192.1801 84.4323 0.0000 6.7276 -57.1594 tty) 0.0000 (x N) (negative quant: 0.0000 -54.1923 tty) 0.0000 jative quant: 0.0000 (x N) (negative quant: 0.0000 (x N) (negative quant: 0.0000)	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 156.6465 192.1801 81.5103 0.0000 7.5117 -56.3107 0.0000 ity) 0.0000 ve if net gr 0.0000 -53.7089 0.0000 ve if net gr 0.0000 ve if net gr	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 168.0471 192.1801 87.4426 0.0000 9.7640 -52.0310 0.0000 eneration) 0.0000 -44.6225 0.0000 0.0000 eneration)	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 167.7954 192.1801 87.3116 0.0000 12.6825 -44.2184 0.0000 0.0000 0.0000 -32.1392 0.0000 0.0000	71.1142 231.7456 30.6863 0.0000 0.0000 187.7664 192.1801 97.7034 0.0000 16.6401 -35.0746 0.0000 0.0000 -17.5448 0.0000 0.0000	213.8493 231.7456 92.2776 0.0000 0.0000 198.4030 192.1801 103.2381 0.0000 0.0000 18.7950 -22.4734 0.0000 0.0000 -6.9782 0.0000 0.0000	231.7456 0.0000 0.0000 Dec 349.8614 231.7456 150.9679 0.0000 0.0000 217.9522 192.1801 192.1801 113.4104 0.0000 0.0000 -16.9844 0.0000 0.0000 -3.8496 0.0000 0.0000 0.0000 0.0000 0.0000	(206) (207) (208) (98) (210) (211) (212) (213) (215) (215) (217) (217) (221) (231) (232) (233a) (235a) (235a) (235a) (235b) (235b) (235d) (211) (211) (212) (213)

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Electricity for lighting (calculated in Appendix L)			162.5750 (232)
Energy saving/generation technologies (Appendices M .N and O)			102.3730 (232)
PV generation Wind generation Hydro-electric generation (Appendix N)			-839.3408 (233) 0.0000 (234) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) Appendix Q - special features			0.0000 (235)
Energy saved or generated Energy used Total delivered energy for all uses			-0.0000 (236) 0.0000 (237) 1127.5859 (238)
1001 dillitia thing, 171 dil abio			112.10003 (200)
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP	Energy	Emission factor	Emissions
Space heating - main system 1	kWh/year 636.0211	kg CO2/kWh	kg CO2/year
Total CO2 associated with community systems Water heating (other fuel)	1168.3306		0.0000 (373)
Space and water heating Pumps, fans and electric keep-hot	0.0000		
Energy for lighting	162.5750	0.1443	23.4646 (268)
Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported	-494.5181 -344.8227		
Total CO2, kg/year	-344.0227	0.1240	-108.7980 (269) 179.2014 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.8800 (273)
13a. Primary energy - Individual heating systems including micro-CHP			
		Primary energy factor kg CO2/kWh	
Space heating - main system 1 Total CO2 associated with community systems	636.0211		
Water heating (other fuel) Space and water heating	1168.3306	1.5203	
Pumps, fans and electric keep-hot Energy for lighting	0.0000 162.5750		0.0000 (281)
Energy saving/generation technologies			
PV Unit electricity used in dwelling PV Unit electricity exported Total	-494.5181 -344.8227		
Total Primary energy kWh/year Dwelling Primary energy Rate (DPER)			2136.8043 (286) 34.3000 (287)
			(2017)
032 10 Marketing Pag V. P. 114 (3- P. 14-4) (11-4)			
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS			
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)			
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SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)			
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS	Area		Volume
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS 1. Overall dwelling characteristics Ground floor		(m)	(2b) = 155.7250 (1b) - (3b)
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS 1. Overall dwelling characteristics	Area (m2) 62.2900	(m)	(2b) = (m3) (2b) = 155.7250 (1b) - (3b) (4)
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS 1. Overall dwelling characteristics Ground floor Total floor area TFA = (la)+(lb)+(lc)+(ld)+(le)(ln) 62.2900	Area (m2) 62.2900	(lb) x 2.5000	(2b) = (m3) (2b) = 155.7250 (1b) - (3b) (4)
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS 1. Overall dwelling characteristics Ground floor Total floor area TFA = (la)+(lb)+(lc)+(ld)+(le)(ln) 62.2900 Dwelling volume	Area (m2) 62.2900	(lb) x 2.5000	(2b) = (m3) (2b) = 155.7250 (1b) - (3b) (4)
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS 1. Overall dwelling characteristics Ground floor Total floor area TFA = (la)+(lb)+(lc)+(ld)+(le)(ln) 62.2900	Area (m2) 62.2900	(lb) x 2.5000	(2b) = 155.7250 (1b) - (3b) (3n) = 155.7250 (5)
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS 1. Overall dwelling characteristics Ground floor Total floor area TFA = (la)+(lb)+(lc)+(ld)+(le)(ln) 62.2900 Dwelling volume 2. Ventilation rate	Area (m2) 62.2900	(lb) x 2.5000	(2b) = 155.7250 (1b) - (3b) (3n) = 155.7250 (5)
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS 1. Overall dwelling characteristics Ground floor Total floor area TFA = (la)+(lb)+(lc)+(ld)+(le)(ln) 62.2900 Dwelling volume Number of open chimneys Number of open flues	Area (m2) 62.2900	(lb) x 2.5000	(2b) = 155.7250 (1b) - (3b) (4)(3n) = 155.7250 (5) m3 per hour 0 * 80 = 0.0000 (6a) 0 * 20 = 0.0000 (6b)
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS 1. Overall dwelling characteristics Ground floor Total floor area TFA = (la)+(lb)+(lc)+(ld)+(le)(ln) 62.2900 Dwelling volume 2. Ventilation rate Number of open chimneys	Area (m2) 62.2900	(lb) x 2.5000	(2b) = 155.7250 (1b) - (3b) ((3n) = 155.7250 (5) m3 per hour 0 * 80 = 0.0000 (6a)
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS 1. Overall dwelling characteristics Ground floor Total floor area TFA = (la)+(lb)+(lc)+(ld)+(le)(ln) 62.2900 Dwelling volume Number of open chimneys Number of open flues Number of open flues Number of folimneys flues attached to closed fire Number of flues attached to solid fuel boiler	Area (m2) 62.2900	(lb) x 2.5000	(m3) (2b) = 155.7250 (lb) - (3b) (4) (3n) = 155.7250 (5) m3 per hour 0 * 80 = 0.0000 (6a) 0 * 20 = 0.0000 (6b) 0 * 10 = 0.0000 (6c) 0 * 20 = 0.0000 (6c) 0 * 20 = 0.0000 (6d)
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS 1. Overall dwelling characteristics Ground floor Total floor area TFA = (la)+(lb)+(lc)+(ld)+(le)(ln) 62.2900 Dwelling volume 2. Ventilation rate Number of open chimneys Number of chimneys / flues attached to closed fire Number of flues attached to solid fuel boiler Number of flues attached to other heater Number of blocked chimneys	Area (m2) 62.2900	(lb) x 2.5000	(2b) = 155.7250 (1b) - (3b) ((3n) = 155.7250 (5) m3 per hour 0 * 80 = 0.0000 (6a) 0 * 20 = 0.0000 (6b) 0 * 10 = 0.0000 (6c) 0 * 20 = 0.0000 (6c)
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS 1. Overall dwelling characteristics Ground floor Total floor area TFA = (la)+(lb)+(lc)+(ld)+(le)(ln) 62.2900 Dwelling volume 2. Ventilation rate Number of open chimneys Number of open flues Number of chimneys / flues attached to closed fire Number of flues attached to solid fuel boiler Number of flues attached to other heater Number of passive vents Number of passive vents Number of passive vents Number of flueless gas fires	Area (m2) 62.2900	(m) (1b) x 2.5000 3a)+(3b)+(3c)+(3d)+(3e)	(2b) = 155.7250 (lb) - (3b) (1d) - (3b) (1
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS 1. Overall dwelling characteristics Ground floor Total floor area TFA = (la)+(lb)+(lc)+(ld)+(le)(ln) 62.2900 Dwelling volume Number of open chimneys Number of open flues Number of flues attached to solid fuel boiler Number of flues attached to solid fuel boiler Number of flues attached to the heater Number of flues attached to the heater Number of passive vents Number of passive vents Number of flueless gas fires Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)- Pressure test	Area (m2) 62.2900	(m) (1b) x 2.5000 3a)+(3b)+(3c)+(3d)+(3e)	(2b) = 155.7250 (1b) - (3b) (1d) - (3b) (1
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS 1. Overall dwelling characteristics Ground floor Total floor area TFA = (la)+(lb)+(lc)+(ld)+(le)(ln) 62.2900 Dwelling volume Number of open chimneys Number of open flues Number of flues attached to closed fire Number of flues attached to other heater Number of flues attached to other heater Number of intermittent extract fans Number of passive vents Number of flueless gas fires Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)- Pressure test Pressure test Method Measured/design AP50	Area (m2) 62.2900	(m) (1b) x 2.5000 3a)+(3b)+(3c)+(3d)+(3e)	(2b) = 155.7250 (lb) - (3b) ((3n) = 155.7250 (5) m3 per hour 0 * 80 = 0.0000 (6a) 0 * 20 = 0.0000 (6b) 0 * 10 = 0.0000 (6c) 0 * 20 = 0.0000 (6d) 0 * 35 = 0.0000 (6d) 0 * 35 = 0.0000 (6f) 2 * 10 = 20.0000 (7a) 0 * 10 = 0.0000 (7b) 0 * 40 = 0.0000 (7c) Air changes per hour 0 / (5) = 0.1284 (8) Yes Blower Door 5.0000 (17)
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS 1. Overall dwelling characteristics Ground floor Total floor area TFA = (la)+(lb)+(lc)+(ld)+(le)(ln) 62.2900 Dwelling volume 8. Ventilation rate 2. Ventilation rate Number of open chimneys Number of chimneys / flues attached to closed fire Number of flues attached to solid fuel boiler Number of flues attached to other heater Number of blocked chimneys Number of intermittent extract fans Number of passive vents Number of flueless gas fires Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)- Pressure test Pressure Test Method	Area (m2) 62.2900	(m) (1b) x 2.5000 3a)+(3b)+(3c)+(3d)+(3e)	(2b) = 155.7250 (1b) - (3b) (1d) - (3b) (1
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS 1. Overall dwelling characteristics 1. Overall floor Total floor area TFA = (la)+(lb)+(lc)+(ld)+(le)(ln) 62.2900 Dwelling volume 2. Ventilation rate Number of open chimneys Number of chimneys / flues attached to closed fire Number of flues attached to oblid fuel boiler Number of flues attached to other heater Number of blocked chimneys Number of intermittent extract fans Number of passive vents Number of flueless gas fires Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)-Pressure test Pressure Test Method Measured/design AP50 Infiltration rate	Area (m2) 62.2900	(m) (1b) x 2.5000 3a)+(3b)+(3c)+(3d)+(3e)	(2b) = 155.7250 (1b) - (3b) (1d) - (3b) (1
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS 1. Overall dwelling characteristics 1. Overall floor Total floor area TFA = (la)+(lb)+(lc)+(ld)+(le)(ln) 62.2900 Dwelling volume Number of open chimneys Number of open flues Number of chimneys / flues attached to closed fire Number of flues attached to other heater Number of flues attached to other heater Number of intermittent extract fans Number of passive vents Number of flueless gas fires Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)- Pressure test Pressure Test Method Measured/design AP50 Infiltration rate Number of sides sheltered Shelter factor Infiltration rate adjusted to include shelter factor	Area (m2) 62.2900 (:	(m) (1b) x 2.5000 3a)+(3b)+(3c)+(3d)+(3e) 20.0000 (20) = 1 - [0.075 x (21) = (18) Sep Oct	(2b) = 155.7250 (1b) - (3b) (1d) - (3b) (1
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS 1. Overall dwelling characteristics Ground floor Total floor area TFA = (la)+(lb)+(lc)+(ld)+(le)(ln) 62.2900 Dwelling volume 2. Ventilation rate Number of open chimneys Number of open flues Number of open flues Number of flues attached to solid fuel boiler Number of flues attached to solid fuel boiler Number of blocked chimneys Number of intermittent extract fans Number of passive vents Number of passive vents Number of flueless gas fires Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)- Pressure test Pressure Test Method Measured/design AP50 Infiltration rate Number of sides sheltered Shelter factor Infiltration rate adjusted to include shelter factor Jan Feb Mar Apr May Jun Wind speed 5.1000 5.0000 4.9000 4.4000 4.3000 3.8000 in Mind factor 1.2750 1.2500 1.2000 1.0000 0.9500 in 0.9500 0.9500 in 0.9500 0.9500 in 0.9500 0.9500 in 0.9	Area (m2) 62.2900 (:	(m) (1b) x 2.5000 3a)+(3b)+(3c)+(3d)+(3e) 20.0000 (20) = 1 - [0.075 x (21) = (18) Sep Oct 4.0000 4.3000	(2b) = 155.7250 (1b) - (3b) (4)(3n) = 155.7250 (5) m3 per hour 0 * 80 = 0.0000 (6a) 0 * 20 = 0.0000 (6b) 0 * 20 = 0.0000 (6c) 0 * 20 = 0.0000 (7a) 0 * 35 = 0.0000 (7a) 0 * 40 = 0.0000 (7b) 0 * 40 = 0.0000 (7c) Air changes per hour 0 / (5) = 0.1284 (8) Yes Blower Door 5.0000 (17) 0.3784 (18) 3 (19) 4 (19)] = 0.7750 (20) x (20) = 0.2933 (21) Nov Dec 4.5000 Dec 4.5000 (22)
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS 1. Overall dwelling characteristics Ground floor Total floor area TFA = (la)+(lb)+(lc)+(ld)+(le)(ln) 62.2900 Dwelling volume Number of open chimneys Number of open flues Number of chimneys / flues attached to closed fire Number of flues attached to solid fuel boiler Number of flues attached to other heater Number of inderwittent extract fans Number of intermittent extract fans Number of passive vents Number of flueless gas fires Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)- Fressure test Fressure Test Method Measured/design AFS0 Infiltration rate Number of sides sheltered Shelter factor Infiltration rate adjusted to include shelter factor Van Feb Mar Apr May Jun Wind speed 5.1000 5.0000 4.9000 4.4000 4.3000 3.8000 Wind factor 1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 Wind fadj infilt rate	Area (m2) 62.2900 (;	(m) (1b) x 2.5000 3a)+(3b)+(3c)+(3d)+(3e) 20.0000 (20) = 1 - [0.075; (21) = (18) Sep Oct 4.0000 4.3000 1.0000 1.0750	(2b) = 155.7250 (1b) - (3b) (1d) - (3b) (1

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Effective ac 0.5699 0.5672 0.5645 0.5520 0.5497 0.5388 0.5388 0.5368 0.5430 0.5497 0.5544 0.5594 (25)

3. Heat losses and heat 			Gross	Openings		tArea	U-value	Ах	п	K-value	AxK	
	1 201		m2	m2		m2	W/m2K	W	/K	kJ/m2K	kJ/K	
TER Opening Type (Uw : Exposed Floor	= 1.20)				7	.2700 .8800	1.1450 0.1300	12.90 1.02	44			(27
Cavity Wall External Roof 1			33.7000 38.1600	11.2700		.4300 .1600	0.1800 0.1100	4.03 4.19				(29
Total net area of exte Fabric heat loss, W/K					79	.7400	30) + (32) =	= 22.16	40			(31
Party Wall 1	- 544 (11 11	0,			95	.6200	0.0000	0.00				(32
hermal mass parameter		/ TFA) in kJ/	m2K								470.7038	(35
ist of Thermal Bridge Kl Element									Psi-value	Tot		
E2 Other linte	els (includi	ng other stee	l lintels)					.5100 .5100	0.0500 0.0500	0.27 0.27		
E4 Jamb E20 Exposed fl	loor (normal	,						.8400 .8900	0.0500 0.3200	1.04		
E7 Party floor	r between dw	ellings (in b		ats)			28	.3700 .4100	0.0700	1.98	59	
P7 Party Wall P3 Party wall	 Intermedi 			ngs (in bloc	ks of flat	3)	19.	.8900	0.0000	0.00	00	
E16 Corner (no E25 Staggered	party wall		ings				1.	.5000 .0000	0.0900 0.0600	0.31 0.06		
E18 Party wall E21 Exposed f1								.0000 .3700	0.0600 0.3200	0.30 1.71		
P5 Party wall E24 Eaves (ins	- Roof (ins	ulation at ra		١			13.	.9600 .0940	0.0800 0.2400	1.11	68	
Thermal bridges (Sum()							-	.0540	0.2400		9.8621	
Point Thermal bridges Cotal fabric heat loss	3							(33) + (36)	(36a) = + (36a) =	0.0000 32.0260	
Ventilation heat loss											_	
Jan (38)m 29.287	Feb 75 29.148	Mar 0 29.0112	Apr 28.3689	May 28.2487	Jun 27.6893	Jul 27.6893	Aug 27.5857	Sep 27.9048	Oct 28.2487	Nov 28.4918	Dec 28.7460	(38
Heat transfer coeff 61.31	35 61.174	0 61.0373	60.3949	60.2748	59.7153	59.7153	59.6117	59.9308	60.2748		60.7720	
Average = Sum(39)m / 1		. 02.0070	00.0049	00.2740	05.7100	03.7100	03.0117	03.3000	55.2740	00.01/3	60.3944	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct 0.9676	Nov	Dec	
HLP (0.984 HLP (average)			0.9696	0.9676	0.9587	0.9587	0.9570	0.9621			0.9756 0.9696	
Days in mont	31 2	8 31	30	31	30	31	31	30	31	30	31	
. Water heating energ	gy requireme	nts (kWh/year)									
l. Water heating energy 	gy requireme	nts (kWh/year)								2.0456	(42
L. Water heating energy Assumed occupancy Not water usage for mi 75.132	gy requireme ixer showers 74.003	nts (kWh/year)				64.4565	66.2464	69.0281	72.2437	2.0456 74.8447	
ssumed occupancy lot water usage for m 75.13 dot water usage for ba 0.000	gy requirements ixer showers 25 74.003 aths 00 0.000	nts (kWh/year 5 5 72.3581)					66.2464	69.0281			(42
I. Water heating energy issumed occupancy lot water usage for m: 75.13; lot water usage for b: 0.00 lot water usage for o: 35.57(gy requireme ixer showers 25 74.003 aths 00 0.000 ther uses 88 34.285	nts (kWh/year 5 72.3581 0 0.0000 1 32.9913	69.2101	66.8870	64.2962	62.8236	64.4565			0.0000	74.8447 0.0000 35.5788	(42
I. Water heating energiassumed occupancy iot water usage for mr. Total water usage for br. 0.000 iot water usage for br. 35.570 werage daily hot water	ixer showers 25 74.003 aths 00 0.000 ther uses 88 34.285 er use (litr	nts (kWh/year 5 72.3581 0 0.0000 1 32.9913 es/day)	69.2101 0.0000 31.6975	66.8870 0.0000 30.4037	64.2962 0.0000 29.1100	62.8236 0.0000 29.1100	64.4565 0.0000 30.4037	0.0000 31.6975	0.0000 32.9913	0.0000 34.2851	74.8447 0.0000 35.5788 101.6141	(42
ssumed occupancy iot water usage for m 75.13: dot water usage for b 0.00 iot water usage for o 35.57 average daily hot water use	gy requirements for showers 25 74.003 aths 00 0.000 ther uses 34.285 er use (litr	nts (kWh/year 5 72.3581 0 0.0000 1 32.9913 es/day) Mar	69.2101 0.0000 31.6975	66.8870 0.0000 30.4037 May	64.2962 0.0000 29.1100 Jun	62.8236 0.0000 29.1100 Jul	64.4565 0.0000 30.4037 Aug	0.0000 31.6975 Sep	0.0000 32.9913 Oct	0.0000 34.2851 Nov	74.8447 0.0000 35.5788 101.6141 Dec	(42 (42 (42 (43
ssumed occupancy iot water usage for m 75.13: dot water usage for b 0.00 iot water usage for o 35.57 average daily hot water use	yy requireme- 25 74.003 thbs 00 0.000 ther uses 34.285 er use (litr Feb	nts (kWh/year 5 72.3581 0 0.0000 1 32.9913 es/day) Mar 5 105.3494	69.2101 0.0000 31.6975	66.8870 0.0000 30.4037	64.2962 0.0000 29.1100	62.8236 0.0000 29.1100	64.4565 0.0000 30.4037	0.0000 31.6975	0.0000 32.9913 Oct 102.0194 138.4393	0.0000 34.2851 Nov 106.5288 151.7698	74.8447 0.0000 35.5788 101.6141 Dec 110.4235 172.8966	(42 (42 (42 (43 (43 (44 (45
I. Water heating energy issumed occupancy iot water usage for mr 75.13. Iot water usage for br 0.00 iot water usage for br 35.57 iverage daily hot water use 110.71: Inergy contet (annual Chergy contett (annual	yy requireme- ixer showers 25 74.003 aths 0 0.000 ther uses 38 34.25 er use (litr Feb 14 108.288 98 154.201	nts (kWh/year 5 72.3581 0 0.0000 1 32.9913 es/day) Mar 5 105.3494 4 161.9182	69.2101 0.0000 31.6975 Apr 100.9076	66.8870 0.0000 30.4037 May 97.2907	64.2962 0.0000 29.1100 Jun 93.4062	62.8236 0.0000 29.1100 Jul 91.9336	64.4565 0.0000 30.4037 Aug 94.8602	0.0000 31.6975 Sep 97.9439	0.0000 32.9913 Oct 102.0194 138.4393	0.0000 34.2851 Nov 106.5288	74.8447 0.0000 35.5788 101.6141 Dec 110.4235 172.8966	(42 (42 (42 (43 (43 (44 (45
I. Water heating energy issumed occupancy for water usage for minute of the state o	ixer showers 74.003 at hs 25 74.003 at hs 20 0.000 ther uses 88 34.285 er use (litr Feb 14 108.288 98 154.201 16) m = 0.15 x	nts (kWh/year 5 72.3581 0 0.0000 1 32.9913 es/day) Mar 5 105.3494 4 161.9182	69.2101 0.0000 31.6975 Apr 100.9076	66.8870 0.0000 30.4037 May 97.2907	64.2962 0.0000 29.1100 Jun 93.4062	62.8236 0.0000 29.1100 Jul 91.9336	64.4565 0.0000 30.4037 Aug 94.8602	0.0000 31.6975 Sep 97.9439	0.0000 32.9913 Oct 102.0194 138.4393	0.0000 34.2851 Nov 106.5288 151.7698 Sum(45)m =	74.8447 0.0000 35.5788 101.6141 Dec 110.4235 172.8966	(42 (42 (42 (43 (43 (44 (45
I. Water heating energy Issumed occupancy Not water usage for m: 75.13: Not water usage for m: 0.00 Not water usage for on 35.57: Neverage daily hot water Usage for on 10.71: Chergy conte 175.33: Chergy content (annual Distribution loss (26.30) Nater storage loss: Store volume	gy requirements showers 25 74.003 at hs 20 0.000 there uses 38 34.285 er use (litr Feb 14 108.288 98 154.201 l) 6) m = 0.15 x 10 23.130	nts (kWh/year 	69.2101 0.0000 31.6975 Apr 100.9076 138.1375 20.7206	66.8870 0.0000 30.4037 May 97.2907 130.9720	64.2962 0.0000 29.1100 Jun 93.4062 114.8538	62.8236 0.0000 29.1100 Jul 91.9336 111.1857	64.4565 0.0000 30.4037 Aug 94.8602 117.4568	0.0000 31.6975 Sep 97.9439 120.7747	0.0000 32.9913 Oct 102.0194 138.4393 Total = 1	0.0000 34.2851 Nov 106.5288 151.7698 Sum(45)m =	74.8447 0.0000 35.5788 101.6141 Dec 110.4235 172.8966 1687.9455 25.9345 150.0000	(42 (42 (42 (43 (43 (44 (45 (46
I. Water heating energy Issumed occupancy Not water usage for mi O.00 Not water usage for be O.00 Not water usage for be Average daily hot water Usaily hot water use 110.71: Chergy conte 175.33: Chergy content (annual Distribution loss (40 26.30: Nater storage loss: Core volume I ff manufacturer de Temperature factor:	yy requireme- ixer showers 25 74.003 aths 00 0.000 ther uses 88 34.285 er use (litr Feb 14 108.288 98 154.201 1) 6)m = 0.15 x 10 23.130	nts (kWh/year 5 72.3581 0 0.0000 1 32.9913 es/day) Mar 5 105.3494 4 161.9182 (45)m 2 24.2877 factor is km	69.2101 0.0000 31.6975 Apr 100.9076 138.1375 20.7206	66.8870 0.0000 30.4037 May 97.2907 130.9720	64.2962 0.0000 29.1100 Jun 93.4062 114.8538	62.8236 0.0000 29.1100 Jul 91.9336 111.1857	64.4565 0.0000 30.4037 Aug 94.8602 117.4568	0.0000 31.6975 Sep 97.9439 120.7747	0.0000 32.9913 Oct 102.0194 138.4393 Total = 1	0.0000 34.2851 Nov 106.5288 151.7698 Sum(45)m =	74.8447 0.0000 35.5788 101.6141 Dec 110.4235 172.8966 1687.9455 25.9345 150.0000 1.3938 0.5400	(42 (42 (42 (43 (43 (44 (45 (45 (46 (46 (46 (46 (46 (46 (46 (46 (46 (46
I. Water heating energy issumed occupancy iot water usage for brown of the for brown iot water usage for brown of the forbit of the forbit of the forbit occupancy iot water usage for brown of the forbit occupancy iot water usage for brown of the forbit occupancy in a content of the forbit occupancy iot of the forbit occupancy iot occupa	yy requireme- ixer showers 25 74.003 aths 00 0.000 ther uses 88 34.285 er use (litr Feb 14 108.288 98 154.201 1) 6)m = 0.15 x 10 23.130	nts (kWh/year 5 72.3581 0 0.0000 1 32.9913 es/day) Mar 5 105.3494 4 161.9182 (45)m 2 24.2877 factor is km	69.2101 0.0000 31.6975 Apr 100.9076 138.1375 20.7206	66.8870 0.0000 30.4037 May 97.2907 130.9720	64.2962 0.0000 29.1100 Jun 93.4062 114.8538	62.8236 0.0000 29.1100 Jul 91.9336 111.1857	64.4565 0.0000 30.4037 Aug 94.8602 117.4568	0.0000 31.6975 Sep 97.9439 120.7747	0.0000 32.9913 Oct 102.0194 138.4393 Total = 1	0.0000 34.2851 Nov 106.5288 151.7698 Sum(45)m =	74.8447 0.0000 35.5788 101.6141 Dec 110.4235 172.8966 1687.9455 25.9345 150.0000 1.3938	(42 (42 (42 (43 (43 (44 (45 (46 (47 (48 (49
I. Water heating energy Issumed occupancy Not water usage for by 0.00 Issumed occupancy Not water usage for by 0.00 Issumed occupancy Issumed occupancy Issumed occupancy Issumed occupancy Issumed occupancy Issumed occupancy Issumed Issume	gy requirements in the second of the second	nts (kWh/year 	69.2101 0.0000 31.6975 Apr 100.9076 138.1375 20.7206 own (kWh/da	66.8870 0.0000 30.4037 May 97.2907 130.9720 19.6458	64.2962 0.0000 29.1100 Jun 93.4062 114.8538	62.8236 0.0000 29.1100 Jul 91.9336 111.1857	64.4565 0.0000 30.4037 Aug 94.8602 117.4568	0.0000 31.6975 Sep 97.9439 120.7747 18.1162	0.0000 32.9913 Oct 102.0194 138.4393 Total = 20.7659	0.0000 34.2851 Nov 106.5288 151.7698 Sum (45) m = 22.7655	74.8447 0.0000 35.5788 101.6141 Dec 110.4235 172.8966 1687.9455 25.9345 150.0000 1.3938 0.5400	(42) (42) (43) (44) (45) (46) (47) (48) (49) (55)
I. Water heating energy issumed occupancy iot water usage for brown of the second occupancy iot water usage for brown of the second occupancy iot water usage for brown occupancy iot water usage loss intergy content (annual bistribution loss (44 26.30) ister storage loss: istore volume 19 If manufacturer de Temperature factor: inter (49) or (54) in inter (49) or (54) in inter storage loss if cylinder contains of cylinder contains	yy requireme- ixer showers 25 74.003 atchs 00.000 0.000 0ther uses 38 34.285 er use (litr Feb 14 108.288 91 104.201 1) 6)m = 0.15 x 10 23.130 eclared loss from Table 2 (55) 225 21.074 dedicated so	nts (kWh/year 5 72.3581 0 0.0000 1 32.9913 es/day) Mar 5 105.3494 4 161.9182 (45)m 2 24.2877 factor is kn b	69.2101 0.0000 31.6975 Apr 100.9076 138.1375 20.7206 own (kWh/da	66.8870 0.0000 30.4037 May 97.2907 130.9720 19.6458 ay):	64.2962 0.0000 29.1100 Jun 93.4062 114.8538 17.2281	62.8236 0.0000 29.1100 Jul 91.9336 111.1857 16.6779	64.4565 0.0000 30.4037 Aug 94.8602 117.4568 17.6185	0.0000 31.6975 Sep 97.9439 120.7747 18.1162	0.0000 32.9913 Oct 102.0194 138.4393 Total = 20.7659	0.0000 34.2851 Nov 106.5288 151.7698 Sum (45) m = 22.7655	74.8447 0.0000 35.5788 101.6141 Dec 110.4235 172.8966 1687.9455 25.9345 150.0000 1.3938 0.5400 0.7527 23.3325	(42) (42) (43) (43) (44) (45) (46) (47) (55) (56) (56)
L. Water heating energy lassumed occupancy lot water usage for brown of the second occupancy lot water usage for brown of the second occupancy lot water usage for brown occupancy lot lot water usage lot	yy requireme- ixer showers 25 74.003 atchs 00 0.000 00 0.000 00 0.000 14 108.288 154.201 1) 6)m = 0.15 x 10 23.130 eclared loss from Table 2 (55) 25 21.074 24 21.011 24 21.011 20 0.000	nts (kWh/year 	69.2101 0.0000 31.6975 Apr 100.9076 138.1375 20.7206 own (kWh/da 22.5798 22.5798 22.5798 22.5120 0.0000	66.8870 0.0000 30.4037 May 97.2907 130.9720 19.6458 ay): 23.3325 23.3325 23.3252 40.0000	64.2962 0.0000 29.1100 Jun 93.4062 114.8538 17.2281 22.5798 22.5798 22.5798 22.5798	62.8236 0.0000 29.1100 Jul 91.9336 111.1857 16.6779	64.4565 0.0000 30.4037 Aug 94.8602 117.4568 17.6185	0.0000 31.6975 Sep 97.9439 120.7747 18.1162 22.5798 22.5798 22.5798 22.5120	0.0000 32.9913 Oct 102.0194 138.4393 Total = 20.7659 23.3325 23.3325 23.3325	0.0000 34.2851 Nov 106.5288 151.7698 Sum (45)m = 22.7655 22.5798 22.5798 22.5798	74.8447 0.0000 35.5788 101.6141 Dec 110.4235 172.8966 1687.9455 25.9345 150.0000 1.93938 0.5400 0.7527 23.3325 23.3252 23.32524	(42) (42) (43) (44) (45) (46) (47) (48) (49) (55) (56) (56) (57)
I. Water heating energy Issumed occupancy Not water usage for my 75.13; Itot water usage for bo 0.00 Itot water usage for on 35.57; Itotwater usage for on 35.57; Itotwater usage for on 10.71; Itotyater usage 110.71; Itotya	gy requirements of the control of th	nts (kWh/year	69.2101 0.0000 31.6975 Apr 100.9076 138.1375 20.7206 own (kWh/da 22.5798 22.5798 22.5120 0.0000	66.8870 0.0000 30.4037 May 97.2907 130.9720 19.6458 ay): 23.3325 23.3325 23.32524 0.0000	64.2962 0.0000 29.1100 Jun 93.4062 114.8538 17.2281 22.5798 22.5798 22.5798 22.5120 0.0000	62.8236 0.0000 29.1100 Jul 91.9336 111.1857 16.6779 23.3325 23.3325 23.2624 0.0000	64.4565 0.0000 30.4037 Aug 94.8602 117.4568 17.6185 23.3325 23.3325 23.2624 0.0000	0.0000 31.6975 Sep 97.9439 120.7747 18.1162 22.5798 22.5798 22.5798 22.5120 0.0000	0.0000 32.9913 Oct 102.0194 138.4393 Total = 20.7659 23.3325 23.3325 23.2624 0.0000	0.0000 34.2851 Nov 106.5288 151.7698 Sum (45)m = 22.7655 22.5798 22.5798 22.5798 22.5120 0.0000	74.8447 0.0000 35.5788 101.6141 Dec 110.4235 172.8966 1687.9455 25.9345 150.0000 1.93938 0.5400 0.7527 23.3325 23.32524 0.0000	(42) (42) (43) (43) (44) (45) (46) (47) (48) (49) (55) (56) (56) (61)
I. Water heating energy Issumed occupancy Not water usage for my 75.13; Itot water usage for bo 0.00 Itot water usage for on 35.57; Itotwater usage for on 35.57; Itotwater usage for on 10.71; Itotyater usage 110.71; Itotya	gy requirements of the control of th	nts (kWh/year	69.2101 0.0000 31.6975 Apr 100.9076 138.1375 20.7206 own (kWh/da 22.5798 22.5798 22.5120 0.0000	66.8870 0.0000 30.4037 May 97.2907 130.9720 19.6458 ay): 23.3325 23.3325 23.32524 0.0000	64.2962 0.0000 29.1100 Jun 93.4062 114.8538 17.2281 22.5798 22.5798 22.5798 22.5120 0.0000	62.8236 0.0000 29.1100 Jul 91.9336 111.1857 16.6779 23.3325 23.3325 23.2624 0.0000	64.4565 0.0000 30.4037 Aug 94.8602 117.4568 17.6185 23.3325 23.3325 23.2624 0.0000	0.0000 31.6975 Sep 97.9439 120.7747 18.1162 22.5798 22.5798 22.5798 22.5120 0.0000	0.0000 32.9913 Oct 102.0194 138.4393 Total = 20.7659 23.3325 23.3325 23.2624 0.0000	0.0000 34.2851 Nov 106.5288 151.7698 Sum (45)m = 22.7655 22.5798 22.5798 22.5798 22.5120 0.0000	74.8447 0.0000 35.5788 101.6141 Dec 110.4235 172.8966 1687.9455 25.9345 150.0000 1.93938 0.5400 0.7527 23.3325 23.32524 0.0000	(42) (42) (43) (43) (44) (45) (46) (47) (48) (49) (55) (56) (56) (61)
I. Water heating energy Issumed occupancy Not water usage for my 75.13; Itot water usage for bo 0.00 Itot water usage for on 35.57; Itotwater usage for on 35.57; Itotwater usage for on 10.71; Itotyater usage 110.71; Itotya	gy requirements of the control of th	nts (kWh/year	69.2101 0.0000 31.6975 Apr 100.9076 138.1375 20.7206 own (kWh/da 22.5798 22.5798 22.5120 0.0000	66.8870 0.0000 30.4037 May 97.2907 130.9720 19.6458 ay): 23.3325 23.3325 23.32524 0.0000	64.2962 0.0000 29.1100 Jun 93.4062 114.8538 17.2281 22.5798 22.5798 22.5798 22.5120 0.0000	62.8236 0.0000 29.1100 Jul 91.9336 111.1857 16.6779 23.3325 23.3325 23.2624 0.0000	64.4565 0.0000 30.4037 Aug 94.8602 117.4568 17.6185 23.3325 23.3325 23.2624 0.0000	0.0000 31.6975 Sep 97.9439 120.7747 18.1162 22.5798 22.5798 22.5798 22.5120 0.0000	0.0000 32.9913 Oct 102.0194 138.4393 Total = 20.7659 23.3325 23.3325 23.2624 0.0000	0.0000 34.2851 Nov 106.5288 151.7698 Sum (45)m = 22.7655 22.5798 22.5798 22.5798 22.5120 0.0000	74.8447 0.0000 35.5788 101.6141 Dec 110.4235 172.8966 1687.9455 25.9345 150.0000 1.93938 0.5400 0.7527 23.3325 23.32524 0.0000	(42) (42) (42) (43) (44) (45) (47) (47) (49) (55) (56) (56) (61)
I. Water heating energiassumed occupancy into water usage for more provided to the second occupancy into the second occupancy occupa	gy requireme- ixer showers 25 74.003 atchs 0.000	nts (kWh/year	69.2101 0.0000 31.6975 Apr 100.9076 138.1375 20.7206 cown (kWh/da 22.5798 22.5798 22.5120 0.0000 ed for each 183.2294 -26.3393 -0.0000 0.0000 0.0000 0.0000	66.8870 0.0000 30.4037 May 97.2907 130.9720 19.6458 ay): 23.3325 23.3252 0.0000 month 177.5669 -24.5473 -0.0000 0.0000 0.0000	64.2962 0.0000 29.1100 Jun 93.4062 114.8538 17.2281 22.5798 22.5798 22.5798 22.5120 0.0000 159.9456 -21.0053 -0.0000 0.0000 0.0000	62.8236 0.0000 29.1100 Jul 91.9336 111.1857 16.6779 23.3325 23.3325 23.2624 0.0000 157.7806 -19.6891 -0.0000 0.0000 0.0000	64.4565 0.0000 30.4037 Aug 94.8602 117.4568 17.6185 23.3325 23.3325 23.2624 0.0000 164.0517 -20.9374 -0.0000 0.0000 0.0000	0.0000 31.6975 Sep 97.9439 120.7747 18.1162 22.5798 22.5798 22.5120 0.0000 165.8665 -21.7329 -0.0000 0.0000 0.0000	0.0000 32.9913 Oct 102.0194 138.4393 Total = 20.7659 23.3325 23.3325 23.2624 0.0000 185.0342 -25.6207 -0.0000 0.0000 0.0000	0.0000 34.2851 Nov 106.5288 151.7698 Sum(45)m = 22.7655 22.5798 22.5798 22.5798 22.5120 0.0000 196.8616 -29.0251 -0.0000 0.0000 0.0000	74.8447 0.0000 35.5788 101.6141 Dec 110.4235 172.8966 1687.9455 25.9345 150.0000 1.9938 0.5400 0.7527 23.3325 23.3252 23.32624 0.0000 219.4915 -33.7114 -0.0000 0.0000 0.0000	(422 (433 (444 (444 (444 (444 (444 (444
I. Water heating energy Issumed occupancy Not water usage for mi O.00 Not water usage for be O.00 Not water usage	gy requireme- ixer showers 25 74.003 aths 00 0.000 ther uses 38 34.285 er use (litr Feb 14 108.288 98 154.201 1) 6)m = 0.15 x 10 23.130 eclared loss from Table 2 (55) 25 21.074 dedicated so 25 21.074 dedicated so 25 21.074 24 21.011 00 0.000 00 water hea 47 196.287 75 -30.377 750 -0.000 00 0.000 00 0.000 00 0.000 00 0.000 72 165.910	nts (kWh/year	69.2101 0.0000 31.6975 Apr 100.9076 138.1375 20.7206 cown (kWh/da 22.5798 22.5798 22.5120 0.0000 ed for each 183.2294 -26.3393 -0.0000 0.0000 0.0000 0.0000	66.8870 0.0000 30.4037 May 97.2907 130.9720 19.6458 ay): 23.3325 23.3252 0.0000 month 177.5669 -24.5473 -0.0000 0.0000 0.0000	64.2962 0.0000 29.1100 Jun 93.4062 114.8538 17.2281 22.5798 22.5798 22.5798 22.5120 0.0000 159.9456 -21.0053 -0.0000 0.0000 0.0000	62.8236 0.0000 29.1100 Jul 91.9336 111.1857 16.6779 23.3325 23.3325 23.2624 0.0000 157.7806 -19.6891 -0.0000 0.0000 0.0000	64.4565 0.0000 30.4037 Aug 94.8602 117.4568 17.6185 23.3325 23.3325 23.3325 23.3252 40.0000 164.0517 -20.9374 -0.0000 0.0000 0.00000 143.1143	0.0000 31.6975 Sep 97.9439 120.7747 18.1162 22.5798 22.5798 22.5120 0.0000 165.8665 -21.7329 -0.0000 0.0000 144.1336	0.0000 32.9913 Oct 102.0194 138.4393 Total = 20.7659 23.3325 23.3325 23.3624 0.0000 185.0342 -25.6207 -0.0000 0.0000 159.4136	0.0000 34.2851 Nov 106.5288 151.7698 Sum(45)m = 22.7655 22.5798 22.5798 22.5798 22.5120 0.0000 196.8616 -29.0251 -0.0000 0.0000 0.0000	74.8447 0.0000 35.5788 101.6141 Dec 110.4235 172.8966 1687.9455 25.9345 150.0000 0.7527 23.3325 23.3252 23.32624 0.0000 219.4915 -33.7114 -0.0000 0.0000 185.7801 1917.4206	(422 (423 (433 (444 (444 (444 (444 (444
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I. Water heating energy Issumed occupancy Issumed occupancy Internal gains Issumed occupancy Issumed Issum	gy requireme- ixer showers 25 74.003 atchs 00 0.000 ther uses 38 34.285 er use (litr Feb 14 108.288 98 154.201 1) 6)m = 0.15 x 10 23.130 eclared loss from Table 2 (55) 25 21.074 dedicated sc dedicated	nts (kWh/year	69.2101 0.0000 31.6975 Apr 100.9076 138.1375 20.7206 own (kWh/da 22.5798 22.5798 22.5798 22.5120 0.0000 ed for each 183.2294 -26.3393 -0.0000 0.0000 156.8901 0.0000 Tota 82.0042	66.8870 0.0000 30.4037 May 97.2907 130.9720 19.6458 ay): 23.3325 23.3325 23.2624 0.0000 month 177.5669 -24.5473 -0.0000 0.0000 153.0196 0.0000 al Energy us 80.8241	64.2962 0.0000 29.1100 Jun 93.4062 114.8538 17.2281 22.5798 22.5798 22.5798 22.5120 0.0000 0.0000 159.9456 -21.0053 -0.0000 0.0000 138.9404 0.0000 ied by insta	62.8236 0.0000 29.1100 Jul 91.9336 111.1857 16.6779 23.3325 23.3325 23.3325 23.3254 0.0000 157.7806 -19.6891 -0.0000 0.0000 138.0915 0.0000 antaneous el 74.2452	64.4565 0.0000 30.4037 Aug 94.8602 117.4568 17.6185 23.3325 23.3325 23.3325 23.32624 0.0000 164.0517 -20.9374 -0.0000 0.0000 143.1143 Total pe 0.0000 lectric show	0.0000 31.6975 Sep 97.9439 120.7747 18.1162 22.5798 22.5798 22.5798 22.5120 0.0000 165.8665 -21.7329 -0.0000 0.0000 144.1336 er year (kW 0.0000 ver(s) (kWh 76.2310	0.0000 32.9913 Oct 102.0194 138.4393 Total = 20.7659 23.3325 23.32524 0.0000 185.0342 -25.6207 -0.0000 0.0000 0.0000 159.4136 h/year) = 30.0000 /year) = S 83.3070	0.0000 34.2851 Nov 106.5288 151.7698 Sum(45)m = 22.7655 22.5798 22.5798 22.5798 22.5120 0.0000 196.8616 -29.0251 -0.0000 0.0000 0.0000 0.0000 167.8365 Sum(64)m = 0.0000 um(64a)m = 86.5369	74.8447 0.0000 35.5788 101.6141 Dec 110.4235 172.8966 1687.9455 25.9345 150.0000 0.7527 23.3325 23.3325 23.3624 0.0000 219.4915 -33.7114 -0.0000 0.0000 185.7801 1917.4206 1917 0.0000 94.7640	(42) (42) (43) (44) (44) (45) (46) (63) (63) (63) (63) (63) (64) (64) (64) (64) (64) (64) (64)
I. Water heating energy Issumed occupancy Issumed occupancy Internal gains (Table 2016 Internal gains (Table 2017 Internal gains (Table 2017 Internal gains (Table 2018 Internal gains (Table 2018 Internal gains (Table Jan Jan Jan Jan Jan Jan Jan Ja	gy requireme- ixer showers 25 74.003 aths 00 0.000 ther uses 38 34.285 er use (litr Feb 14 108.288 98 154.201 1) 6)m = 0.15 x 10 23.130 eclared loss from Table 2 (55) 25 21.074 dedicated so 25 21.074 24 21.011 00 0.000 or water hea 47 196.287 196	nts (kWh/year	69.2101 0.0000 31.6975 Apr 100.9076 138.1375 20.7206 own (kWh/da) 22.5798 22.5798 22.5798 22.5120 0.0000 ed for each 183.2294 -26.3393 -0.0000 0.0000 156.8901 0.0000 Total	66.8870 0.0000 30.4037 May 97.2907 130.9720 19.6458 ay): 23.3325 23.3252 23.2624 0.0000 month 177.5669 -24.5473 -0.0000 0.0000 153.0196 0.0000 al Energy us 80.8241	64.2962 0.0000 29.1100 Jun 93.4062 114.8538 17.2281 22.5798 22.5798 22.5798 22.5720 0.0000 0.0000 138.9404 0.0000 138.9404 0.0000 138.9404 Jun 102.2793	62.8236 0.0000 29.1100 Jul 91.9336 111.1857 16.6779 23.3325 23.3325 23.3325 23.3254 0.0000 157.7806 -19.6891 -0.0000 0.0000 138.0915 0.0000 antaneous el 74.2452 Jul 102.2793	64.4565 0.0000 30.4037 Aug 94.8602 117.4568 17.6185 23.3325 23.3252 23.3252 23.32624 0.0000 164.0517 -20.9374 -0.0000 0.0000 143.1143 Total pe 0.0000 143.1143 Total pe 0.0000 143.1143 Total pe 0.0000 143.143 Total pe 0.0000 143.143 Total pe	0.0000 31.6975 Sep 97.9439 120.7747 18.1162 22.5798 22.5798 22.5798 22.5120 0.0000 165.8665 -21.7329 -0.0000 0.0000 144.1336 er year (kW	0.0000 32.9913 Oct 102.0194 138.4393 Total = 20.7659 23.3325 23.3325 23.3325 23.32624 0.0000 185.0342 -25.6207 -0.0000 0.0000 159.4136 h/year) = 3 83.3070 Oct	0.0000 34.2851 Nov 106.5288 151.7698 151.7698 Sum (45)m = 22.7655 22.5798 22	74.8447 0.0000 35.5788 101.6141 Dec 110.4235 172.8966 1687.9455 25.9345 150.0000 0.7527 23.3325 23.3325 23.3624 0.0000 219.4915 -33.7114 -0.0000 0.0000 185.7801 1917 0.0000 0.0000 94.7640 Dec	(42 (42 (42 (42 (43 (44 (44 (45 (45 (46 (46 (46 (46 (46 (46 (46 (46 (46 (46
I. Water heating energiassumed occupancy iot water usage for me of the control of the control occupancy iot water usage for me of the control occupancy iot water usage for be of the control occupancy iot water usage for be of the control occupancy iot water usage for be of the control occupancy iot water usage for be of the control occupancy interced to the control occupancy iot occupancy io	gy requirements in the state of	nts (kWh/year	69.2101 0.0000 31.6975 Apr 100.9076 138.1375 20.7206 own (kWh/da 22.5798 22.5798 22.5798 22.5120 0.0000 ed for each 183.2294 -26.3393 -0.0000 0.0000 156.8901 0.0000 Tot: 82.0042 Apr 102.2793 tion 19 or : 95.0407	66.8870 0.0000 30.4037 May 97.2907 130.9720 19.6458 ay): 23.3325 23.3325 23.3254 0.0000 month 177.5669 -24.5473 -0.0000 153.0196 0.0000 al Energy us 80.8241 May 102.2793 L9a), also s 91.9748	64.2962 0.0000 29.1100 Jun 93.4062 114.8538 17.2281 22.5798 22.5798 22.5798 22.5798 22.5120 0.0000 0.0000 159.9456 -21.0053 -0.0000 0.0000 138.9404 0.0000 ed by insta	62.8236 0.0000 29.1100 Jul 91.9336 111.1857 16.6779 23.3325 23.3325 23.3252 40.0000 157.7806 -19.6891 -0.0000 0.0000 138.0915 0.0000 138.0915 0.0000 antaneous el 74.2452 Jul 102.2793 91.9748	64.4565 0.0000 30.4037 Aug 94.8602 117.4568 17.6185 23.3325 23.3325 23.2624 0.0000 164.0517 -20.9374 -0.0000 0.0000 143.1143 Total periods of the control of	0.0000 31.6975 Sep 97.9439 120.7747 18.1162 22.5798 22.5798 22.5798 22.5120 0.0000 165.8665 -21.7329 -0.0000 0.0000 144.1336 er year (kW 0.0000 ver(s) (kWh 76.2310	0.0000 32.9913 Oct 102.0194 138.4393 Total = 20.7659 23.3325 23.3325 23.3325 23.3325 23.0624 0.0000 185.0342 -25.6207 -0.0000 0.0000 159.4136 h/year) = \$ 0.0000 /year) = \$ 83.3070 Oct 102.2793	0.0000 34.2851 Nov 106.5288 151.7698 Sum(45)m = 22.7655 22.5798 22.5798 22.5798 22.5120 0.0000 196.8616 -29.0251 -0.0000 0.0000 167.8365 Sum(64)m = 0.0000 um(64a)m = 86.5369	74.8447 0.0000 35.5788 101.6141 Dec 110.4235 172.8966 1687.9455 25.9345 150.0000 0.7527 23.3325 23.3325 23.3624 0.0000 219.4915 -33.7114 -0.0000 0.0000 185.7801 1917 0.0000 0.0000 94.7640 Dec	(42 (42 (42 (43 (44 (45 (45 (46 (45 (46 (46 (46 (46 (46 (46 (46 (46 (46 (46

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Pumps, fans Losses e.g. e Water heating Total interna	-81.8234 gains (Tab 128.4629 l gains	(negative v -81.8234	-81.8234 122.4647	33.2279 3.0000 le 5) -81.8234 113.8947 431.5370	33.2279 3.0000 -81.8234 108.6346 410.6546	33.2279 0.0000 -81.8234 103.1422 393.4267	33.2279 0.0000 -81.8234 99.7919 379.1267	33.2279 0.0000 -81.8234 102.5945 380.0751	33.2279 0.0000 -81.8234 105.8765 391.0953	33.2279 3.0000 -81.8234 111.9718 407.0719	33.2279 3.0000 -81.8234 120.1902 430.9126	33.2279 3.0000 -81.8234 127.3710 446.8289	(70) (71) (72)
6. Solar gain													
[Jan]			A	rea m2	Solar flux Table 6a W/m2	Speci or	g fic data Table 6b	Specific or Tab	FF data le 6c	Acces facto Table 6	or	Gains W	
Northeast			11.2	700	11.2829			0	.7000	0.770	00	38.8614	(75)
Solar gains Total gains	494.6661	544.5535	589.5075	665.5945	725.2738	728.8441	692.9028	630.2210	173.6619 564.7573	96.6707 503.7426	48.8977 479.8103	31.7361 478.5650	(83) (84)
7. Mean inter	nal tempera	ture (heati	ng season)										
Temperature d Utilisation f	actor for g	ains for li	ving area, n	nil,m (see	Table 9a)							21.0000	(85)
tau alpha util living a	132.8334 9.8556 rea	133.1363 9.8758	9.8956	134.8537 9.9902	135.1226 10.0082	10.0926	Jul 136.3885 10.0926	Aug 136.6255 10.1084	10.0599	Oct 135.1226 10.0082	9.9720	Dec 134.0169 9.9345	
MIT	0.9996 20.4536	0.9987 20.5448	0.9939	0.9454 20.8950	0.7587	0.5240	0.3792	0.4351	0.7234	0.9758	0.9984	0.9997	
Th 2 util rest of	20.0964	20.0983	20.1001	20.1088	20.1104	20.1179	20.1179	20.1193	20.1150	20.1104	20.1071	20.4396	
MIT 2 Living area f	raction	0.9979 19.5866	0.9900 19.7735	0.9165 20.0200	0.6930 20.1047	0.4520 20.1178	0.3032 20.1179	0.3518 20.1193	0.6358 20.1131 fLA =	0.9562 19.9889 Living area	0.9972 19.6978 1/(4) =	0.9995 19.4567 0.3851	(90) (91)
MIT Temperature a adjusted MIT		19.9556	20.1270	20.3570	20.4454	20.4575	20.4576	20.4585	20.4527	20.3244	20.0552	19.8352 0.0000 19.8352	
8. Space heat			 Mar	Apr	May	Jun	Jul	 	Sep	Oct	Nov	Dec	
Utilisation Useful gains Ext temp. Heat loss rat	4.3000		0.9901 583.6779 6.5000	0.9256 616.0822 8.9000	0.7184 521.0376	0.4798 349.6713 14.6000	0.3325 230.3576 16.6000	0.3839	0.6699 378.3432 14.1000	0.9620 484.5791 10.6000	0.9971 478.4129 7.1000	0.9995 478.3039 4.2000	(95)
Space heating	953.2984 kWh	921.0131		691.9449		349.7815	230.3599	241.9331	380.7225	586.1386	784.0198	950.1860	(97)
Space heating Solar heating	requirement	_	er year (kW)			0.0000	0.0000	0.0000	0.0000	75.5602		351.0803 1485.7114	
Solar heating Space heating	contributi	0.0000 on - total p		0.0000 Wh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Space heating Space heating	341.4981 requirement	253.8172 t after sol			4.5302 al per year	0.0000 (kWh/year)	0.0000	0.0000	0.0000		220.0370	351.0803 1485.7114 23.8515	
 9a. Energy re	auirements		l heating s		luding micro								
Fraction of s Fraction of s Efficiency of Efficiency of Efficiency of	pace heat fi pace heat fi main space main space	rom seconda rom main sy heating sy heating sy supplementa	ry/supplementstem(s) stem(s) stem 1 (in stem 2 (in stem	ntary syste %) %)								0.0000 1.0000 92.3000 0.0000	(202) (206) (207)
Space heating		Feb t 253.8172	Mar	Apr 54.6211	May 4.5302	Jun 0.0000	Jul 0.0000	Aug 0.0000	Sep 0.0000	Oct 75.5602	Nov 220.0370	Dec 351.0803	(00)
Space heating	efficiency		ing system :	1)		0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	
Space heating	fuel (main 369.9871	heating sy 274.9916	stem) 199.9646	59.1778	4.9081	0.0000	0.0000	0.0000	0.0000	81.8637	238.3933	380.3687	
Space heating Space heating	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	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
	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 Efficiency of	requirement 187.5872	165.9100	176.7038	156.8901	153.0196	138.9404	138.0915	143.1143	144.1336	159.4136	167.8365	185.7801 79.8000	
(217)m Fuel for wate	85.3857 r heating, 1	85.0102 kWh/month		81.9448	80.0332	79.8000	79.8000	79.8000	79.8000	82.4884	84.6680	85.4645	(217)
Space cooling (221)m	fuel requi:	rement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Pumps and Fa Lighting Electricity g	7.3041 19.1106	6.5973 15.3312	7.3041 13.8040	7.0685 10.1134	7.3041 7.8119	7.0685 6.3824	7.3041	7.3041 9.2630	7.0685 12.0317	7.3041 15.7863	7.0685 17.8306	7.3041 19.6417	(231)
(233a)m Electricity g	-21.2892 enerated by	-31.0349 wind turbi	-46.1166 nes (Append:	-53.6723 ix M) (nega	-59.4691 tive quantit	ΣY)				-36.3112	-23.7709		
(234a)m Electricity g			0.0000 tric genera			0.0000 ative quant		0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

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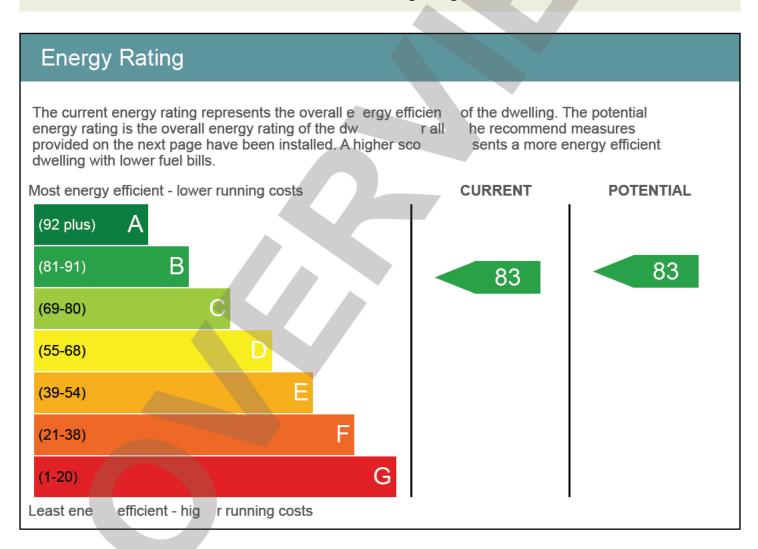
(235a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0 0 0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if ne (235c)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	et generation)		0.0000	0.0000	0.0000	. ,
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m -9.1125 -19.4417 -39.1457 -59.5300 -79.4240 -80.0464 -79.08			-28.0276	-12.2401	-7.1845	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.000		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 0.000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if ne (235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.000	et generation) 000 0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year Space heating fuel - main system 1 Space heating fuel - main system 2 Space heating fuel - secondary Efficiency of water heater Water heating fuel used Space cooling fuel					1609.6548 0.0000 0.0000 79.8000 2323.4590 0.0000	(213) (215) (219)
Electricity for pumps and fans: Total electricity for the above, kWh/year Electricity for lighting (calculated in Appendix L)					86.0000 154.2331	
Energy saving/generation technologies (Appendices M ,N and Q) PV generation Wind generation Hydro-electric generation (Appendix N) Electricity generated - Micro CHP (Appendix N) Appendix Q - special features					-1026.2798 0.0000 0.0000 0.0000	(234) (235a)
Energy saved or generated Energy used Total delivered energy for all uses					-0.0000 0.0000 3147.0672	(237)
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP						
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP	Energy	Emiss	ion factor		Emissions	
	kWh/year		kg CO2/kWh	k	g CO2/year	(251)
Space heating - main system 1			ion factor kg CO2/kWh 0.2100	k	g CO2/year 338.0275	(261)
	kWh/year		kg CO2/kWh	k	g CO2/year 338.0275 0.0000 487.9264	(261) (373) (264)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating	kWh/year 1609.6548 2323.4590		kg CO2/kWh 0.2100 0.2100	k	g CO2/year 338.0275 0.0000 487.9264 825.9539	(261) (373) (264) (265)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot	kWh/year 1609.6548 2323.4590 86.0000		kg CO2/kWh 0.2100 0.2100 0.1387	k	g CO2/year 338.0275 0.0000 487.9264 825.9539 11.9293	(261) (373) (264) (265) (267)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating	kWh/year 1609.6548 2323.4590		kg CO2/kWh 0.2100 0.2100	k	g CO2/year 338.0275 0.0000 487.9264 825.9539	(261) (373) (264) (265) (267)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies	kWh/year 1609.6548 2323.4590 86.0000 154.2331		kg CO2/kWh 0.2100 0.2100 0.1387 0.1443	le.	g CO2/year 338.0275 0.0000 487.9264 825.9539 11.9293 22.2606	(261) (373) (264) (265) (267)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling	kWh/year 1609.6548 2323.4590 86.0000 154.2331		kg CO2/kWh 0.2100 0.2100 0.1387 0.1443	lc	g CO2/year 338.0275 0.0000 487.9264 825.9539 11.9293 22.2606	(261) (373) (264) (265) (267)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies	kWh/year 1609.6548 2323.4590 86.0000 154.2331		kg CO2/kWh 0.2100 0.2100 0.1387 0.1443	lc	g CO2/year 338.0275 0.0000 487.9264 825.9539 11.9293 22.2606	(261) (373) (264) (265) (267) (268)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported	kWh/year 1609.6548 2323.4590 86.0000 154.2331		kg CO2/kWh 0.2100 0.2100 0.1387 0.1443	lc	g CO2/year 338.0275 0.0000 487.9264 825.9539 11.9293 22.2606	(261) (373) (264) (265) (267) (268) (269) (272)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year	kWh/year 1609.6548 2323.4590 86.0000 154.2331		kg CO2/kWh 0.2100 0.2100 0.1387 0.1443	lc	g CO2/year 338.0275 0.0000 487.9264 825.9539 11.9293 22.2606 -66.6712 -66.3173 -132.9885 727.1553	(261) (373) (264) (265) (267) (268) (269) (272)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling FV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER)	kWh/year 1609.6548 2323.4590 86.0000 154.2331 -498.0124 -528.2674	Primary ene	kg CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1339 0.1255	k	g CO2/year 338.0275 0.0000 487.9264 825.9539 11.9293 22.2606 -66.6712 -66.3173 -132.9885 727.1553 11.6700	(261) (373) (264) (265) (267) (268) (268) (269) (272) (273)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER)	kWh/year 1609.6548 2323.4590 86.0000 154.2331 -498.0124 -528.2674	Primary ene	kg CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1339 0.1255	k	g CO2/year 338.0275 0.0000 487.9264 825.9539 11.9293 22.2606 -66.6712 -66.3173 -132.9885 727.1553 11.6700	(261) (373) (264) (265) (267) (268) (268) (269) (272) (273)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling FV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER)	kWh/year 1609.6548 2323.4590 86.0000 154.2331 -498.0124 -528.2674	Primary ene	kg CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1339 0.1255	k	g CO2/year 338.0275 0.0000 487.9264 825.9539 11.9293 22.2606 -66.6712 -66.3173 -132.9885 727.1553 11.6700	(261) (373) (264) (265) (267) (268) (269) (272) (273)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel)	kWh/year 1609.6548 2323.4590 86.0000 154.2331 -498.0124 -528.2674	Primary ene	kg CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1339 0.1255	k	g CO2/year 338.0275 0.0000 487.9264 825.9539 11.9293 22.2606 -66.6712 -66.3173 -132.9885 727.1553 11.6700	(261) (373) (264) (265) (267) (268) (269) (272) (273) (273)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating	kWh/year 1609.6548 2323.4590 86.0000 154.2331 -498.0124 -528.2674 Energy kWh/year 1609.6548 2323.4590	Primary ene	kg CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1339 0.1255 crgy factor kg CO2/kWh 1.1300 1.1300	k Prim	g CO2/year 338.0275 0.0000 487.9264 825.9539 11.9293 22.2606 -66.6712 -66.3173 -132.9885 727.1553 11.6700 ary energy kWh/year 1818.9100 0.0000 265.5087 4444.4187	(261) (373) (264) (265) (267) (268) (269) (272) (273) (273) (275) (473) (278) (279)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel)	kWh/year 1609.6548 2323.4590 86.0000 154.2331 -498.0124 -528.2674 Energy kWh/year 1609.6548	Primary ene	kg CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1339 0.1255 rgy factor kg CO2/kWh 1.1300	k Prim	g CO2/year 338.0275 0.0000 487.9264 825.9539 11.9293 22.2606 -66.6712 -66.3173 -132.9885 727.1553 11.6700	(261) (373) (264) (265) (267) (268) (269) (272) (273) (273) (275) (473) (278) (278) (278)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy saving/generation technologies	kWh/year 1609.6548 2323.4590 86.0000 154.2331 -498.0124 -528.2674 -528.2674 -528.2674 2323.4590 86.0000 154.2331	Primary ene	kg CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1339 0.1255 crgy factor kg CO2/kWh 1.1300 1.5128 1.5338	k	g CO2/year 338.0275 0.0000 487.9264 825.9539 22.2606 -66.6712 -66.3173 -132.9885 727.1553 11.6700 ary energy kWh/year 1818.9100 0.0000 2625.5087 4444.4187 236.5679	(261) (373) (264) (265) (267) (268) (269) (272) (273) (273) (273) (278) (278) (278) (279) (281) (282)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling Energy saving/generation technologies PV Unit electricity used in dwelling	KWh/year 1609.6548 2323.4590 86.0000 154.2331 -498.0124 -528.2674 Energy kWh/year 1609.6548 2323.4590 86.0000 154.2331	Primary ene	kg CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1339 0.1255 crgy factor kg CO2/kWh 1.1300 1.5128 1.5338 1.4947	k	g CO2/year 338.0275 0.0000 487.9264 825.9539 11.9293 22.2606 -66.6712 -66.3173 -132.9885 727.1553 11.6700 ary energy kWh/year 1818.9100 0.0000 2625.5087 4444.4187 130.1008 236.5679	(261) (373) (264) (265) (267) (268) (269) (272) (273) (273) (273) (278) (278) (278) (279) (281) (282)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling FV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity used in dwelling PV Unit electricity used in dwelling PV Unit electricity exported	kWh/year 1609.6548 2323.4590 86.0000 154.2331 -498.0124 -528.2674 -528.2674 -528.2674 2323.4590 86.0000 154.2331	Primary ene	kg CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1339 0.1255 crgy factor kg CO2/kWh 1.1300 1.5128 1.5338	k	g CO2/year 338.0275 0.0000 487.9264 825.9539 11.9293 22.2606 -66.6712 -66.3173 -132.9885 727.1553 11.6700 ary energy kWh/year 1818.9100 0.0000 2625.5087 4444.4187 4444.4187 4444.4187 4444.4187 -744.3976 -243.4215	(261) (373) (264) (265) (267) (268) (269) (272) (273) (273) (273) (278) (279) (281) (282)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling Energy saving/generation technologies PV Unit electricity used in dwelling	KWh/year 1609.6548 2323.4590 86.0000 154.2331 -498.0124 -528.2674 Energy kWh/year 1609.6548 2323.4590 86.0000 154.2331	Primary ene	kg CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1339 0.1255 crgy factor kg CO2/kWh 1.1300 1.5128 1.5338 1.4947	k	g CO2/year 338.0275 0.0000 487.9264 825.9539 11.9293 22.2606 -66.6712 -66.3173 -132.9885 727.1553 11.6700 ary energy kWh/year 1818.9100 0.0000 2625.5087 4444.4187 130.1008 236.5679	(261) (373) (264) (265) (267) (268) (269) (272) (273) (273) (273) (273) (278) (279) (281) (282)

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Dwelling Address	Unit 1, Highland Square , Bristol
Report Date	05/03/2024
Property Type	Flat, Semi-Detached
Floor Area [m ²]	62

This document is not an Energy Performance Certificat EPC) s required by the Energy Performance of Buildings Reg io



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Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good
Feature	Description			gy Performance
Walls	Average thermal transmi	ttance 0.18 W/m²K		Very Good
Roof	Average thermal transmi	ttance 0.11 W/m²K		Very Good
Floor	Average thermal transmi	ttance 0.18 W/m²K		Very Good
Windows	High performance glazin	Good		
Main heating	Air source heat pump, ra	diators, electric		Average
Main heating controls	Time and temperature z	contro		Very Good
Secondary heating	None			
Hot water	From main sys m	Average		
Lighting	Good ligh g efficien		Good	
Air tightness	Air perme 50] =	4.5 h.m² (assumed)		Good

Primary Energy use

The primary energy use for this property per year is 30 kilowatt hour (kWh) per square metre

Estim ted CO₂ missions of the dwelling

The estimated ing provides an indication of the dwelling's impact on the environment in terms of carbon dioxide emissions; the higher the rating the less impact it has on the environment.

The estimated CO emissions for this dwellings is: 0.2 per year

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With the recommended measures the potential CO emissions could be:

0

per year

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelli

To reach the dwelling's potential energy rating all of the recommended measures shown would d to be installed.

Having these measures installed individually or in any other order may give a different result omp d with the cumulative potential rating.

Recommended measure	Typical	Potential Rati	C ulative	Cumulative
	Yearly	after	avings	Potential
	Saving	measure insta	(per year)	Rating

Estimated energy use and potential aving

Estimated energy cost for this property over a year

£457

Over a year you could save

£0

The estimated cost and saving how how much the average hou ld would spend in this property heating, lighting and hot water. It not based on how e is used by the people living at the pr

Containg the ssessor and the accreditation scheme

As	sessor contact details
Assessor name	
Assessor's accreditation number	
Email Address	

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Accreditation sche	eme contact details
Accreditation scheme	Elmhurst Energy Systems Ltd
Telephone	
Email Address	

Assessment details					
Related party disclosure	No related pa				
Date of assessment	05/03/202				
Date of certificate	05/03/202				
Type of assessment	SAP w dwellin				



Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Tue 05 Mar 2024 08:41:58

Project Information			
Assessed By		Building Type	Maisonette, Mid-terrace
OCDEA Registration	EES/025661	Assessment Date	2024-03-05

Dwelling Details			
Assessment Type	As designed	Total Floor Area	92 m ²
Site Reference	Unit 4	Plot Reference	Residual
Address	Unit 1 Highland Square, Bristo	Unit 1 Highland Square, Bristol	

Client Details		
Name	Tebby & Son	
Company	SF Tebby & Son	
Address	Unit 11 Avon Gorge Industrial Estate , Bristol, BS2 9XX	

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate				
Fuel for main heating system	Electricity			
Target carbon dioxide emission rate	11.51 kgCO ₂ /m ²			
Dwelling carbon dioxide emission rate	4.52 kgCO ₂ /m ²	OK		
1b Target primary energy rate and dwelling primary energy				
Target primary energy	60.37 kWh _{PE} /m ²			
Dwelling primary energy	47.26 kWh _{PE} /m ²	OK		
1c Target fabric energy efficiency and dwelling fabric energy efficiency				
Target fabric energy efficiency	38.1 kWh/m ²			
Dwelling fabric energy efficiency	37.4 kWh/m ²	OK		

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m²K]	Dwelling average U-Value [W/m²K]	Element with highest individual U-Value	
External walls	0.26	0.18	Walls (1) (0.18)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	0.18	Exposed Floor (0.18)	OK
Roofs	0.16	0.11	Roof (1) (0.11)	OK
Windows, doors,	1.6	1.31	W01 (1.31)	OK
and roof windows				
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))			
Name	Net area [m ²]	U-Value [W/m ² K]	
Exposed wall: Walls (1)	71.34	0.18	
Exposed wall: Walls (2)	13.04	0.18	
Party wall: Party Wall (1)	65.88	0 (!)	
Party floor: Exposed Floor, Exposed Floor	7.22	0.18	
Exposed roof: Roof (1)	53.98	0.11	

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
W01, Windows	2.38	North East	0.7	1.31
W02, Windows	2.38	North East	0.7	1.31
W03, Windows	2.38	North East	0.7	1.31
W04, Windows	4.41	North East	0.7	1.31
W05, Windows	2.38	South East	0.7	1.31
W06, Windows	0.53	South West	0.7	1.31
W07, Windows	0.53	South West	0.7	1.31

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))	
Building part 1 - Main Dwelling: Thermal bridging calculated from linear thermal transmittances for each junction	

Date generated: 2024-03-05 08:41:58

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Not government-approved scheme	0.023 (!)	
External wall	E3: Sill	Calculated by person with suitable expertise	0.021 (!)	
External wall	E4: Jamb	Calculated by person with suitable expertise	0.016 (!)	
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.116	
External wall	E7: Party floor between dwellings (in blocks of flats)	Calculated by person with suitable expertise	0.038 (!)	
Party wall	P7: Exposed floor (normal)	Calculated by person with suitable expertise	0.185	
Party wall	P3: Intermediate floor between dwellings (in blocks of flats)	SAP table default	0 (!)	
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.043	
External wall	E25: Staggered party wall between dwellings	Calculated by person with suitable expertise	0.036 (!)	
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.046	
External wall	E21: Exposed floor (inverted)	SAP table default	0.32	
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.101	
Party wall	P8: Exposed floor (inverted)	Calculated by person with suitable expertise	0.185	
External wall	E14: Flat roof	SAP table default	0.16	
Roof	R8: Roof to wall (rafter)	SAP table default	0.12	
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.001 (!)	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))			
Maximum permitted air permeability at 50Pa	8 m ³ /hm ²		
Dwelling air permeability at 50Pa	4.5 m ³ /hm ² , Design value	OK	
Air permeability test certificate reference		·	

4 Space heating			
Main heating system 1: Heat pump with	Main heating system 1: Heat pump with radiators or underfloor heating - Electricity		
Efficiency	247.7%		
Emitter type	Radiators		
Flow temperature	55°C		
System type	Heat Pump		
Manufacturer	Atlantic		
Model	Logic Air 8kW		
Commissioning			
Secondary heating system: N/A			
Fuel	N/A		
Efficiency	N/A		
Commissioning			

5 Hot water		
Cylinder/store - type: Cylinder		
Capacity	150 litres	
Declared heat loss	2.09 kWh/day	
Primary pipework insulated	Yes	
Manufacturer		
Model		
Commissioning		
Waste water heat recovery system 1 - type: N/A		
Efficiency		
Manufacturer		
Model		

6 Controls			
Main heating 1 - type: Time and tempera	ature zone control by	arrangement of plumbing and electrical s	ervices
Function			
Ecodesign class			
Manufacturer			
Model			
Water heating - type: Cylinder thermosta	at and HW separately	timed	
Manufacturer			
Model			
7 Lighting			
Minimum permitted light source efficacy	75 lm/W		
Lowest light source efficacy	80 lm/W		ОК
External lights control	N/A		OK
	14/7 (
8 Mechanical ventilation			
System type: N/A	T		
Maximum permitted specific fan power	N/A		Lance
Specific fan power	N/A		N/A
Minimum permitted heat recovery	N/A		
efficiency			Land
Heat recovery efficiency	N/A		N/A
Manufacturer/Model			
Commissioning			
9 Local generation			
N/A			
40 Heat matricella			
10 Heat networks			
N/A			
11 Supporting documentary evidence			
N/A			
12 Declarations			
a. Assessor Declaration			
	infirmation that the co	ontents of this BREL Compliance Report	
		nformation submitted for this dwelling for	
the purpose of carrying out the "As de			
evidence (SAP Conventions, Appendi			
documentary evidence required) has			
Compliance Report.	been reviewed in the	course of preparing this bitch	
озприанос порон.			
Signed:		Assessor ID:	
Oignou.		7.000000.15.	
Name:		Date:	
b. Client Declaration			

N/A



Property Reference	Un	it 4								Issued	on Date	05/03	/2024	
Assessment Reference	Re	sidual					Pro	р Туре	Ref	Tebby ar	nd Son G	arage		
Property	Un	it 1, Highla	nd Square	, Bristol										
SAP Rating				81 B		DER		4.52)		ER	11	.51	
Environmental				96 A		% DER	< TFR	4.52	-				.73	
CO ₂ Emissions (t/year)				0.38		DFEE	· · · · ·	37.3	20		FEE		.13	
Compliance Check				See BREL			E < TFE		, o			1.9		
% DPER < TPER				21.72		DPER		47.2	26	1	PER		.37	
Assessor Details										,	Assesso	טון טון	867-000)1
Client	UT DATA 5	OD. No.	Dilal /	A - Danis	1\									
SUMMARY FOR INP	UT DATA F	OR: Nev	v Build (As Design	ied)									
Orientation				Southwest	<u> </u>									
Property Tenture				1										
Transaction Type				6										
Terrain Type				Urban										
1.0 Property Type				Maisonette	e, Mid-Terra	ce								
Position of Flat				Top-floor fl	at									
Which Floor				1										
2.0 Number of Storeys				3										
.0 Date Built				2024										
3.0 Property Age Band				L										
I.0 Sheltered Sides				3										
5.0 Sunlight/Shade				Average of	r unknown									
6.0 Thermal Mass Param	eter			Precise ca	lculation									
Thermal Mass				N/A						k	J/m²K			
7.0 Electricity Tariff				Standard										
Smart electricity meter	fitted			No										
Smart gas meter fitted				No										
7.0 Measurements														
					Basement		Loss P 6		r In	ternal Flo		Average	Store 0.00 m	
				Gr	ound floor	:	3.30 n	n		4.86 n) ²		2.50 m	
					1st Storey 2nd Storey	:	14.97 18.05	m		59.81 r 27.28 r	n²		2.70 m 2.42 m	
					3rd Storey 4th Storey		0.00 n 0.00 n			0.00 m 0.00 m			0.00 m 0.00 m	
					5th Storey 6th Storey	:	0.00 n 0.00 n	n		0.00 m 0.00 m		(0.00 m 0.00 m	
					7th Storey		0.00 n			0.00 m			0.00 m	
3.0 Living Area				27.28						m	2			
9.0 External Walls														
Description	Туре	Consti	ruction			U-Value (W/m²K)	Kappa (kJ/m²K)		Nett Area (m²)	Shelter Res	Shelter	Openings		Calculat Type
	Cavity Wall		wall : plasterb avity, any outs	oard on dabs, d	lense block,	0.18	150.00	86.33	71.34	0.00	None	14.99	Enter	Gross Ar
Cavity Wall	Carry Hall			two layers of pla	asterboard)	0.18	18.00	13.04	13.04	0.00	None	0.00	Enter	Gross A
Cavity Wall Sloping Wall	Timber Frame	TITIDEI												
Sloping Wall 1.1 Party Walls	Timber Frame	Timber	0	-4:					11 1/-1	V	A	Chalka	-	
Sloping Wall On Party Walls Description	Timber Frame		Construc						(W/m ² K)	· Kappa) (kJ/m²K)	Area (m²)	Shelter Res		elter
Sloping Wall	Timber Frame	Cavity with		ction asterboard o	n both sides	s, dense	cellular l	blocks,						e iter one
Sloping Walls O.1 Party Walls Description Party Wall 1	Timber Frame Type Filled (Cavity with	Single pla		n both side:	s, dense	cellular l	blocks,	(W/m ² K)) (kJ/m²K)	(m²)	Res		
Sloping Wall On Party Walls Description	Timber Frame Type Filled (Cavity with Sealing	Single pla	asterboard o	n both side:	s, dense	cellular I	blocks,	(W/m ² K)) (kJ/m²K)	(m²)	Res	No opa /	

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Description	Туре	Construc	ction			-Value V/m²K)			a(m²) /	Nett Area		Shelter Factor	Calcula Type		Openings
External Roof 1	External Flat Roof	Plasterbo	ard, ins	sulated flat roof		0.11	9.00	53		(m²) 53.98	None	0.00	Enter G Area		0.00
10.2 Internal Ceilings															
Description Internal Ceiling 1		Storey +1		Construction Plasterboard ceiling,	carpet	ed chip	board	floor					,	Area 32.	(m²) 14
11.0 Heat Loss Floors															
Description Exposed Floor	Type Exposed Floor - Solid	Storey Inde		Construction Other				U- Val i (W/m² 0.18	K)	She	None	F	actor (k	appa J/m²K '5.00	Area (m²)) 7.22
11.1 Party Floors															
Description		Storey	Cons	truction											Area (m²)
Party Floor 1		Index Lowest occupied	Preca	st concrete planks floo	or, scre	ed, car	peted						(kJ/m 30.0		47.73
11.2 Internal Floors															
Description		Storey	Cons	truction									Карр		Area (m²)
Internal Floor 1		Index	Plaste	erboard ceiling, carpete	ed chip	board f	loor						(kJ/m 9.00		32.14
12.0 Opening Types															
Description	Data Source	Type		Glazing				azing Sap	Filling Type		3-value	Frame Type	Fram Facto	or	U Value (W/m²K)
Windows	Manufacturer	Window		Double Low-E So	oft 0.05	,			Air Fille	ed	0.63	Wood	0.70		1.31
13.0 Openings															
Name W01	Opening Ty Windows	pe		.ocation Cavity Wall				Orienta North E			Area (2.3			Pitc 0	h
W02	Windows		(Cavity Wall				North I			2.3			0	
W03 W04	Windows Windows			Cavity Wall Cavity Wall				North E			2.3 4.4			0	
W05	Windows		(Cavity Wall				South I	East		2.3	8		0	
W06 W07	Windows Windows			Cavity Wall Cavity Wall				South \ South \			0.5 0.5			0	
14.0 Conservatory			١	lone											
15.0 Draught Proofing			1	00							%				
16.0 Draught Lobby			١	lo											
17.0 Thermal Bridging			(Calculate Bridges											
17.1 List of Bridges			C					n-:	A -1!	D.					
Bridge Type E2 Other lintels (including	g other steel linte	els)		ce Type Bov Approved Scheme		Length 8.20		Psi).02	0.02	ea Re	eference	•			mported No
E3 Sill		•		endently assessed		8.20		0.02	0.02						No
E4 Jamb E20 Exposed floor (norm	al)			endently assessed endently assessed		23.67 3.12).02).12	0.02 0.12						No No
E7 Party floor between de	wellings (in block	s of flats)	Indep	endently assessed		31.46	0	0.04	0.04						No
P7 Party Wall - Exposed P3 Party wall - Intermedia		dwellinge		endently assessed K1 - Default		4.67 14.45).18).00	0.18 0.00						No No
(in blocks of flats)	ate floor between	i uweiii iga	Table	KT - Delault		17.70		7.00	0.00						NO
E16 Corner (normal) E25 Staggered party wall	l botuson durollir	ngo.		endently assessed endently assessed		16.64 26.80).04).04	0.04 0.04						No No
E18 Party wall between d		iys		endently assessed		5.20).0 4).05	0.04						No
E21 Exposed floor (invert		B		K1 - Default		1.50		0.32	0.32						No
P4 Party wall - Roof (insu P8 Party Wall - Exposed		evei)		endently assessed endently assessed		14.49 4.60).10).18	0.10 0.18						No No
E14 Flat roof			Table	K1 - Default		24.47	0	0.16	0.16						No
R8 Roof to wall (rafter) E6 Intermediate floor with	nin a dwelling			K1 - Default endently assessed		4.32 18.05).12).00	0.12 0.00						No No
Y-value			C	.08							W/m²K				
18.0 Pressure Testing			١	'es											
Designed AP ₅₀			4	.50							m³/(h.m	²) @ 50 F	^o a		
Property Tested?			١	'es											
Test Method			E	Blower Door											
19.0 Mechanical Ventilation	1														
Mechanical Ventilation															
Mechanical Ventilat	ion System Pres	ent	١	lo											
20.0 Fans, Open Fireplaces	, Flues														

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21.0 Fixed Cooling System	No					
22.0 Lighting						
No Fixed Lighting	No					
	Name Lighting 1	Efficacy 80.00	Power 15		Capacity 1200	Count 5
24.0 Main Heating 1	Database					
Percentage of Heat	100.00				%	
Database Ref. No.	106764					
Fuel Type	Electricity					
SAP Code	0					
In Winter	247.69					
In Summer	188.71					
Model Name	Logic Air 8kW					
Manufacturer	Atlantic					
System Type	Heat Pump					
Controls SAP Code	2207					
Delayed Start Stat	No					
HETAS approved System	No					
Oil Pump Inside	No					
FI Case	0.00					
Flue Type	None or Unknown					
Fan Assisted Flue	No					
Is MHS Pumped	Pump in heated space	е				
Heating Pump Age	2013 or later					
Heat Emitter	Radiators					
Flow Temperature	Enter value					
Flow Temperature Value	55.00					
Boiler Interlock	No					
25.0 Main Heating 2	None					
26.0 Heat Networks	None			$\overline{}$		
Heat Source Fuel Type Heating L	Jse Efficiency Per	centage Of I	Heat Heat Power	Electi	rical Fuel Factor	Efficiency type
Heat source 1 None Heat source 2 None Heat source 3 None Heat source 4 None Heat source 5 None			Ratio			
Heat source 2 None Heat source 3 None Heat source 4 None Heat source 5 None						
Heat source 2 None Heat source 3 None Heat source 4 None Heat source 5 None	Main Heating 1					
Heat source 2 None Heat source 3 None Heat source 4 None Heat source 5 None 28.0 Water Heating	Main Heating 1					
Heat source 2 None Heat source 3 None Heat source 4 None Heat source 5 None 28.0 Water Heating Water Heating						
Heat source 2 None Heat source 3 None Heat source 4 None Heat source 5 None 28.0 Water Heating Water Heating SAP Code	901					
Heat source 2 None Heat source 3 None Heat source 4 None Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System	901 No					
Heat source 2 None Heat source 3 None Heat source 4 None Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1	901 No No					
Heat source 2 None Heat source 3 None Heat source 4 None Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2	901 No No					
Heat source 2 None Heat source 3 None Heat source 4 None Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System	901 No No No					
Heat source 2 None Heat source 3 None Heat source 4 None Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System Solar Panel	901 No No No No No No					
Heat source 2 None Heat source 3 None Heat source 4 None Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System Solar Panel Water use <= 125 litres/person/day	901 No No No No Yes					
Heat source 2 None Heat source 3 None Heat source 4 None Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System Solar Panel Water use <= 125 litres/person/day Summer Immersion	901 No No No No No Ves No					

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Immersion On	ly Heating Ho	t Water		No							
28.1 Showers											
Description			Shower Typ	pe			low Rate [I/min]	Rated Power [kW]	Connected	Connected To	
1			Combi boile	er or unvented l	hot water sy	stem	7.00	[KVV]	No		
28.3 Waste Water	Heat Recov	ery System									
29.0 Hot Water Cy	ylinder			Hot Water (Cylinder						
Cylinder Stat				Yes							
Cylinder In He	ated Space			Yes							
Independent T	ime Control			Yes							
Insulation Type	е			Measured L	_OSS						
Cylinder Volun	ne			150.00					L		
Loss				2.09					kWh/day		
Pipes insulatio	n			Fully insulat	ted primary p	pipework					
In Airing Cupb	oard			No							
31.0 Thermal Sto	re			None							
34.0 Small-scale	Hydro			None							
Electricity Gen	erated			0.00							
Apportioned				0.00					kWh/Year	r	
Connected to	dwelling's ele	ctricity meter		Yes							
Electricity Gen	eration			Annual							
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec
Recommendation Lower cost m None Further meas	easures	eve even highe	er standards								
	Solar wate	er heating		Typical Cost	Турі	ical savin	gs per ye	SAF	Ratings after rating 0	er improvement Environmen 0 0	tal Impact

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Property Reference	e		Unit 4							Issue	d on Da	ate	05/03/2024	
Assessment Refer	rence		Residual					Prop Type F	Ref	Tebby a	and Son	Garage		
Property			Unit 1, Highland	l Square , Bristo	l									
SAP Rating					81 B		DER	4.	52		TER		11.51	
Environmental					96 A		% DER < TER	1					60.73	
CO₂ Emissions (t/)	/ear)				0.38		DFEE	37	7.38		TFEE		38.13	
Compliance Check	k				See BREL		% DFEE < TFE	EE					1.97	
% DPER < TPER					21.72		DPER	47	7.26		TPER	₹	60.37	
Assessor Details											Asse	ssor ID	U367-00	01
Client														
SAP 10 WORKSHEET CALCULATION OF D						7 2022)			-					
1. Overall dwell	ing charact	teristic	:s					 Area	- - a Sto	orey he	eight		Volume	<u>.</u>
Ground floor First floor Second floor Total floor area Dwelling volume	TFA = (la))+(lb)+((lc)+(ld)+(le	è)(ln)	Ş	91.9500		59.8100 27.2800) (lb) x	2. 2. 2.	(m) .5000 .7000 .4200	(2b) = (2c) = (2d) =	(m3) 12.1500 161.4870 66.0176 239.6546	(1b) - (3i (1c) - (3c (1d) - (3c (4)
2. Ventilation r									-				m3 per hour	:
Number of open of Number of open f Number of open f Number of flues Number of flues Number of blocke Number of interm Number of passiv Number of fluele	lues ys / flues attached to attached to d chimneys ittent extr e vents	o solid o other ract far	fuel boiler heater	fire								0 * 20 = 0 * 35 = 0 * 20 = 5 * 10 =	0.0000 0.0000 0.0000	(6b) (6c) (6d) (6e) (6f) (7a)
Infiltration due Pressure test Pressure Test Me Measured/design Infiltration rat Number of sides	thod AP50 e	ys, flue	s and fans	= (6a)+(6b))+(6c)+(6d)+((6e)+(6f)+((6g)+(7a)+(7	7b)+(7c) =	=	50	0.0000	Air chan / (5) =	ges per hour 0.2086 Yes Blower Door 4.5000 0.4336	(8) : : (17)
Shelter factor Infiltration rat	e adjusted	to incl	ude shelter	factor					(20) = 1			(19)] = x (20) =		
Wind speed Wind factor Adj infilt rate	Jan 5.1000 1.2750		Mar 4.9000 1.2250				Jul 3.8000 0.9500		Sep 4.0000 1.0000	4.	t .3000 .0750			
Effective ac	0.4285		0.4117 0.5847		0.3613 0.5653		0.3193 0.5510				.3613 .5653			
3. Heat losses a									-					
Element				Gross	Openings	Net	Area	U-value	A 2			-value	АхЕ	
Windows (Uw = 1. Exposed Floor Cavity Wall Sloping Wall External Roof 1 Total net area o	f external			13.0400 53.9800	m2 14.9900	71. 13. 53.	0400 9800 5700	0.1800 0.1800 0.1100	12.84 2.34 5.93	996 112 172 378		kJ/m2K 5.0000 0.0000 8.0000 9.0000	kJ/F 541.5000 10701.0000 234.7200 485.8200	(27) (28b) (29a) (29a) (30) (31)
Fabric heat loss Party Wall 1 Party Floor 1 Internal Wall 1 Internal Floor 1 Internal Ceiling		п (Ах С	")			47. 139. 32.	(26)(3 8800 7300 7500 1400 1400	30) + (32) 0.0000			10 1	0.0000	4611.6000 1909.2000 13975.0000 578.5200 289.2600	(32d) (32c) (32d)
Heat capacity Cm Thermal mass par List of Thermal Kl Eleme	ameter (TMI Bridges		TFA) in kJ/	m2K					(30) + (3	32) + (33326.6200 362.4428	
		includin	ng other stee	el lintels)					8.2000		230		1886	

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E3 Sill E4 Jamb E20 Exposed floor (r E7 Party floor betwee P7 Party Wall - Expo P3 Party wall - Inte E16 Corner (normal) E25 Staggered party E18 Party wall betwee E21 Exposed floor (i P4 Party Wall - Roof P8 Party Wall - Expo E14 Flat roof R8 Roof to wall (raf E6 Intermediate floor Thermal bridges (Sum (L x Po	een dwellings (in osed floor (normal ermediate floor be wall between dwel een dwellings inverted) f (insulation at c osed floor (invert fter) or within a dwelli) tween dwelli lings eiling level ed)	ings (in bloo	cks of flat:	s)	23 3 31 4 14 16 26 5 1 14 4 24 4	2000 6700 1200 4640 6700 4500 6400 8000 2000 5000 4900 5960 4700 3200 0500	0.0210 0.0160 0.1160 0.1850 0.0000 0.0460 0.360 0.0460 0.3200 0.1010 0.1850 0.1200 0.1200	0.17 0.37 0.36 1.19 0.86 0.00 0.71 0.96 0.23 0.48 1.46 0.85 3.91 0.51	87 19 56 39 00 55 48 92 00 35 00 35 52	(36)
Point Thermal bridges Total fabric heat loss	•		•				(33) + (36)	(36a) = + (36a) =	0.0000 53.4109	
(38)m 46.8031 4	lated monthly (38): Feb Mar 46.5211 46.2448	n = 0.33 x Apr 44.9469	(25)m x (5) May 44.7040	Jun 43.5736	Jul 43.5736	Aug 43.3642	Sep 44.0090	Oct 44.7040	Nov 45.1953	Dec 45.7089	(38)
Heat transfer coeff 100.2140 Average = Sum(39)m / 12 =	99.9320 99.6557	98.3578	98.1149	96.9845	96.9845	96.7751	97.4199	98.1149	98.6062	99.1198 98.3566	(39)
	Feb Mar 1.0868 1.0838 28 31		May 1.0670 31	Jun 1.0548 30	Jul 1.0548 31	Aug 1.0525 31	Sep 1.0595 30	Oct 1.0670 31	Nov 1.0724 30	Dec 1.0780 1.0697 31	(40)
4. Water heating energy requ											
Assumed occupancy Hot water usage for mixer sh										2.6515	(42)
Hot water usage for baths	84.6808 82.7405 0.0000 0.0000	79.7556	77.0812 0.0000	73.3397	70.3805	73.8400	75.5800	79.2858	83.1450 0.0000	85.9199 0.0000	
Hot water usage for other us			35.7062	34.1868	34.1868	35.7062	37.2256	38.7450	40.2644	41.7838	
Average daily hot water use Jan	(litres/day) Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	117.2682 Dec	(43)
Daily hot water use 127.7812 12	24.9452 121.4855 65.3278 173.6002	116.9811 152.8066	112.7874 145.3379	107.5265 124.3508	104.5672 115.5499	109.5462 128.9379	112.8056 130.8489	118.0308 152.0946	123.4094 166.7919	127.7037 187.5422	
Energy content (annual) Distribution loss (46)m = 0			21.8007	18.6526	17.3325	19.3407	19.6273		um(45)m = 25.0188	1831.3046 28.1313	
Water storage loss: Store volume a) If manufacturer declared Temperature factor from Ta Enter (49) or (54) in (55)	d loss factor is k									150.0000 2.0900 0.5400 1.1286	(47) (48) (49)
Total storage loss 34.9866 3 If cylinder contains dedicat	31.6008 34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(56)
34.9866 3 Primary loss 23.2624 2	31.6008 34.9866 21.0112 23.2624 0.0000 0.0000	33.8580 22.5120 0.0000	34.9866 23.2624 0.0000	33.8580 22.5120 0.0000	34.9866 23.2624 0.0000	34.9866 23.2624 0.0000	33.8580 22.5120 0.0000	34.9866 23.2624 0.0000	33.8580 22.5120 0.0000	34.9866 23.2624 0.0000	(59)
WWHRS 0.0000 PV diverter 0.0000 Solar input 0.0000	er heating calcula 17.9398 231.8492 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	180.7208 0.0000 0.0000 0.0000 0.0000	173.7989 0.0000 0.0000 0.0000 0.0000	187.1869 0.0000 0.0000 0.0000 0.0000	187.2189 0.0000 0.0000 0.0000 0.0000	210.3436 0.0000 0.0000 0.0000 0.0000	223.1619 0.0000 0.0000 0.0000 0.0000	245.7912 0.0000 0.0000 0.0000 0.0000	(63a) (63b) (63c)
246.3650 21	17.9398 231.8492	209.1766	203.5869	180.7208	173.7989	187.1869 Total pe	187.2189 er year (kW	210.3436 h/year) = S	223.1619 um(64)m =		
12Total per year (kWh/year) Electric shower(s) 0.0000	0.0000 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	2517 0.0000	
Heat gains from water heatin		Tot	al Energy u						m(64a)m =	0.0000	(64a)
105.1470	57.0011 104.5215	55.5042	34.3241	00.4420	03.0193	05.4710	00.0032	57.1700	100.3343	100.5570	(65)
5. Internal gains (see Table	e 5 and 5a)										
Metabolic gains (Table 5), W			May				Sep	Oct	Nov	Dec	
(66)m 132.5741 13 Lighting gains (calculated i	32.5741 132.5741 in Appendix L. egu	132.5741 ation L9 or	132.5741 L9a), also:	132.5741 see Table 5	132.5741	132.5741	132.5741	132.5741	132.5741	132.5741	
127.2048 14 Appliances gains (calculated 242.6198 24	40.8339 127.2048 d in Appendix L, e	131.4450 quation L13	127.2048 or L13a), a	131.4450 lso see Tab:	127.2048 le 5	127.2048	131.4450	127.2048	131.4450	127.2048 231.9148	
Cooking gains (calculated in	45.1374 238.7931 n Appendix L, equa 36.2574 36.2574	tion L15 or	L15a), also	see Table : 36.2574	5 36.2574	36.2574	36.2574	36.2574	36.2574	36.2574	(69)
Pumps, fans 0.0000 Losses e.g. evaporation (neg	0.0000 0.0000 gative values) (Ta	0.0000 ole 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Water heating gains (Table 5	06.0593 -106.0593 5) 44.4361 140.2168										
Total internal gains	93.1797 568.9869										
6. Solar gains											
[Jan]		Area m2	Solar flux Table 6a W/m2	Speci: or	g fic data Table 6b	Specific or Tabl	FF data Le 6c	Acce fact Table	or	Gains W	

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Northeast Southeast Southwest			1.0	800 600	11.2829 36.7938 36.7938		0.6300 0.6300 0.6300	0	.7000 .7000 .7000	0.770 0.770 0.770	00	39.8269 26.7623 11.9194	(77)
C-1									275 5026	171 0040	05 4440	CE (2001	(02)
Solar gains Total gains													
7. Mean inter	nal temperat												
Temperature d	uring heating	ng periods	in the livi	ng area from	n Table 9,							21.0000	(85)
Utilisation f	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau alpha	7.1584	92.6369 7.1758	92.8938 7.1929	94.1196 7.2746	94.3526 7.2902	95.4523 7.3635	95.4523 7.3635			94.3526 7.2902	93.8825 7.2588	93.3960 7.2264	
util living a	0.9992	0.9979	0.9933	0.9637	0.8491	0.6284	0.4595	0.5184	0.8068	0.9803	0.9977	0.9994	(86)
Mon living	20.1189	10 1521	10 4020	10 7506	10 0744	20 0250	20.9993	20.9985		20.7020 19.7414			
24 / 16 24 / 9	0 3	0	0	0	0	0	0	0 0 0	0	0	0	0	
24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of	28 20.5492	20.2451	20.4402	20.7229	20.9252	20.9927	20.9993	20.9985	20.9614	0 0 20.7020 20.0278	20.3692	10 20.2294	(87)
util rest of		0.9969		0.9454	0.7903	20.0380	20.0380		0.7193	0.9668			
MIT 2 Living area f	19.6023	19.1521		19.7586	19.9744	20.0350	20.0378		20.0136	19.7414 Living area	19.3204	19.1651	(90)
MIT Temperature a	djustment			20.0447	20.2565	20.3191	20.3231	20.3240		20.0264		19.4809 0.0000	(92)
adjusted MIT	19.8832	19.4764	19.7100	20.0447	20.2565	20.3191	20.3231	20.3240	20.2948	20.0264	19.6315	19.4809	(93)
8. Space heat													
Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	657.0276	737.3003						379.2180		0.9668 668.3445		633.2858	(95)
Ext temp. Heat loss rat	4.3000 e W 1561.6580			8.9000	11.7000 839.5235	14.6000 554.6681	16.6000 361.0821		14.1000 603.4935	10.6000	7.1000	4.2000 1514.6374	
Space heating	kWh		387.2727		41.3438	0.0000	0.0000	0.0000	0.0000	190.8551		655.7256	
Space heating Solar heating	requirement	t - total p	er year (kW	h/year)								3031.5275	. ,
Solar heating	contribution		0.0000 per year (ki		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 0.0000	(98b)
Space heating Space heating	673.0450			173.4455			0.0000	0.0000	0.0000	190.8551		655.7256 3031.5275	(98c)
Space heating					Par Jame	(, 1)				(98c)		32.9693	(99)
9a. Energy re		- Individua	l heating s	ystems, incl	luding micr	o-CHP							
Fraction of s	pace heat fi	rom seconda	ry/suppleme									0.0000 1.0000	
Efficiency of Efficiency of	main space	heating sy	stem 1 (in									247.6858 0.0000	(206)
Efficiency of												0.0000	
Space heating			Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating	efficiency	(main heat	387.2727 ing system: 247.6858	1)	41.3438	0.0000	0.0000	0.0000	0.0000	190.8551 247.6858	426.4398 247.6858	655.7256 247.6858	
Space heating	fuel (main		stem)	70.0264	16.6920	0.0000	0.0000	0.0000	0.0000	77.0553	172.1697	264.7409	
Space heating					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Space heating	0.0000	0.0000	stem 2) 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating	fuel (secon 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													
Efficiency of	246.3650	217.9398	231.8492	209.1766	203.5869	180.7208	173.7989	187.1869	187.2189	210.3436	223.1619	245.7912 188.7089	
(217)m Fuel for wate	188.7089 r heating, 1	188.7089 kWh/month	188.7089	188.7089	188.7089	188.7089	188.7089	188.7089	188.7089	188.7089	188.7089	188.7089	(217)
Space cooling	fuel requir			110.8462		95.7670	92.0989	99.1935	99.2104	111.4646	118.2572	130.2489	
(221)m Pumps and Fa Lighting	0.0000 0.0000 31.1079	0.0000 0.0000 24.9559	0.0000 0.0000 22.4700	0.0000 0.0000 16.4625	0.0000 0.0000 12.7161	0.0000 0.0000 10.3892	0.0000 0.0000 11.6001	0.0000 0.0000 15.0782	0.0000 0.0000 19.5851	0.0000 0.0000 25.6967	0.0000 0.0000 29.0244	0.0000 0.0000 31.9725	(231)
Electricity g (233a)m		PVs (Appen				0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Electricity g (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	
Electricity g	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					 (Appendix 	N) (negativ	ve if net o						
Electricity u (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 u (235c)m Electricity g (233b)m	0.0000 enerated by 0.0000	0.0000 PVs (Appen 0.0000	0.0000 dix M) (neg 0.0000	0.0000 ative quant: 0.0000	0.0000 ity) 0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	
Electricity u (235c)m Electricity g	0.0000 menerated by 0.0000 menerated by 0.0000	0.0000 PVs (Appen 0.0000 wind turbi 0.0000	0.0000 dix M) (neg 0.0000 nes (Append 0.0000	0.0000 ative quant: 0.0000 ix M) (negat 0.0000	0.0000 ity) 0.0000 tive quanti 0.0000	0.0000 ty) 0.0000	0.0000 0.0000 0.0000 ity)	0.0000	0.0000	0.0000			(233b)
Electricity u (235c)m Electricity g (233b)m Electricity g (234b)m Electricity g (235b)m Electricity u	0.0000 senerated by 0.0000 senerated by 0.0000 senerated by 0.0000 senerated by 0.0000	0.0000 PVs (Appen 0.0000 wind turbi 0.0000 hydro-elec 0.0000 electricity	0.0000 dix M) (neg. 0.0000 nes (Append 0.0000 tric genera 0.0000	0.0000 ative quanti 0.0000 ix M) (negat 0.0000 tors (Append 0.0000 by micro-CH	0.0000 ity) 0.0000 cive quanti 0.0000 dix M) (neg 0.0000 ? (Appendix	0.0000 ty) 0.0000 ative quant: 0.0000 N) (negative	0.0000 0.0000 0.0000 ity) 0.0000 ve if net g	0.0000 0.0000 0.0000 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	(233b) (234b) (235b)
Electricity u (235c)m Electricity g (233b)m Electricity g (234b)m Electricity g (235b)m	0.0000 enerated by 0.0000 enerated by 0.0000 enerated by 0.0000 sed or net e	0.0000 PVs (Appen 0.0000 wind turbi 0.0000 hydro-elec 0.0000	0.0000 dix M) (neg 0.0000 nes (Append 0.0000 tric genera 0.0000	0.0000 ative quant: 0.0000 ix M) (negat 0.0000 tors (Append	0.0000 ity) 0.0000 cive quanti 0.0000 dix M) (neg 0.0000	0.0000 ty) 0.0000 ative quant: 0.0000	0.0000 0.0000 0.0000 ity) 0.0000	0.0000 0.0000 0.0000 generation)	0.0000	0.0000	0.0000	0.0000	(233b) (234b) (235b)

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Space heating fuel - main system 1 Space heating fuel - main system 2 Space heating fuel - secondary Efficiency of water heater Water heating fuel used Space cooling fuel Electricity for pumps and fans: Total electricity for the above, kWh/year Electricity for lighting (calculated in Appendix L) Energy saving/generation technologies (Appendices M ,N and Q) PV generation Wind generation Hydro-electric generation (Appendix N) Electricity generated - Micro CHP (Appendix N) Appendix Q - special features Energy saved or generated Energy used Total delivered energy for all uses		1223.9409 (211) 0.0000 (213) 0.0000 (215) 188.7089 1333.8746 (219) 0.0000 (221) 0.0000 (231) 251.0584 (232) 0.0000 (233) 0.0000 (234) 0.0000 (235) -0.0000 (235) -0.0000 (236) 0.0000 (237) 2808.8738 (238)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Total CO2, kg/year EPC Dwelling Carbon Dioxide Emission Rate (DER)	Energy kWh/year kg CO2/kWh 1223,9409 0.1563 0.1408 0.0000 0.0000 251.0584 0.1443	kg CO2/year 191.2888 (261) 0.0000 (373) 187.8229 (264) 379.1117 (265) 0.0000 (267)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Total Primary energy kWh/year Dwelling Primary energy Rate (DPER)	Energy Primary energy factor kWh/year kg CO2/kWh 1223.9409 1.5786 1333.8746 1.5207 0.0000 0.0000 251.0584 1.5338	kWh/year 1932.1217 (275) 0.0000 (473) 2028.3662 (278) 3960.4899 (279) 0.0000 (281)
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS 1. Overall dwelling characteristics		
Ground floor First floor Second floor Total floor area TFA = (la)+(lb)+(lc)+(ld)+(le)(ln) Dwelling volume 91.9500	Area Storey height	(2b) = 12.1500 (1b) - (3b) (2c) = 161.4870 (1c) - (3c) (2d) = 66.0176 (1d) - (3d) (4)
Number of open chimneys Number of open flues Number of chimneys / flues attached to closed fire Number of flues attached to solid fuel boiler Number of flues attached to other heater Number of blocked chimneys Number of intermittent extract fans Number of passive vents Number of flueless gas fires Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+ Pressure test Pressure Test Method Measured/design AP50 Infiltration rate Number of sides sheltered		m3 per hour 0 * 80 = 0.0000 (6a) 0 * 20 = 0.0000 (6b) 0 * 10 = 0.0000 (6c) 0 * 20 = 0.0000 (6d) 0 * 35 = 0.0000 (6e) 3 * 10 = 30.0000 (7a) 0 * 10 = 0.0000 (7b) 0 * 40 = 0.0000 (7c) Air changes per hour / (5) = 0.1252 (8) Yes Blower Door 5.0000 (17) 0.3752 (18) 3 (19)
Shelter factor Infiltration rate adjusted to include shelter factor	(21) = (18) 1	(19)] = 0.7750 (20) x (20) = 0.2908 (21)
Jan Feb Mar Apr May Jun Jul Wind speed 5.1000 5.0000 4.9000 4.4000 4.3000 3.8000 3.8000 Wind factor 1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 Adj infilt rate	3.7000 4.0000 4.3000 0.9250 1.0000 1.0750	4.5000 4.7000 (22) 1.1250 1.1750 (22a)

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0.3416 (22b) 0.5584 (25) Effective ac 0.5661 0.5423 0.5687 0.5634 0.5511 0.5489 0.5382 0.5382 0.5362 0.5489 0.5535 3. Heat losses and heat loss parameter Gross m2 Openings m2 NetArea m2 U-value A x U W/K K-value kJ/m2K AxK kJ/K TER Opening Type (Uw = 1.20) 14.9900 1.1450 17.1641 Exposed Floor 7.2200 71.3400 0.1300 0.9386 (28b) (29a) 86.3300 14.9900 Cavity Wall 0.1800 Sloping Wall External Roof 1 (29a) (30) 13 0400 0.1800 Total net area of external elements Aum(A, m2) Fabric heat loss, W/K = Sum (A x U) 160.5700 (31) (26)...(30) + (32) = 39,2289 Party Wall 1 65.8800 0.0000 362.4428 (35) Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K List of Thermal Bridges KI Element
E2 Other lintels (including other steel lintels) Psi-value 0.0500 0.0500 Total 0.4100 0.4100 Length 8.2000 8.2000 E3 Sill 23.6700 0.0500 1.1835 E20 Exposed floor (normal) E7 Party floor between dwellings (in blocks of flats) 3.1200 31.4640 0.3200 0.9984 E7 Party floor between dwellings (in blocks of flats)
P7 Party Wall - Exposed floor (normal)
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)
E16 Corner (normal)
E25 Staggered party wall between dwellings
E18 Party wall between dwellings
E21 Exposed floor (inverted)
P4 Party wall - Roof (insulation at ceiling level)
P8 Party Wall - Exposed floor (inverted)
E14 Flat roof
E18 Roof to wall (rafter) 4.6700 14.4500 16.6400 0.1600 0.7472 0.0000 0.0000 1.4976 0.0600 26.8000 1.6080 5.2000 0.0600 0.3120 4.5960 24.4700 0.2400 1.1030 0.0800 R8 Roof to wall (rafter)
E6 Intermediate floor within a dwelling
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 0.0600 0.2592 14.9078 (36) Point Thermal bridges (36a) =0.0000 Total fabric heat loss (33) + (36) + 54.1367 (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr 43.5882 May 43.4064 Jun Jul Aug 42.4035 Sep 42.8861 Oct 43.4064 Jan (38)m 44.9777 Heat transfer coeff 44.7666 44.5598 42.5602 42.5602 44.1586 (38) 97.7249 96.5402 97.0229 97.9109 98.2954 (39) 99.1144 98.9034 98.6965 97.5432 96.6969 96.6969 97.5432 Average = Sum(39)m / 12 =97.7241 Jul Apr May Jun Sep 1.0779 1.0648 1.0690 (40) 1.0756 1.0734 1.0628 1.0608 1.0516 1.0516 1.0499 1.0552 1.0608 HLP (average) Days in mont 1.0628 31 31 4. Water heating energy requirements (kWh/year) Assumed occupancy Hot water usage for mixer showers 88,2264 86.9006 84.9685 81,2719 78.5438 75.5016 73.7723 75.6898 77.7916 81.0581 84.8342 87.8884 (42a) Hot water usage for baths
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42b) Hot water usage for other uses 41.7838 40.2644 38
Average daily hot water use (litres/day) 38,7450 37 2256 35 7062 34 1868 34 1868 35 7062 37 2256 38 7450 40.2644 41.7838 (42c) 119.3271 (43) Apr Mav Jun Jul Aug Sep Oct Nov Daily hot water use 130.0103 127.1650 Energy conte 205.9045 181.0812 129.6722 (44) 123.7135 118.4975 114,2500 109.6883 107.9591 111.3959 115.0172 119.8031 125.0986 190.1430 162.2171 153.8025 134.8746 130.5672 137.9315 141.8277 162.5717 178.2258 203.0354 (45) Energy content (annual)
Distribution loss (46)m = 0.15 x (45)m
30.8857 27.1622 28.5215 Total = Sum(45)m =1982,1821 23.0704 24.3858 Water storage loss: Water storage 1055.

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

Temperature factor from Table 2b

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

Total storage loss

23 3325 21.0745 23.3325 22.5798 23 150.0000 (47) 1.3938 0.5400 (49) 0.7527 (55) 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
Primary loss 23.2624 21.0112 23.2624 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 Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 Total heat required for water heating calculated for each month 252.4994 223.1669 236.7379 207.3089 200.3974 22 5120 23 2624 22 5120 23 2624 22 5120 23 2624 0.0000 200.3974 179.9664 177.1621 186.9196 209.1666 223.3177 249,6303 (62) 184.5264 -39.5865 (63a) -0.0000 (63b) 0.0000 (63c) WWHRS -40.3334 -0.0000 -35.6712 -0.0000 -37.3529 -0.0000 -30.9296 -0.0000 -28.8253 -0.0000 -24.6660 -0.0000 -24.5863 -0.0000 -25.5204 -0.0000 -30.0858 -0.0000 -34.0835 -0.0000 Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 **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 212.1659 187.4957 199.3851 176.3793 171.5721 155.3004 154.0416 159.9401 161.3992 179.0808 189.2342 210.0437 (64) Total per year (kWh/year) = Sum(64)m = 2156.0381 12Total per year (kWh/year) Electric shower(s) 2156 (64) 0.0000 0.0000 0.0000 Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a) Heat gains from water heating, kWh/month 105.7392 93.8781 100. 100.4985 90.0107 88.4152 80.9193 80.6895 83.1381 83.2312 91.3310 95.3336 104.7852 (65) 5. Internal gains (see Table 5 and 5a) Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun 132.5741 132.5741 132.5741 132.5741 132.5741 Jul 132.5741 Aug 132.5741 Sep Oct Nov Dec 132.5741 132.5741 132.5741 (66)

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Lighting gains					L9a), also s 127.2048			127 2048	131.4450	127.2048	131.4450	127.2048	(67)
Appliances ga:	ins (calcul	ated in App	endix L, eq	uation L13	or L13a), al	so see Tab	le 5						
Cooking gains	(calculate	d in Append	ix L, equat:	ion L15 or		see Table	5	178.9906	185.3350	198.8414	215.8908	231.9148	
Pumps, fans	3.0000	36.2574 3.0000	36.2574 3.0000	36.2574 3.0000	36.2574 3.0000	36.2574 0.0000	36.2574 0.0000	36.2574 0.0000	36.2574 0.0000	36.2574 3.0000	36.2574 3.0000	36.2574 3.0000	
Losses e.g. e	-106.0593	-106.0593			-106.0593	-106.0593	-106.0593	-106.0593	-106.0593	-106.0593	-106.0593	-106.0593	(71)
Water heating	142.1225		135.0786	125.0148	118.8377	112.3879	108.4536	111.7448	115.5989	122.7567	132.4077	140.8403	(72)
Total internal		591.4431	566.8487	547.5187	520.0521	498.8184	479.9390	480.7125	495.1511	514.5751	545.5157	565.7321	(73)
6. Solar gains													
[Jan]			A:	rea	Solar flux		g		FF	Acce	33	Gains	
				m2	Table 6a W/m2	Speci or	fic data Table 6b	Specific or Tab	data le 6c	fact Table		M	
Northeast			11.5	500	11.2829		0.6300	0		0.77		39.8269	(75)
Southeast Southwest			2.3	800 600	36.7938 36.7938		0.6300 0.6300	0	.7000 .7000	0.77	00 00	26.7623 11.9194	(77) (79)
Solar gains Total gains					447.5529 967.6049						96.4442 641.9599	65.6281 631.3602	
-													
7. Mean inter													
Temperature du Utilisation fa						Th1 (C)						21.0000	(85)
tau	Jan 93.4011	Feb 93.6004	Mar 93.7966			Jun 95.7362	Jul 95.7362	Aug 95.8916	Sep 95.4146	Oct 94.9056	Nov 94.5492	Dec 94.1794	
alpha util living a	7.2267	7.2400	7.2531	7.3153	7.3270	7.3824	7.3824	7.3928	7.3610	7.3270	7.3033	7.2786	
,	0.9992	0.9979	0.9933	0.9640	0.8497	0.6314	0.4610	0.5223	0.8101	0.9808	0.9978	0.9994	(86)
MIT Th 2	20.1320	20.2569	20.4496 20.0226	20.7252 20.0313	20.9260 20.0330	20.9926	20.9993	20.9984	20.9607	20.7030 20.0330	20.3733 20.0297	20.1128 20.0262	
util rest of h		0.9969	0.9898	0.9458	0.7911	0.5414	0.3610	0.4148	0.7232	0.9675	0.9965	0.9992	
MIT 2 Living area fi	19.0132	19.1743	19.4208	19.7662	19.9801	20.0375	20.0404	20.0416	20.0167	19.7470 Living are	19.3306	18.9944 0.2967	(90)
MIT Temperature a	19.3451	19.4955	19.7260	20.0508	20.2607	20.3209	20.3249	20.3255	20.2968		19.6399	19.3262	
adjusted MIT		19.4955	19.7260	20.0508	20.2607	20.3209	20.3249	20.3255	20.2968	20.0307	19.6399	19.3262	(93)
8. Space heat:	ing require	ment 											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(04)
Utilisation Useful gains	Jan 0.9985 655.2518	Feb 0.9962 735.5760	0.9884 793.7790	0.9463 850.8043	0.8062 780.0513	0.5682 549.3161	0.3907 359.9727	0.4469 378.4165	0.7485 576.9368	0.9674 664.1153	0.9958 639.2596	0.9989 630.6473	(95)
Utilisation	Jan 0.9985 655.2518 4.3000	Feb 0.9962 735.5760 4.9000	0.9884 793.7790 6.5000	0.9463 850.8043 8.9000	0.8062 780.0513 11.7000	0.5682 549.3161 14.6000	0.3907 359.9727 16.6000	0.4469 378.4165 16.4000	0.7485 576.9368 14.1000	0.9674 664.1153 10.6000	0.9958 639.2596 7.1000	0.9989 630.6473 4.2000	(95) (96)
Utilisation Useful gains Ext temp. Heat loss rate Space heating	Jan 0.9985 655.2518 4.3000 e W 1491.1909 kWh	Feb 0.9962 735.5760 4.9000	0.9884 793.7790 6.5000 1305.3629	0.9463 850.8043 8.9000 1089.7065	0.8062 780.0513 11.7000 835.0394	0.5682 549.3161 14.6000 553.1912	0.3907 359.9727 16.6000 360.1867	0.4469 378.4165 16.4000 378.9659	0.7485 576.9368 14.1000 601.2294	0.9674 664.1153 10.6000 919.8963	0.9958 639.2596 7.1000 1227.7950	0.9989 630.6473 4.2000 1486.8361	(95) (96) (97)
Utilisation Useful gains Ext temp. Heat loss rate Space heating Space heating	Jan 0.9985 655.2518 4.3000 e W 1491.1909 kWh 621.9387 requiremen	Feb 0.9962 735.5760 4.9000 1443.5434 475.7541	0.9884 793.7790 6.5000 1305.3629 380.6185	0.9463 850.8043 8.9000 1089.7065 172.0096	0.8062 780.0513 11.7000	0.5682 549.3161 14.6000 553.1912	0.3907 359.9727 16.6000 360.1867	0.4469 378.4165 16.4000 378.9659	0.7485 576.9368 14.1000 601.2294	0.9674 664.1153 10.6000 919.8963	0.9958 639.2596 7.1000 1227.7950	0.9989 630.6473 4.2000 1486.8361	(95) (96) (97)
Utilisation Useful gains Ext temp. Heat loss rate Space heating Space heating Solar heating	Jan 0.9985 655.2518 4.3000 e W 1491.1909 kWh 621.9387 requirement kWh 0.0000	Feb 0.9962 735.5760 4.9000 1443.5434 475.7541 t - total p 0.0000	0.9884 793.7790 6.5000 1305.3629 380.6185 er year (kWI	0.9463 850.8043 8.9000 1089.7065 172.0096 h/year)	0.8062 780.0513 11.7000 835.0394 40.9112	0.5682 549.3161 14.6000 553.1912	0.3907 359.9727 16.6000 360.1867	0.4469 378.4165 16.4000 378.9659	0.7485 576.9368 14.1000 601.2294	0.9674 664.1153 10.6000 919.8963	0.9958 639.2596 7.1000 1227.7950	0.9989 630.6473 4.2000 1486.8361 637.0045 2942.2832 0.0000	(95) (96) (97) (98a)
Utilisation Useful gains Ext temp. Heat loss rate Space heating Space heating	Jan 0.9985 655.2518 4.3000 e W 1491.1909 kWh 621.9387 requiremen kWh 0.0000 contributi kWh	Feb 0.9962 735.5760 4.9000 1443.5434 475.7541 t - total p 0.0000 on - total	0.9884 793.7790 6.5000 1305.3629 380.6185 er year (kWI 0.0000 per year (ki	0.9463 850.8043 8.9000 1089.7065 172.0096 h/year) 0.0000 Wh/year)	0.8062 780.0513 11.7000 835.0394 40.9112	0.5682 549.3161 14.6000 553.1912 0.0000	0.3907 359.9727 16.6000 360.1867 0.0000	0.4469 378.4165 16.4000 378.9659 0.0000	0.7485 576.9368 14.1000 601.2294 0.0000	0.9674 664.1153 10.6000 919.8963 190.3010 0.0000	0.9958 639.2596 7.1000 1227.7950 423.7455 0.0000	0.9989 630.6473 4.2000 1486.8361 637.0045 2942.2832 0.0000 0.0000	(95) (96) (97) (98a) (98b)
Utilisation Useful gains Ext temp. Heat loss rate Space heating Space heating Solar heating Solar heating Space heating Space heating	Jan 0.9985 655.2518 4.3000 e W 1491.1909 kWh 621.9387 requiremen kWh 0.0000 contributi kWh 621.9387 requiremen	Feb 0.9962 735.5760 4.9000 1443.5434 475.7541 t - total p 0.0000 on - total;	0.9884 793.7790 6.5000 1305.3629 380.6185 er year (kW) 0.0000 per year (ki	0.9463 850.8043 8.9000 1089.7065 172.0096 h/year) 0.0000 Wh/year)	0.8062 780.0513 11.7000 835.0394 40.9112 0.0000	0.5682 549.3161 14.6000 553.1912 0.0000 0.0000	0.3907 359.9727 16.6000 360.1867 0.0000	0.4469 378.4165 16.4000 378.9659 0.0000	0.7485 576.9368 14.1000 601.2294 0.0000	0.9674 664.1153 10.6000 919.8963 190.3010 0.0000	0.9958 639.2596 7.1000 1227.7950 423.7455 0.0000	0.9989 630.6473 4.2000 1486.8361 637.0045 2942.2832 0.0000 0.0000 637.0045 2942.2832	(95) (96) (97) (98a) (98b)
Utilisation Useful gains Ext temp. Heat loss rate Space heating Space heating Solar heating Solar heating	Jan 0.9985 655.2518 4.3000 e W 1491.1909 kWh 621.9387 requiremen kWh 0.0000 contributi kWh 621.9387 requiremen	Feb 0.9962 735.5760 4.9000 1443.5434 475.7541 t - total p 0.0000 on - total;	0.9884 793.7790 6.5000 1305.3629 380.6185 er year (kW) 0.0000 per year (ki	0.9463 850.8043 8.9000 1089.7065 172.0096 h/year) 0.0000 Wh/year)	0.8062 780.0513 11.7000 835.0394 40.9112 0.0000	0.5682 549.3161 14.6000 553.1912 0.0000 0.0000	0.3907 359.9727 16.6000 360.1867 0.0000	0.4469 378.4165 16.4000 378.9659 0.0000	0.7485 576.9368 14.1000 601.2294 0.0000	0.9674 664.1153 10.6000 919.8963 190.3010 0.0000	0.9958 639.2596 7.1000 1227.7950 423.7455 0.0000	0.9989 630.6473 4.2000 1486.8361 637.0045 2942.2832 0.0000 0.0000	(95) (96) (97) (98a) (98b)
Utilisation Useful gains Ext temp. Heat loss rate Space heating Space heating Solar heating Solar heating Space heating Space heating Space heating	Jan 0.9985 655.2518 4.3000 e W 1491.1909 kWh 621.9387 requiremen kWh 0.0000 contributi kWh 621.9387 requiremen per m2	Feb 0.9962 735.5760 4.9000 1443.5434 475.7541 t - total p 0.0000 on - total; 475.7541 t after sol	0.9884 793.7790 6.5000 1305.3629 380.6185 er year (kWI 0.0000 per year (ki	0.9463 850.8043 8.9000 1089.7065 172.0096 h/year) 0.0000 Wh/year) 172.0096 tion - tota	0.8062 780.0513 11.7000 835.0394 40.9112 0.0000 40.9112 1 per year (0.5682 549.3161 14.6000 553.1912 0.0000 0.0000 0.0000 (kWh/year)	0.3907 359.9727 16.6000 360.1867 0.0000 0.0000	0.4469 378.4165 16.4000 378.9659 0.0000 0.0000	0.7485 576.9368 14.1000 601.2294 0.0000	0.9674 664.1153 10.6000 919.8963 190.3010 0.0000	0.9958 639.2596 7.1000 1227.7950 423.7455 0.0000	0.9989 630.6473 4.2000 1486.8361 637.0045 2942.2832 0.0000 0.0000 637.0045 2942.2832	(95) (96) (97) (98a) (98b)
Utilisation Useful gains Ext temp. Heat loss rate Space heating Space heating Solar heating Space heating Space heating Space heating Space heating	Jan 0.985 655.2518 4.3000 e W 1491.1909 kWh 621.9387 requiremen kWh 0.0000 contributi kWh 621.9387 requiremen per m2	Feb 0.9962 735.5760 4.9000 1443.5434 475.7541 t - total p 0.0000 on - total; 475.7541 t after sol	0.9884 793.7790 6.5000 1305.3629 380.6185 er year (kWI 0.0000 per year (kWI 380.6185 ar contribut	0.9463 850.8043 8.9000 1089.7065 172.0096 h/year) 0.0000 Wh/year) 172.0096 tion - tota	0.8062 780.0513 11.7000 835.0394 40.9112 0.0000 40.9112 1 per year (0.5682 549.3161 14.6000 553.1912 0.0000 0.0000 0.0000 (kWh/year)	0.3907 359.9727 16.6000 360.1867 0.0000 0.0000	0.4469 378.4165 16.4000 378.9659 0.0000 0.0000	0.7485 576.9368 14.1000 601.2294 0.0000	0.9674 664.1153 10.6000 919.8963 190.3010 0.0000	0.9958 639.2596 7.1000 1227.7950 423.7455 0.0000	0.9989 630.6473 4.2000 1486.8361 637.0045 2942.2832 0.0000 0.0000 637.0045 2942.2832	(95) (96) (97) (98a) (98b)
Utilisation Useful gains Ext temp. Heat loss rate Space heating Space heating Solar heating Solar heating Space heating Space heating Space heating Space heating Fraction of si	Jan 0.9985 655.2518 4.3000 e W 1491.1909 kWh 621.9387 requiremen kWh 0.0000 contributi kWh 621.9387 requiremen per m2	Feb 0.9962 735.5760 4.9000 1443.5434 475.7541 t - total p 0.0000 on - total; 475.7541 t after sol	0.9884 793.7790 6.5000 1305.3629 380.6185 er year (kWI 0.0000 per year (kI 380.6185 ar contribut	0.9463 850.8043 8.9000 1089.7065 172.0096 h/year) 0.0000 Wh/year) 172.0096 tion - tota	0.8062 780.0513 11.7000 835.0394 40.9112 0.0000 40.9112 1 per year (0.5682 549.3161 14.6000 553.1912 0.0000 0.0000 0.0000 (kWh/year)	0.3907 359.9727 16.6000 360.1867 0.0000 0.0000	0.4469 378.4165 16.4000 378.9659 0.0000 0.0000	0.7485 576.9368 14.1000 601.2294 0.0000	0.9674 664.1153 10.6000 919.8963 190.3010 0.0000	0.9958 639.2596 7.1000 1227.7950 423.7455 0.0000	0.9989 630.6473 4.2000 1486.8361 637.0045 2942.2832 0.0000 637.0045 2942.2832 31.9987	(95) (96) (97) (98a) (98b) (98c) (99)
Utilisation Useful gains Ext temp. Heat loss rate Space heating Space heating Solar heating Solar heating Space heating Space heating Space heating Space heating Space heating	Jan 0.9985 655.2518 4.3000 e W 1491.1909 kWh 621.9387 requiremen kWh 621.9387 requiremen per m2	Feb 0.9962 735.5760 4.9000 1443.5434 475.7541 t - total p 0.0000 on - total; 475.7541 t after sol	0.9884 793.7790 6.5000 1305.3629 380.6185 er year (kWl 0.0000 per year (ki 380.6185 ar contribut 1 heating sy	0.9463 850.8043 8.9000 1089.7065 172.0096 h/year) 0.0000 Wh/year) 172.0096 tion - tota	0.8062 780.0513 11.7000 835.0394 40.9112 0.0000 40.9112 1 per year (0.5682 549.3161 14.6000 553.1912 0.0000 0.0000 0.0000 (kWh/year)	0.3907 359.9727 16.6000 360.1867 0.0000 0.0000	0.4469 378.4165 16.4000 378.9659 0.0000 0.0000	0.7485 576.9368 14.1000 601.2294 0.0000	0.9674 664.1153 10.6000 919.8963 190.3010 0.0000	0.9958 639.2596 7.1000 1227.7950 423.7455 0.0000	0.9989 630.6473 4.2000 1486.8361 637.0045 2942.2832 0.0000 0.0000 637.0045 2942.2832 31.9987	(95) (96) (97) (98a) (98b) (98c) (99)
Utilisation Useful gains Ext temp. Heat loss rate Space heating Space heating Solar heating Space heating Space heating Space heating Space heating Fraction of spraction of spraction of spraction of sprace in the sprace of spraction of spractic sprac	Jan 0.9985 655.2518 4.3000 e W 1491.1909 kWh 621.9387 requiremen kWh 621.9387 requiremen per m2	Feb 0.9962 735.5760 4.9000 1443.5434 475.7541 t - total p 0.0000 on - total; 475.7541 t after sol - Individua rom seconda rom main sy heating sy heating sy heating sy	0.9884 793.7790 6.5000 1305.3629 380.6185 er year (kWI 0.0000 per year (ki 380.6185 ar contribut 1 heating sy ry/supplement stem (s) stem 1 (in the stem 2 (0.9463 850.8043 8.9000 1089.7065 172.0096 h/year) 0.0000 Wh/year) 172.0096 tion - tota	0.8062 780.0513 11.7000 835.0394 40.9112 0.0000 40.9112 1 per year (0.5682 549.3161 14.6000 553.1912 0.0000 0.0000 0.0000 (kWh/year)	0.3907 359.9727 16.6000 360.1867 0.0000 0.0000	0.4469 378.4165 16.4000 378.9659 0.0000 0.0000	0.7485 576.9368 14.1000 601.2294 0.0000	0.9674 664.1153 10.6000 919.8963 190.3010 0.0000	0.9958 639.2596 7.1000 1227.7950 423.7455 0.0000	0.9989 630.6473 4.2000 1486.8361 637.0045 2942.2832 0.0000 637.0045 2942.2832 31.9987	(95) (96) (97) (98a) (98b) (98c) (99) (201) (202) (206) (207)
Utilisation Useful gains Ext temp. Heat loss rate Space heating Space heating Solar heating Space heating Space heating Space heating Fraction of space heating Fraction of space fifticiency of	Jan 0.9985 655.2518 4.3000 e W 1491.1909 kWh 621.9387 requiremen kWh 621.9387 requiremen per m2	Feb 0.9962 735.5760 4.9000 1443.5434 475.7541 t - total p 0.0000 on - total; 475.7541 t after sol - Individua rom seconda rom main sy heating sy heating sy heating sy	0.9884 793.7790 6.5000 1305.3629 380.6185 er year (kWI 0.0000 per year (ki 380.6185 ar contribut 1 heating sy ry/supplement stem (s) stem 1 (in the stem 2 (0.9463 850.8043 8.9000 1089.7065 172.0096 h/year) 0.0000 Wh/year) 172.0096 tion - tota	0.8062 780.0513 11.7000 835.0394 40.9112 0.0000 40.9112 1 per year (0.5682 549.3161 14.6000 553.1912 0.0000 0.0000 0.0000 (kWh/year)	0.3907 359.9727 16.6000 360.1867 0.0000 0.0000	0.4469 378.4165 16.4000 378.9659 0.0000 0.0000	0.7485 576.9368 14.1000 601.2294 0.0000	0.9674 664.1153 10.6000 919.8963 190.3010 0.0000	0.9958 639.2596 7.1000 1227.7950 423.7455 0.0000	0.9989 630.6473 4.2000 1486.8361 637.0045 2942.2832 0.0000 637.0045 2942.2832 31.9987	(95) (96) (97) (98a) (98b) (98c) (99) (201) (202) (206) (207)
Utilisation Useful gains Ext temp. Heat loss rate Space heating Space heating Solar heating Space heating Space heating Space heating Fraction of space heating Fraction of space fifticiency of	Jan 0.9985 655.2518 4.3000 e W 1491.1909 kWh 621.9387 requiremen kWh 0.0000 contributi kWh 621.9387 requirement per m2 quirements pace heat f main space main space secondary/Jan requiremen	Feb 0.9962 735.5760 4.9000 1443.5434 475.7541 t - total p 0.0000 on - total; 475.7541 t after sol - Individua - rom seconda yheating sy heating sy supplementa Feb t	0.9884 793.7790 6.5000 1305.3629 380.6185 er year (kWI 0.0000 per year (kWI 380.6185 ar contribut 1 heating sy ry/supplements stem 1 (in stem 1 (in stem 2 (in stem	0.9463 850.8043 8.9000 1089.7065 172.0096 h/year) 0.0000 Wh/year) 172.0096 tion - tota ystems, inc ntary syste %) %) system, % Apr	0.8062 780.0513 11.7000 835.0394 40.9112 0.0000 40.9112 1 per year (0.5682 549.3161 14.6000 553.1912 0.0000 0.0000 0.0000 (kWh/year)	0.3907 359.9727 16.6000 360.1867 0.0000 0.0000	0.4469 378.4165 16.4000 378.9659 0.0000 0.0000	0.7485 576.9368 14.1000 601.2294 0.0000 0.0000	0.9674 664.1153 10.6000 919.8963 190.3010 0.0000 190.3010 (98c	0.9958 639.2596 7.1000 1227.7950 423.7455 0.0000 423.7455) / (4) =	0.9989 630.6473 4.2000 1486.8361 637.0045 2942.2832 0.0000 637.0045 2942.2832 31.9987 0.0000 1.0000 92.33000 0.00000 0.00000	(95) (96) (97) (98a) (98b) (98c) (99) (201) (202) (206) (207) (208)
Utilisation Useful gains Ext temp. Heat loss rate Space heating Space heating Solar heating Space heating Space heating Space heating Space heating Space heating Fraction of sp. Fraction of	Jan 0.9985 655.2518 4.3000 e W 1491.1909 kWh 621.9387 requiremen kWh 0.0000 contributi kWh 621.9387 requirements pace heat f p	Feb 0.9962 735.5760 4.9000 1443.5434 475.7541 t - total p 0.0000 on - total : 475.7541 t after sol - Individua rom seconda rom main sy heating sy heating sy supplementa Feb t 475.7541 (main heat 92.3000	0.9884 793.7790 6.5000 1305.3629 380.6185 er year (kWI 0.0000 per year (kWI 380.6185 ar contribut 1 heating system 1 (in stem 1 (in stem 1 (in stem 2 (in stem 2 (in stem 2 (in stem 2 (in stem 3 (in stem 2 (in	0.9463 850.8043 8.9000 1089.7065 172.0096 h/year) 0.0000 Wh/year) 172.0096 tion - tota ystems, incontary system %) %) %) %) %) %) %) Apr 172.0096	0.8062 780.0513 11.7000 835.0394 40.9112 0.0000 40.9112 1 per year (0.5682 549.3161 14.6000 553.1912 0.0000 0.0000 0.0000 (kWh/year)	0.3907 359.9727 16.6000 360.1867 0.0000 0.0000	0.4469 378.4165 16.4000 378.9659 0.0000 0.0000	0.7485 576.9368 14.1000 601.2294 0.0000 0.0000	0.9674 664.1153 10.6000 919.8963 190.3010 0.0000 190.3010 (98c	0.9958 639.2596 7.1000 1227.7950 423.7455 0.0000 423.7455) / (4) =	0.9989 630.6473 4.2000 1486.8361 637.0045 2942.2832 0.0000 637.0045 2942.2832 31.9987 0.0000 1.0000 92.3000 0.0000 Dec	(95) (96) (97) (98a) (98b) (98c) (99) (201) (202) (206) (207) (208)
Utilisation Useful gains Ext temp. Heat loss rate Space heating Space heating Solar heating Solar heating Space heating Space heating Space heating Fraction of spraction of spractic spraction of spraction of spractic sp	Jan 0.9985 655.2518 4.3000 e W 1491.1909 kWh 621.9387 requiremen kWh 621.9387 requiremen per m2 pace heat f pace	Feb 0.9962 735.5760 4.9000 1443.5434 475.7541 t - total p 0.0000 on - total : 475.7541 t after sol - Individua rom main sy heating sy heating sy supplementa Feb t 475.7541 (main heat 92.3000 heating sy heating sy heating sy heating sy heating sy supplementa Feb t 475.7541 (main heat 92.3000 heating sy heati	0.9884 793.7790 6.5000 1305.3629 380.6185 er year (kWI 0.0000 per year (kWI 380.6185 ar contribut 1 heating system 1 (in stem 1 (in stem 1 (in stem 2 (in stem 2 (in stem 2 (in stem 2 (in stem 3 (in stem 2 (in	0.9463 850.8043 8.9000 1089.7065 172.0096 h/year) 0.0000 Wh/year) 172.0096 tion - tota ystems, inc ntary syste %) %) system, % Apr 172.0096 1) 92.3000	0.8062 780.0513 11.7000 835.0394 40.9112 0.0000 40.9112 1 per year (0.5682 549.3161 14.6000 553.1912 0.0000 0.0000 (kWh/year)	0.3907 359.9727 16.6000 360.1867 0.0000 0.0000 Jul 0.0000	0.4469 378.4165 16.4000 378.9659 0.0000 0.0000	0.7485 576.9368 14.1000 601.2294 0.0000 0.0000 0.0000	0.9674 664.1153 10.6000 919.8963 190.3010 0.0000 190.3010 (98c	0.9958 639.2596 7.1000 1227.7950 423.7455 0.0000 423.7455) / (4) =	0.9989 630.6473 4.2000 1486.8361 637.0045 2942.2832 0.0000 637.0045 2942.2932 31.9987 0.0000 92.3000 0.0000 Dec 637.0045	(95) (96) (97) (98a) (98b) (98c) (99) (201) (202) (206) (207) (208) (98) (210)
Utilisation Useful gains Ext temp. Heat loss rate Space heating Space heating Solar heating Space heating Space heating Space heating Space heating Space heating Fraction of sp. Fraction of	Jan 0.9985 655.2518 4.3000 e W 1491.1909 kWh 621.9387 requiremen kWh 0.0000 contributi kWh 622.9387 requirements per m2 contributi kWh 621.9387 requirements pace heat f main space main space main space secondary/ Jan requiremen 621.9387 Jan requiremen 621.9387 requiremen 621.9387 difficiency 92.3000 fuel (main 673.8231	Feb 0.9962 735.5760 4.9000 1443.5434 475.7541 t - total p 0.0000 on - total; 475.7541 t after sol - Individua rom seconda rom main sy heating sy heating sy supplementa Feb t 475.7541 (main heat 92.3000 heating sy 515.4432	0.9884 793.7790 6.5000 1305.3629 380.6185 er year (kW) 0.0000 per year (kW) 380.6185 ar contribut 1 heating system 1 (in stem 2 (in stem 2) (in stem	0.0463 850.8043 8.9000 1089.7065 172.0096 h/year) 0.0000 Wh/year) 172.0096 tion - tota ystems, inc mary system % Apr 172.0096 1) 92.3000 186.3593	0.8062 780.0513 11.7000 835.0394 40.9112 0.0000 40.9112 1 per year (0.5682 549.3161 14.6000 553.1912 0.0000 0.0000 (kWh/year) 0-CHP Jun 0.0000 0.0000	0.3907 359.9727 16.6000 360.1867 0.0000 0.0000 Jul 0.0000 0.0000	0.4469 378.4165 16.4000 378.9659 0.0000 0.0000 Aug 0.0000 0.0000	0.7485 576.9368 14.1000 601.2294 0.0000 0.0000 0.0000	0.9674 664.1153 10.6000 919.8963 190.3010 0.0000 190.3010 (98c	0.9958 639.2596 7.1000 1227.7950 423.7455 0.0000 423.7455) / (4) = Nov 423.7455 92.3000	0.9989 630.6473 4.2000 1486.8361 637.0045 2942.2832 0.0000 637.0045 2942.2832 31.9987 0.0000 1.0000 92.33000 0.0000 Dec 637.0045 92.3000 690.1457	(95) (96) (97) (98a) (98b) (98c) (99) (201) (202) (206) (207) (208) (98) (210) (211)
Utilisation Useful gains Ext temp. Heat loss rate Space heating Space heating Solar heating Solar heating Space heating Space heating Space heating Fraction of space heating Efficiency of Efficiency of Efficiency of Space heating Space heating	Jan 0.9985 655.2518 4.3000 e W 1491.1909 kWh 621.9387 requiremen kWh 621.9387 requiremen requiremen contributi kWh 621.9387 requiremen per m2 Quirements quirements quirements condary/ Jan requiremen 621.9387 requiremen face heat f pace heat f pa	Feb 0.9962 735.5760 4.9000 1443.5434 475.7541 t - total p 0.0000 on - total; 475.7541 t after sol - Individua rom seconda rom main sy heating sy heating sy supplementa Feb t 475.7541 (main heat 92.3000 heating sy 515.4432 (main heat 0.0000	0.9884 793.7790 6.5000 1305.3629 380.6185 er year (kWI 0.0000 per year (kWI 380.6185 ar contribut 1 heating s; ry/supplements stem 1 (in stem 2 (in stem	0.9463 850.8043 8.9000 1089.7065 172.0096 h/year) 0.0000 Wh/year) 172.0096 tion - tota wystems, inc ntary syste % % Apr 172.0096 1) 92.3000 186.3593 0.0000	0.8062 780.0513 11.7000 835.0394 40.9112 0.0000 40.9112 1 per year (0.5682 549.3161 14.6000 553.1912 0.0000 0.0000 (kWh/year) CHP Jun 0.0000 0.0000	Jul 0.0000 0.0000 0.0000 0.0000	0.4469 378.4165 16.4000 378.9659 0.0000 0.0000 Aug 0.0000 0.0000 0.0000 0.0000	0.7485 576.9368 14.1000 601.2294 0.0000 0.0000 0.0000 Sep 0.0000 0.0000 0.0000	0.9674 664.1153 10.6000 919.8963 190.3010 0.0000 190.3010 (98c	0.9958 639.2596 7.1000 1227.7950 423.7455 0.0000 423.7455) / (4) = Nov 423.7455 92.3000 459.0959 0.0000	0.9989 630.6473 4.2000 1486.8361 637.0045 2942.2832 0.0000 637.0045 2942.2832 31.9987 0.0000 0.0000 0.0000 Dec 637.0045 92.3000 690.1457 0.0000	(95) (96) (97) (98a) (98b) (98c) (99) (201) (202) (206) (207) (208) (210) (211) (212)
Utilisation Useful gains Ext temp. Heat loss rate Space heating Space heating Solar heating Space heating Space heating Space heating Space heating Fraction of space heating	Jan 0.9985 655.2518 4.3000 e 1491.1909 kWh 621.9387 requirement kWh 621.9387 requirement contributi kWh 621.9387 requirement accident per m2 Jan requirement 621.9387 requirement contributi contribu	Feb 0.9962 735.5760 4.9000 1443.5434 475.7541 t - total p 0.0000 on - total; 475.7541 t after sol - Individua - rom seconda rom main sy heating sy heating sy heating sy heating sy supplementa Feb t 475.7541 (main heat 92.3000 heating sy 515.4432 (main heat 0.0000 heating sy 0.0000 ndary)	0.9884 793.7790 6.5000 1305.3629 380.6185 er year (kW) 0.0000 per year (kW) 380.6185 ar contribut 1 heating system 1 (in: stem 1 (in: stem 2 (in: stem 1) Mar 380.6185 ing system: 92.3000 stem, 412.3710 ing system: 0.0000 stem 2) 0.0000	0.0463 850.8043 8.9000 1089.7065 172.0096 h/year) 0.0000 Wh/year) 172.0096 tion - tota ystems, inc ntary syste %) %) % Apr 172.0096 1) 92.3000 186.3593 2) 0.0000	0.8062 780.0513 11.7000 835.0394 40.9112 0.0000 40.9112 1 per year (0.5682 549.3161 14.6000 553.1912 0.0000 0.0000 0.0000 (kWh/year) D-CHP Jun 0.0000 0.0000 0.0000	Jul 0.0000 0.0000 0.0000 0.0000	0.4469 378.4165 16.4000 378.9659 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.7485 576.9368 14.1000 601.2294 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.9674 664.1153 10.6000 919.8963 190.3010 0.0000 190.3010 (98c	0.9958 639.2596 7.1000 1227.7950 423.7455 0.0000 423.7455) / (4) = Nov 423.7455 92.3000 459.0959 0.0000 0.0000	0.9989 630.6473 4.2000 1486.8361 637.0045 2942.2832 0.0000 637.0045 2942.2832 31.9987 0.0000 0.0000 0.0000 Dec 637.0045 92.3000 690.1457 0.0000 0.0000	(95) (96) (97) (98a) (98b) (98c) (99) (201) (202) (206) (207) (208) (98) (210) (211) (212) (213)
Utilisation Useful gains Ext temp. Heat loss rate Space heating Space heating Solar heating Solar heating Space heating Space heating Space heating Fraction of space heating	Jan 0.9985 655.2518 4.3000 e W 1491.1909 kWh 621.9387 requirement kWh 621.9387 requirement per m2 pace heat f pace	Feb 0.9962 735.5760 4.9000 1443.5434 475.7541 t - total p 0.0000 on - total; 475.7541 t after sol tafter sol t	0.9884 793.7790 6.5000 1305.3629 380.6185 er year (kW) 0.0000 per year (kW) 380.6185 ar contribut 1 heating system 1 (in: stem 1 (in: stem 2 (in: stem 1) Mar 380.6185 ing system: 92.3000 stem, 412.3710 ing system: 0.0000 stem 2) 0.0000	0.9463 850.8043 8.9000 1089.7065 172.0096 h/year) 0.0000 Wh/year) 172.0096 tion - tota wystems, inc ntary syste % % Apr 172.0096 1) 92.3000 186.3593 0.0000	0.8062 780.0513 11.7000 835.0394 40.9112 0.0000 40.9112 1 per year (luding micro m (Table 11) May 40.9112 92.3000 44.3241 0.0000	0.5682 549.3161 14.6000 553.1912 0.0000 0.0000 0.0000 0.Wh/year) D-CHP Jun 0.0000 0.0000 0.0000	Jul 0.0000 0.0000 0.0000 0.0000	0.4469 378.4165 16.4000 378.9659 0.0000 0.0000 Aug 0.0000 0.0000 0.0000 0.0000	0.7485 576.9368 14.1000 601.2294 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.9674 664.1153 10.6000 919.8963 190.3010 0.0000 190.3010 (98c	0.9958 639.2596 7.1000 1227.7950 423.7455 0.0000 423.7455) / (4) = Nov 423.7455 92.3000 459.0959 0.0000	0.9989 630.6473 4.2000 1486.8361 637.0045 2942.2832 0.0000 637.0045 2942.2832 31.9987 0.0000 0.0000 0.0000 Dec 637.0045 92.3000 690.1457 0.0000	(95) (96) (97) (98a) (98b) (98c) (99) (201) (202) (206) (207) (208) (98) (210) (211) (212) (213)
Utilisation Useful gains Ext temp. Heat loss rate Space heating Space heating Solar heating Space heating Space heating Space heating Fraction of space heating	Jan 0.9985 655.2518 4.3000 e W 1491.1909 kWh 621.9387 requiremen kWh 621.9387 requiremen contributi kWh 621.9387 requiremen per m2 Quirements pace heat f pace he	Feb 0.9962 735.5760 4.9000 1443.5434 475.7541 t - total p 0.0000 on - total; 475.7541 t after sol - Individua	0.9884 793.7790 6.5000 1305.3629 380.6185 er year (kWI 0.0000 per year (kI 380.6185 ar contribut 1 heating system (s) stem 1 (in stem 2 (in stem 1 (in st	0.9463 850.8043 8.9000 1089.7065 172.0096 h/year) 0.0000 Wh/year) 172.0096 tion - tota ystems, inc. ntary syste %) %) %) system, % Apr 172.0096 1) 92.3000 186.3593 2) 0.0000 0.0000	0.8062 780.0513 11.7000 835.0394 40.9112 0.0000 40.9112 1 per year (0.5682 549.3161 14.6000 553.1912 0.0000 0.0000 (kWh/year) CHP Jun 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	Jul 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.4469 378.4165 16.4000 378.9659 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.7485 576.9368 14.1000 601.2294 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.9674 664.1153 10.6000 919.8963 190.3010 0.0000 190.3010 (98c	0.9958 639.2596 7.1000 1227.7950 423.7455 0.0000 423.7455) / (4) = Nov 423.7455 92.3000 459.0959 0.0000 0.0000	0.9989 630.6473 4.2000 1486.8361 637.0045 2942.2832 0.0000 637.0045 2942.2832 31.9987 0.0000 1.0000 92.33000 0.0000 Dec 637.0045 92.3000 690.1457 0.0000 0.0000 0.0000	(95) (96) (97) (98a) (98b) (98c) (99) (201) (202) (206) (207) (208) (210) (211) (212) (213) (215)
Utilisation Useful gains Ext temp. Heat loss rate Space heating Space heating Solar heating Solar heating Space heating Space heating Space heating Space heating Fraction of space heating	Jan 0.9985 655.2518 4.3000 e W 1491.1909 kWh 621.9387 requiremen kWh 0.0000 contributi kWh 621.9387 requiremen per m2 quirements pace heat f main space m	Feb 0.9962 735.5760 4.9000 1443.5434 475.7541 t - total p 0.0000 on - total: 475.7541 t after sol t af	0.9884 793.7790 6.5000 1305.3629 380.6185 er year (kWI 0.0000 per year (kWI 380.6185 ar contribut 1 heating system (s) stem 1 (in stem 1 (in stem 1) stem 2 (in stem 1) year (kWI 380.6185 ing system (s) stem 0 0.0000 stem 0 0.0000 199.3851	0.9463 850.8043 8.9000 1089.7065 172.0096 h/year) 0.0000 Wh/year) 172.0096 tion - tota whose the second of the se	0.8062 780.0513 11.7000 835.0394 40.9112 0.0000 40.9112 1 per year (0.5682 549.3161 14.6000 553.1912 0.0000 0.0000 0.0000 (kWh/year) D-CHP Jun 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 155.3004	Jul 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.4469 378.4165 16.4000 378.9659 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.7485 576.9368 14.1000 601.2294 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 161.3992	0.9674 664.1153 10.6000 919.8963 190.3010 0.0000 190.3010 (98c Oct 190.3010 92.3000 206.1766 0.0000 0.0000 179.0808	0.9958 639.2596 7.1000 1227.7950 423.7455 0.0000 423.7455) / (4) = Nov 423.7455 92.3000 459.0959 0.0000 0.0000 0.0000	0.9989 630.6473 4.2000 1486.8361 637.0045 2942.2832 0.0000 637.0045 2942.2832 31.9987 0.0000 1.0000 92.3000 0.0000 Dec 637.0045 92.3000 690.1457 0.0000 0.0000 0.0000	(95) (96) (97) (98a) (98b) (98c) (99) (201) (202) (206) (207) (208) (211) (212) (213) (215)
Utilisation Useful gains Ext temp. Heat loss rate Space heating Space heating Solar heating Solar heating Space heating Space heating Space heating Space heating Fraction of space heating	Jan 0.9985 655.2518 4.3000 e 1491.1909 kWh 621.9387 requiremen kWh 0.0000 contributi kWh 621.9387 requiremen per m2 Quirements pace heat f main space mai	Feb 0.9962 735.5760 4.9000 1443.5434 475.7541 t - total p 0.0000 on - total; 475.7541 t after sol tafter sol t	0.9884 793.7790 6.5000 1305.3629 380.6185 er year (kW) 0.0000 per year (kW) 380.6185 ar contribut 1 heating system (system 2) 1 heating system 2 1 heating system 2 2.3000 192.3000 199.3851 85.4857	0.0463 850.8043 8.9000 1089.7065 172.0096 h/year) 0.0000 Wh/year) 172.0096 tion - tota ystems, inc mary system, % Apr 172.0096 10 92.3000 186.3593 2) 0.0000 0.0000 176.3793 84.0035	0.8062 780.0513 717.7000 835.0394 40.9112 0.0000 40.9112 1 per year (1.1 per year (1.2 per year (1.3 per year (1.4 per year (1.5 per	0.5682 549.3161 14.6000 553.1912 0.0000 0.0000 0.0000 (kWh/year) D-CHP Jun 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 155.3004 79.8000	Jul 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.4469 378.4165 16.4000 378.9659 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 159.9401 79.8000	0.7485 576.9368 14.1000 601.2294 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 161.3992 79.8000	0.9674 664.1153 10.6000 919.8963 190.3010 0.0000 190.3010 (98c Oct 190.3010 92.3000 206.1766 0.0000 0.0000 179.0808 84.1963	0.9958 639.2596 7.1000 1227.7950 423.7455 0.0000 423.7455) / (4) = Nov 423.7455 92.3000 459.0959 0.0000 0.0000 189.2342 85.8123	0.9989 630.6473 4.2000 1486.8361 637.0045 2942.2832 0.0000 637.0045 2942.2832 31.9987 0.0000 0.0000 Dec 637.0045 92.3000 0.0000 Dec 637.0045 92.3000 0.0000 0.0000 0.0000 0.0000	(95) (96) (97) (98a) (98b) (98c) (99) (201) (202) (206) (207) (208) (210) (211) (212) (213) (215) (64) (216) (217)
Utilisation Useful gains Ext temp. Heat loss rate Space heating Space heating Solar heating Space heating	Jan 0.9985 655.2518 4.3000 e W 1491.1909 kWh 621.9387 requirement kWh 621.9387 requirement main space heat f pace	Feb 0.9962 735.5760 4.9000 1443.5434 475.7541 t - total p 0.0000 on - total; 475.7541 t after sol tafter sol t	0.9884 793.7790 6.5000 1305.3629 380.6185 er year (kW) 0.0000 per year (kW) 380.6185 ar contribut 1 heating system (system 2) 1 heating system 2 1 heating system 2 2.3000 192.3000 199.3851 85.4857	0.9463 850.8043 8.9000 1089.7065 172.0096 h/year) 0.0000 Wh/year) 172.0096 tion - tota whose the second of the se	0.8062 780.0513 717.7000 835.0394 40.9112 0.0000 40.9112 1 per year (1.1 per year (1.2 per year (1.3 per year (1.4 per year (1.5 per	0.5682 549.3161 14.6000 553.1912 0.0000 0.0000 0.0000 (kWh/year) D-CHP Jun 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 155.3004	Jul 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.4469 378.4165 16.4000 378.9659 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.7485 576.9368 14.1000 601.2294 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 161.3992 79.8000	0.9674 664.1153 10.6000 919.8963 190.3010 0.0000 190.3010 (98c Oct 190.3010 92.3000 206.1766 0.0000 0.0000 179.0808	0.9958 639.2596 7.1000 1227.7950 423.7455 0.0000 423.7455) / (4) = Nov 423.7455 92.3000 459.0959 0.0000 0.0000 0.0000	0.9989 630.6473 4.2000 1486.8361 637.0045 2942.2832 0.0000 637.0045 2942.2832 31.9987 0.0000 0.0000 Dec 637.0045 92.3000 0.0000 Dec 637.0045 92.3000 0.0000 0.0000 0.0000 0.0000	(95) (96) (97) (98a) (98b) (98c) (99) (201) (202) (206) (207) (208) (210) (211) (212) (213) (215) (64) (216) (217) (219)

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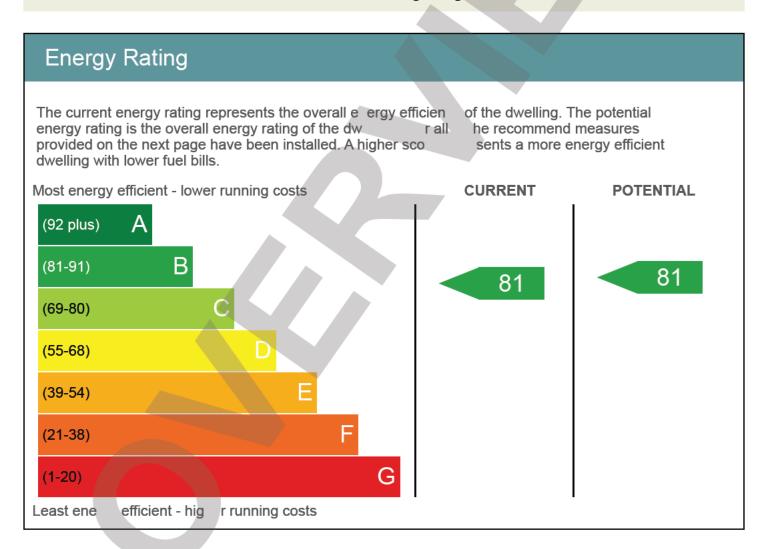
Pumps and Fa 7.3041 6.5973 7.3041 7.0685 7.3041 7.0685 7.304 Lighting 26.4306 21.2036 19.0915 13.9873 10.8042 8.8271 9.855	7.3041 9 12.8111	7.0685 16.6404	7.3041 21.8331	7.0685 24.6604	7.3041 27.1652	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m -30.8211 -44.6104 -65.8046 -75.9780 -83.6196 -78.6382 -77.652			-51.8847	-34.2865	-26.5114	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.000		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	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net (235c)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 Electricity generated by FVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
(233b)m -14.0566 -29.9011 -60.0562 -91.1267 -121.4089 -122.3440 -120.925 Electricity generated by wind turbines (Appendix M) (negative quantity)	-101.9844	-74.2074	-43.0897	-18.8715	-11.0925	(233b)
(234b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
(235b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net	generation)		0.0000		0.0000	
(235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 Annual totals kWh/year	0.0000	0.0000	0.0000	0.0000		,,
Space heating fuel - main system 1 Space heating fuel - main system 2					3187.7391	(213)
Space heating fuel - secondary Efficiency of water heater Water heating fuel used					0.0000 79.8000 2584.3607	
Space cooling fuel					0.0000	
Electricity for pumps and fans: Total electricity for the above, kWh/year Electricity for lighting (calculated in Appendix L)					86.0000 213.3105	
Energy saving/generation technologies (Appendices M ,N and Q) PV generation					-1514.9530	(222)
Wind generation Hydro-electric generation (Appendix N) Electricity generated - Micro CHP (Appendix N)					0.0000 0.0000 0.0000	(234) (235a)
Appendix Q - special features Energy saved or generated					-0.0000	,,
Energy used Total delivered energy for all uses					0.0000 4556.4572	
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP						
	Energy kWh/year	kç	on factor g CO2/kWh	k	Emissions g CO2/year	
Space heating - main system 1 Total CO2 associated with community systems	Energy kWh/year 3187.7391	kç	g CO2/kWh 0.2100	k	g CO2/year 669.4252 0.0000	(373)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating	Energy kWh/year 3187.7391 2584.3607	kç	g CO2/kWh 0.2100 0.2100	k	g CO2/year 669.4252 0.0000 542.7158 1212.1410	(373) (264) (265)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel)	Energy kWh/year 3187.7391	kç	g CO2/kWh 0.2100	k	g CO2/year 669.4252 0.0000 542.7158	(373) (264) (265) (267)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105	kç	g CO2/kWh 0.2100 0.2100 0.1387 0.1443	lc	g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873	(373) (264) (265) (267)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting	Energy kWh/year 3187.7391 2584.3607 86.0000	kç	g CO2/kWh 0.2100 0.2100	le.	g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326	(373) (264) (265) (267) (268)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105	kç	g CO2/kWh 0.2100 0.2100 0.1387 0.1443	le.	g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121	(373) (264) (265) (267) (268) (269) (272)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105	kç	g CO2/kWh 0.2100 0.2100 0.1387 0.1443	le.	g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326 1058.6249	(373) (264) (265) (267) (268) (269) (272)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER)	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105	kç	g CO2/kWh 0.2100 0.2100 0.1387 0.1443	le.	g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326 1058.6249	(373) (264) (265) (267) (268) (269) (272)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105 -705.8886 -809.0645	kç	g CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1340 0.1256	k	g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326 1058.6249 11.5100	(373) (264) (265) (267) (268) (269) (272)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) 13a. Primary energy - Individual heating systems including micro-CHP Space heating - main system 1	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105 -705.8886 -809.0645	kç Primary enerç kç	g CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1340 0.1256	k	g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326 1058.6249 11.5100 ary energy kWh/year 3602.1451	(264) (265) (267) (268) (268) (268) (269) (272) (273)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies FV Unit electricity used in dwelling FV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel)	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105 -705.8886 -809.0645	kç Primary enerç kç	g CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1340 0.1256	k	g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326 1058.6249 11.5100 ary energy kWh/year 3602.1451 0.0000 2920.3276	(264) (265) (267) (268) (268) (268) (272) (273) (273)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105 -705.8886 -809.0645 Energy kWh/year 3187.7391	kç Primary enerç kç	g CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1340 0.1256	k Prim	g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326 1058.6249 11.5100 ary energy kWh/year 3602.1451 0.0000	(264) (265) (267) (268) (269) (272) (273) (273) (273)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105 -705.8886 -809.0645 -809.065	kç Primary enerç kç	g CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1340 0.1256 gy factor g CO2/kWh 1.1300 1.1300 1.5128 1.5338	k	g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326 1058.6249 11.5100 ary energy kWh/year 3602.1451 0.0000 2920.3276 6522.4728 327.1827	(264) (265) (267) (268) (269) (272) (273) (273) (273)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling FV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105 -705.8886 -809.0645 Energy kWh/year 3187.7391 2584.3607 86.0000	kç Primary enerç kç	g CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1340 0.1256 gy factor g CO2/kWh 1.1300 1.5128	Prim	g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326 1058.6249 11.5100 ary energy kWh/year 3602.1451 0.0000 2920.3276 6522.4728 6522.4728 6522.4728 327.1827	(265) (267) (268) (269) (269) (272) (273) (273) (273) (278) (279) (279) (281) (282)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling Energy saving/generation technologies PV Unit electricity used in dwelling	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105 -705.8886 -809.0645 Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105	kç Primary enerç kç	g CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1340 0.1256 gy factor g CO2/kWh 1.1300 1.5128 1.5338	Prim	g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326 1058.6249 11.5100 ary energy kWh/year 0.0000 2920.3276 6522.4728 130.1008 327.1827	(264) (267) (268) (267) (268) (269) (272) (273) (273) (273) (273) (279) (281) (282)

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Dwelling Address	Unit 1, Highland Square , Bristol
Report Date	05/03/2024
Property Type	Maisonette, Mid-Terrace
Floor Area [m ²]	92

This document is not an Energy Performance Certificat EPC) s required by the Energy Performance of Buildings Reg io



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Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good		
Feature	Description			gy Performance		
Walls	Average thermal transmi	ttance 0.18 W/m²K		Very Good		
Roof	Average thermal transmi	ttance 0.11 W/m²K		Very Good		
Floor	Average thermal transmi	ttance 0.18 W/m²K		Very Good		
Windows	High performance glazing			Good		
Main heating	Air source heat pump, radiators, electric			Good		
Main heating controls	Time and temperature z contro			Very Good		
Secondary heating	None					
Hot water	From main sys m			Average		
Lighting	Good ligh g efficien			Good		
Air tightness	Air perme 50] =	4.5 h.m² (assumed)		Good		

Primary Energy use

The primary energy use for this property per year is 44 kilowatt hour (kWh) per square metre

Estim ted CO₂ missions of the dwelling

The estimated ing provides an indication of the dwelling's impact on the environment in terms of carbon dioxide emissions; the higher the rating the less impact it has on the environment.

The estimated CO emissions for this dwellings is: 0.4 per year

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With the recommended measures the potential CO emissions could be:

0

per year

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelli

To reach the dwelling's potential energy rating all of the recommended measures shown would d to be installed.

Having these measures installed individually or in any other order may give a different result omp d with the cumulative potential rating.

Recommended measure	Typical	Potential Rati	C ulative	Cumulative
	Yearly	after	avings	Potential
	Saving	measure insta	(per year)	Rating

Estimated energy use and potential aving

Estimated energy cost for this property over a year

£654

Over a year you could save

£0

The estimated cost and saving how how much the average hou ld would spend in this property heating, lighting and hot water. It not based on how e is used by the people living at the pr

Containg the ssessor and the accreditation scheme

Assessor contact details				
Assessor name				
Assessor's accreditation number				
Email Address				

SAP 10 Online 2.13.11 Page 3 of 4



Accreditation scheme contact details			
Accreditation scheme Elmhurst Energy Systems Ltd			
Telephone			
Email Address			

Assessment details				
Related party disclosure	No related pa			
Date of assessment	05/03/202			
Date of certificate	05/03/202			
Type of assessment	SAP w dwellin			



Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Tue 05 Mar 2024 08:41:59

Project Information				
Assessed By		Building Type	Maisonette, Mid-terrace	
OCDEA Registration	EES/025661	Assessment Date	2024-03-05	

Dwelling Details				
Assessment Type	As designed	Total Floor Area	92 m ²	
Site Reference	Unit 4	Plot Reference	PV	
Address	Unit 1 Highland Squa	are, Bristol	·	

Client Details		
Name	Tebby & Son	
Company	SF Tebby & Son	
Address	Unit 11 Avon Gorge Industrial Estate , Bristol, BS2 9XX	

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission	rate			
Fuel for main heating system	Electricity			
Target carbon dioxide emission rate	11.51 kgCO ₂ /m ²			
Dwelling carbon dioxide emission rate	3.33 kgCO ₂ /m ²	OK		
1b Target primary energy rate and dwelling primary energy				
Target primary energy	60.37 kWh _{PE} /m ²			
Dwelling primary energy	37.13 kWh _{PE} /m ²	OK		
1c Target fabric energy efficiency and dwelling fabric energy efficiency				
Target fabric energy efficiency	38.1 kWh/m²			
Dwelling fabric energy efficiency	37.4 kWh/m ²	OK		

2a Fabric U-values					
Element	Maximum permitted average U-Value [W/m²K]	Dwelling average U-Value [W/m²K]	Element with highest individual U-Value		
External walls	0.26	0.18	Walls (1) (0.18)	OK	
Party walls	0.2	0	Party Wall (1) (0)	N/A	
Curtain walls	1.6	0	N/A	N/A	
Floors	0.18	0.18	Exposed Floor (0.18)	OK	
Roofs	0.16	0.11	Roof (1) (0.11)	OK	
Windows, doors, and roof windows	1.6	1.31	W01 (1.31)	OK	
Rooflights	2.2	N/A	N/A	N/A	

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))				
Name	Net area [m ²]	U-Value [W/m ² K]		
Exposed wall: Walls (1)	71.34	0.18		
Exposed wall: Walls (2)	13.04	0.18		
Party wall: Party Wall (1)	65.88	0 (!)		
Party floor: Exposed Floor, Exposed Floor	7.22	0.18		
Exposed roof: Roof (1)	53.98	0.11		

2c Openings (better than typically expected values are flagged with a subsequent (!))					
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]	
W01, Windows	2.38	North East	0.7	1.31	
W02, Windows	2.38	North East	0.7	1.31	
W03, Windows	2.38	North East	0.7	1.31	
W04, Windows	4.41	North East	0.7	1.31	
W05, Windows	2.38	South East	0.7	1.31	
W06, Windows	0.53	South West	0.7	1.31	
W07, Windows	0.53	South West	0.7	1.31	

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))
Building part 1 - Main Dwelling: Thermal bridging calculated from linear thermal transmittances for each junction

Date generated: 2024-03-05 08:41:59

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Not government-approved scheme	0.023 (!)	
External wall	E3: Sill	Calculated by person with suitable expertise	0.021 (!)	
External wall	E4: Jamb	Calculated by person with suitable expertise	0.016 (!)	
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.116	
External wall	E7: Party floor between dwellings (in blocks of flats)	Calculated by person with suitable expertise	0.038 (!)	
Party wall	P7: Exposed floor (normal)	Calculated by person with suitable expertise	0.185	
Party wall	P3: Intermediate floor between dwellings (in blocks of flats)	SAP table default	0 (!)	
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.043	
External wall	E25: Staggered party wall between dwellings	Calculated by person with suitable expertise	0.036 (!)	
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.046	
External wall	E21: Exposed floor (inverted)	SAP table default	0.32	
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.101	
Party wall	P8: Exposed floor (inverted)	Calculated by person with suitable expertise	0.185	
External wall	E14: Flat roof	SAP table default	0.16	
Roof	R8: Roof to wall (rafter)	SAP table default	0.12	
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.001 (!)	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))									
Maximum permitted air permeability at 50Pa	8 m ³ /hm ²								
Dwelling air permeability at 50Pa	4.5 m ³ /hm ² , Design value	OK							
Air permeability test certificate reference		·							

4 Space heating									
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity									
Efficiency	247.7%								
Emitter type	Radiators								
Flow temperature	55°C								
System type	Heat Pump								
Manufacturer	Atlantic								
Model	Logic Air 8kW								
Commissioning									
Secondary heating system: N/A									
Fuel	N/A								
Efficiency	N/A								
Commissioning									

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	150 litres
Declared heat loss	2.09 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 -	type: N/A
Efficiency	
Manufacturer	
Model	

6 Controls			
Main heating 1 - type: Time and tempera	ature zone control by	arrangement of plumbing and electrical s	ervices
Function			
Ecodesign class			
Manufacturer			
Model			
Water heating - type: Cylinder thermosta	at and HW separately	timed	
Manufacturer			
Model			
7 Lighting			
Minimum permitted light source efficacy	75 lm/W		
Lowest light source efficacy	80 lm/W		OK
External lights control	N/A		
_			
8 Mechanical ventilation			
System type: N/A Maximum permitted specific fan power	N//A		
Specific fan power	N/A N/A		N/A
Minimum permitted heat recovery	N/A		IVA
efficiency	17/7		
Heat recovery efficiency	N/A		N/A
Manufacturer/Model	14/7		14/7
Commissioning			
9 Local generation	(4)		
Technology type: Photovoltaic system			
Peak power	1.045 kWp		
Orientation Pitch	South West 45°		
Overshading	None or very little		
Manufacturer	None or very little		
MCS certificate			
10 Heat networks			
N/A			
11 Supporting documentary evidence			
N/A			
12 Declarations			
a. Assessor Declaration	office of the state of	starts of this DDEL Occupions Depart	
		entents of this BREL Compliance Report	
		nformation submitted for this dwelling for and that the supporting documentary	
evidence (SAP Conventions, Appendi	•	•	
documentary evidence required) has			
Compliance Report.	been reviewed in the	course of preparing this BREL	
оопірнаное пероп.			
Signed:		Assessor ID:	
Oignou.		7.000000110.	
Name:		Date:	
h Client Declaration		<u> </u>	

N/A



Property Reference	Unit 4								Issued	on Date	05/03	/2024	
Assessment Reference	PV					Pro	p Type l	Ref	Tebby an	d Son G	arage		
Property	Unit 1	, Highla	nd Square	, Bristol									
SAP Rating				81 B	DER		3.33		Т	ER	11	.51	
Environmental				97 A	% DEF	? < TER						.07	
CO ₂ Emissions (t/year)				0.27	DFEE		37.3	18	Т	FEE		.13	
Compliance Check				See BREL	% DFE	E < TFE					1.9		
% DPER < TPER				38.50	DPER		37.1	3	Т	PER		.37	
Assessor Details									A	\ssessoi	· ID U3	367-00	001
Client													
SUMMARY FOR INPU	T DATA FO	R: Nev	v Build (A	As Designed)									
Orientation			(.	Southwest									
Property Tenture				1									
Transaction Type				6									
Transaction Type Terrain Type				Urban									
2.				Maisonette, Mid-Te	rraco								
1.0 Property Type Position of Flat				Top-floor flat	iiace								
				•									
Which Floor				1									
2.0 Number of Storeys				3									
3.0 Date Built				2024									
3.0 Property Age Band				L									
4.0 Sheltered Sides				3									
5.0 Sunlight/Shade				Average or unknow									
6.0 Thermal Mass Parame	ter			Precise calculation									
Thermal Mass				N/A					kJ	l/m²K			
7.0 Electricity Tariff				Standard									
Smart electricity meter fi	itted			No									
Smart gas meter fitted				No									
7.0 Measurements					Наз	t Loss Po	orimete	r In	ternal Floo	or Area	Average	Stor	ey Heigh
				Basem	ent:	0.00 r	n		0.00 m	2	_	0.00 r	n .
				Ground flo 1st Sto	rey:	3.30 r 14.97	m		4.86 m 59.81 n	n²		2.50 r 2.70 r	n
				2nd Sto 3rd Sto		18.05 0.00 r			27.28 n 0.00 m			2.42 r 0.00 r	
				4th Sto	rey:	0.00 r 0.00 r	n		0.00 m 0.00 m	²		0.00 r 0.00 r	n
				6th Sto	reý:	0.00 r	n		0.00 m	2		0.00 r	n
				7th Sto	rey:	0.00 r	n		0.00 m			0.00 r	n
8.0 Living Area				27.28					m				
9.0 External Walls Description	Туре	Constr	ruction			Карра		Nett Area	Shelter	Shelter	Opening	s Area	Calculation
	Cavity Wall			oard on dabs, dense bloc	(W/m²K)	(kJ/m²K) 150.00	Area(m²) 86.33	(m²) 71.34	Res 0.00	None	14.99		Type r Gross Are
Sloping Wall	Timber Frame		avity, any outsi framed wall (t	ide structure two layers of plasterboard	0.18	18.00	13.04	13.04	0.00	None	0.00	Ente	r Gross Are
9.1 Party Walls	_		_							_			_
Description	Type		Construc	tion					Kappa (kJ/m²K)	Area (m²)	Shelter Res	SI	nelter
Party Wall 1	Filled Cav Edge Sea		Single pla cavity	sterboard on both si	des, dense	cellular	blocks,	0.00	70.00	65.88	0.00	١	lone
9.2 Internal Walls		-	-										
memai mana													
Description			Constructi	ion							Kap (k.l/n		Area (m
				ion ck, dense plaster							Kap (kJ/n 100	n²K)	Area (m 139.75

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Description	Туре	Construc	ction		Kappa G (kJ/m²K)Ar	ea(m²) /	Nett Area		Shelter Factor	Calculatio Type	nOpenings
External Roof 1	External Flat Roof	Plasterbo	ard, insulated flat roof	0.11	9.00 5		(m²) 53.98	None	0.00	Enter Gros Area	s 0.00
10.2 Internal Ceilings											
Description Internal Ceiling 1		Storey +1	Construction Plasterboard ceili	ng, carpeted chip	board floor						e a (m²) 2.14
11.0 Heat Loss Floors	_										
Description Exposed Floor	Type Exposed Floor - Solid	Storey Inde			U-Va (W/m 0.1	¹K)		Iter Code None	Fa	nelter Kapp actor (kJ/m).00 75.0	
11.1 Party Floors											
Description		Storey	Construction								Area (m²
Party Floor 1		Index Lowest occupied	Precast concrete planks	floor, screed, car	peted					(kJ/m²K) 30.00	47.73
11.2 Internal Floors											
Description		Storey Index	Construction							Kappa	
Internal Floor 1		index	Plasterboard ceiling, car	peted chipboard f	loor					(kJ/m²K) 9.00	32.14
12.0 Opening Types											
Description	Data Source	Type	Glazing		Glazing Gap	Filling Type		-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double Low-l	Soft 0.05		Air Fille	ed	0.63	Wood	0.70	1.31
13.0 Openings									_		
Name W01	Opening Ty Windows	pe	Location Cavity Wall		Orient North			Area (2.38			tch 0
W02	Windows		Cavity Wall		North	East		2.38	3		0
W03 W04	Windows Windows		Cavity Wall		North North			2.38 4.4			0 0
W05	Windows		Cavity Wall Cavity Wall		South			2.38			0
W06	Windows		Cavity Wall		South	West		0.53	3		0
W07	Windows		Cavity Wall		South	West		0.53	3		0
			-								
14.0 Conservatory			None								
14.0 Conservatory 15.0 Draught Proofing			None					%			
-								%			
15.0 Draught Proofing 16.0 Draught Lobby			100 No					%			
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging			100					%			
15.0 Draught Proofing 16.0 Draught Lobby			100 No	Length	Psi	Adjusto	ed Re	%			Imported
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin	ng other steel linte	els)	100 No Calculate Bridges Source Type Non Gov Approved Scho	emes 8.20	0.02	0.02					No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill	ng other steel linte	els)	100 No Calculate Bridges Source Type Non Gov Approved Sch Independently assessed	emes 8.20 8.20	0.02 0.02	0.02 0.02					No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm	nal)	•	100 No Calculate Bridges Source Type Non Gov Approved Schi Independently assessed Independently assessed Independently assessed	emes 8.20 8.20 23.67 3.12	0.02 0.02 0.02 0.12	0.02 0.02 0.02 0.12					No No No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between d	nal) dwellings (in block	•	No Calculate Bridges Source Type Non Gov Approved Scholndependently assessed Independently Index I	emes 8.20 8.20 23.67 3.12 31.46	0.02 0.02 0.02 0.12 0.04	0.02 0.02 0.02 0.12 0.04					No No No No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between d P7 Party Wall - Exposed	nal) dwellings (in block I floor (normal)	ss of flats)	100 No Calculate Bridges Source Type Non Gov Approved Schi Independently assessed Independently assessed Independently assessed	8.20 8.20 23.67 3.12 31.46 4.67	0.02 0.02 0.02 0.12	0.02 0.02 0.02 0.12					No No No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between d P7 Party Wall - Exposed P3 Party wall - Intermedi (in blocks of flats)	nal) dwellings (in block I floor (normal)	ss of flats)	100 No Calculate Bridges Source Type Non Gov Approved Schelndependently assessed Independently Assessed Indepe	8.20 8.20 23.67 3.12 31.46 4.67 14.45	0.02 0.02 0.02 0.12 0.04 0.18 0.00	0.02 0.02 0.02 0.12 0.04 0.18 0.00					No No No No No No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between of P7 Party Wall - Exposed P3 Party Wall - Intermedi (in blocks of flats) E16 Comer (normal)	nal) dwellings (in block I floor (normal) iate floor betweer	ss of flats)	No Calculate Bridges Source Type Non Gov Approved Schindependently assessed Independently Independe	8.20 8.20 23.67 3.12 31.46 4.67 14.45	0.02 0.02 0.02 0.12 0.04 0.18 0.00	0.02 0.02 0.02 0.12 0.04 0.18 0.00					No No No No No No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between d P7 Party Wall - Exposed P3 Party wall - Intermedi (in blocks of flats)	nal) dwellings (in block d floor (normal) liate floor betweer	ss of flats)	100 No Calculate Bridges Source Type Non Gov Approved Schelndependently assessed Independently Assessed Indepe	8.20 8.20 23.67 3.12 31.46 4.67 14.45	0.02 0.02 0.02 0.12 0.04 0.18 0.00	0.02 0.02 0.02 0.12 0.04 0.18 0.00					No No No No No No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between of P7 Party Wall - Exposed P3 Party wall - Intermedi (in blocks of flats) E16 Comer (normal) E25 Staggered party wall E18 Party wall between e21 Exposed floor (invertible)	nal) dwellings (in block floor (normal) liate floor betweer ll between dwellin dwellings rted)	ss of flats) n dwellings	Too No Calculate Bridges Source Type Non Gov Approved Schindependently assessed Independently assessed Table K1 - Default	8.20 8.20 23.67 3.12 31.46 4.67 14.45 16.64 26.80 5.20 1.50	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.04 0.05 0.32	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.04 0.05 0.32					No No No No No No No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between d P7 Party Wall - Exposed P3 Party wall - Intermedi (in blocks of flats) E16 Comer (normal) E25 Staggered party wal E18 Party wall between E21 Exposed floor (inver P4 Party wall - Roof (insi	nal) dwellings (in block difloor (normal) liate floor betweer all between dwellin dwellings rted) sulation at ceiling	ss of flats) n dwellings	Too No Calculate Bridges Source Type Non Gov Approved Schelindependently assessed Independently Indep	8.20 8.20 23.67 3.12 31.46 4.67 14.45 16.64 26.80 5.20 1.50	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.04 0.05 0.32 0.10	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.04 0.05 0.32 0.10					No No No No No No No No No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between of P7 Party Wall - Exposed P3 Party Wall - Intermedi (in blocks of flats) E16 Corner (normal) E25 Staggered party wall E18 Party wall between of E21 Exposed floor (inver P4 Party Wall - Roof (insight P8 Party Wall - Exposed E14 Flat roof	nal) dwellings (in block difloor (normal) liate floor betweer all between dwellin dwellings rted) sulation at ceiling	ss of flats) n dwellings	No Calculate Bridges Source Type Non Gov Approved Schindependently assessed Independently assessed Table K1 - Default	8.20 8.20 23.67 3.12 31.46 4.67 14.45 16.64 26.80 5.20 1.50	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.04 0.05 0.32	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.04 0.05 0.32					No No No No No No No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between of P7 Party Wall - Exposed P3 Party Wall - Intermedi (in blocks of flats) E16 Comer (normal) E25 Staggered party wall E18 Party wall between e21 Exposed floor (inver P4 Party wall - Roof (ins) P8 Party Wall - Exposed	nal) dwellings (in block of floor (normal) iate floor between all between dwellin dwellings rted) ulation at ceiling of floor (inverted)	ss of flats) n dwellings	No Calculate Bridges Source Type Non Gov Approved Scholadependently assessed Independently Independen	emes 8.20 8.20 23.67 3.12 31.46 4.67 14.45 16.64 26.80 5.20 1.50 14.49 4.60 24.47	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.04 0.05 0.32 0.10 0.18	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.18					No No No No No No No No No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between of P7 Party Wall - Exposed P3 Party wall - Intermedi (in blocks of flats) E16 Comer (normal) E25 Staggered party wal E18 Party wall between of E21 Exposed floor (inver P4 Party Wall - Roof (insi P8 Party Wall - Exposed E14 Flat roof R8 Roof to wall (rafter)	nal) dwellings (in block of floor (normal) iate floor between all between dwellin dwellings rted) ulation at ceiling of floor (inverted)	ss of flats) n dwellings	No Calculate Bridges Source Type Non Gov Approved Schindependently assessed Independently Applications Individual Independently Individual Individ	emes 8.20 8.20 23.67 3.12 31.46 4.67 14.45 16.64 26.80 5.20 1.50 14.49 4.60 24.47	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.18 0.16 0.12	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.16					No N
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between of P7 Party Wall - Exposed P3 Party Wall - Intermedi (in blocks of flats) E16 Comer (normal) E25 Staggered party wall E18 Party wall between of E21 Exposed floor (inver P4 Party Wall - Exposed E14 Flat roof R8 Roof to wall (rafter) E6 Intermediate floor with	nal) dwellings (in block of floor (normal) iate floor between all between dwellin dwellings rted) ulation at ceiling of floor (inverted)	ss of flats) n dwellings	No Calculate Bridges Source Type Non Gov Approved Schindependently assessed Independently I	emes 8.20 8.20 23.67 3.12 31.46 4.67 14.45 16.64 26.80 5.20 1.50 14.49 4.60 24.47	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.18 0.16 0.12	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.16		ference:			No N
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between d P7 Party Wall - Exposed P3 Party wall - Intermedi (in blocks of flats) E16 Comer (normal) E25 Staggered party wal E18 Party wall between E21 Exposed floor (inver P4 Party Wall - Exposed E14 Flat roof R8 Roof to wall (rafter) E6 Intermediate floor with Y-value	nal) dwellings (in block of floor (normal) iate floor between all between dwellin dwellings rted) ulation at ceiling of floor (inverted)	ss of flats) n dwellings	No Calculate Bridges Source Type Non Gov Approved Schindependently assessed Independently	emes 8.20 8.20 23.67 3.12 31.46 4.67 14.45 16.64 26.80 5.20 1.50 14.49 4.60 24.47	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.18 0.16 0.12	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.16		eference:		ra	No N
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between of P7 Party Wall - Exposed P3 Party Wall - Intermedi (in blocks of flats) E16 Corner (normal) E25 Staggered party wall E18 Party wall between E21 Exposed floor (inver P4 Party Wall - Roof (inser P8 Party Wall - Exposed E14 Flat roof R8 Roof to wall (rafter) E6 Intermediate floor with Y-value 18.0 Pressure Testing	nal) dwellings (in block of floor (normal) iate floor between all between dwellin dwellings rted) ulation at ceiling of floor (inverted)	ss of flats) n dwellings	No Calculate Bridges Source Type Non Gov Approved Schindependently assessed Independently In	emes 8.20 8.20 23.67 3.12 31.46 4.67 14.45 16.64 26.80 5.20 1.50 14.49 4.60 24.47	0.02 0.02 0.02 0.12 0.18 0.00 0.04 0.04 0.05 0.32 0.10 0.18 0.16 0.12	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.16		eference:		d'a	No No No No No No No No No No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between of P7 Party Wall - Exposed P3 Party wall - Intermedi (in blocks of flats) E16 Comer (normal) E25 Staggered party wall E18 Party wall between of E21 Exposed floor (inverteam of P8 Party Wall - Exposed E14 Flat roof R8 Roof to wall (rafter) E6 Intermediate floor with Y-value 18.0 Pressure Testing Designed APso	nal) dwellings (in block of floor (normal) iate floor between all between dwellin dwellings rted) ulation at ceiling of floor (inverted)	ss of flats) n dwellings	No Calculate Bridges Source Type Non Gov Approved Scholadependently assessed Independently In	emes 8.20 8.20 23.67 3.12 31.46 4.67 14.45 16.64 26.80 5.20 1.50 14.49 4.60 24.47	0.02 0.02 0.02 0.12 0.18 0.00 0.04 0.04 0.05 0.32 0.10 0.18 0.16 0.12	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.16		eference:		°a	No No No No No No No No No No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between d P7 Party Wall - Exposed P3 Party wall - Intermedi (in blocks of flats) E16 Corner (normal) E25 Staggered party wall E18 Party wall between dE21 Exposed floor (inver P4 Party wall - Roof (insigher P8 Party Wall - Exposed E14 Flat roof R8 Roof to wall (rafter) E6 Intermediate floor with Y-value 18.0 Pressure Testing Designed APso Property Tested?	nal) dwellings (in block difloor (normal) iate floor between dwellings rted) ulation at ceiling difloor (inverted) thin a dwelling	ss of flats) n dwellings	No Calculate Bridges Source Type Non Gov Approved Schindependently assessed Independently Independent	emes 8.20 8.20 23.67 3.12 31.46 4.67 14.45 16.64 26.80 5.20 1.50 14.49 4.60 24.47	0.02 0.02 0.02 0.12 0.18 0.00 0.04 0.04 0.05 0.32 0.10 0.18 0.16 0.12	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.16		eference:		°a	No No No No No No No No No No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between of P7 Party Wall - Exposed P3 Party wall - Intermedi (in blocks of flats) E16 Comer (normal) E25 Staggered party wall E18 Party wall between of E21 Exposed floor (inverse P4 Party wall - Exposed E14 Flat roof R8 Roof to wall (rafter) E6 Intermediate floor with Y-value 18.0 Pressure Testing Designed APso Property Tested? Test Method	nal) dwellings (in block difloor (normal) iate floor between dwellings rted) sulation at ceiling if floor (inverted) thin a dwelling	ss of flats) n dwellings	No Calculate Bridges Source Type Non Gov Approved Schindependently assessed Independently Independent	emes 8.20 8.20 23.67 3.12 31.46 4.67 14.45 16.64 26.80 5.20 1.50 14.49 4.60 24.47	0.02 0.02 0.02 0.12 0.18 0.00 0.04 0.04 0.05 0.32 0.10 0.18 0.16 0.12	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.16		eference:		'a	No N
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between d P7 Party Wall - Exposed P3 Party wall - Intermedi (in blocks of flats) E16 Corner (normal) E25 Staggered party wall E18 Party wall between E21 Exposed floor (inver P4 Party Wall - Roof (insi P8 Party Wall - Exposed E14 Flat roof R8 Roof to wall (rafter) E6 Intermediate floor with Y-value 18.0 Pressure Testing Designed APso Property Tested? Test Method 19.0 Mechanical Ventilation	nal) dwellings (in block difloor (normal) liate floor between dwellings rted) ulation at ceiling of floor (inverted) thin a dwelling	as of flats) a dwellings ags devel)	No Calculate Bridges Source Type Non Gov Approved Schindependently assessed Independently Independent	emes 8.20 8.20 23.67 3.12 31.46 4.67 14.45 16.64 26.80 5.20 1.50 14.49 4.60 24.47	0.02 0.02 0.02 0.12 0.18 0.00 0.04 0.04 0.05 0.32 0.10 0.18 0.16 0.12	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.16		eference:		·°a	No N

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21.0 Fixed Cooling System	No					
22.0 Lighting						
No Fixed Lighting	No					
	Name Lighting 1	Efficacy 80.00	Power 15	'	Capacity 1200	Count 5
24.0 Main Heating 1	Database					
Percentage of Heat	100.00				%	
Database Ref. No.	106764					
Fuel Type	Electricity					
SAP Code	0					
In Winter	247.69					
In Summer	188.71					
Model Name	Logic Air 8kW					
Manufacturer	Atlantic					
System Type	Heat Pump					
Controls SAP Code	2207					
Delayed Start Stat	No					
HETAS approved System	No					
Oil Pump Inside	No					
FI Case	0.00					
Flue Type	None or Unknown					
Fan Assisted Flue	No					
Is MHS Pumped	Pump in heated sp	ace				
Heating Pump Age	2013 or later					
Heat Emitter	Radiators					
Flow Temperature	Enter value					
Flow Temperature Value	55.00					
Boiler Interlock	No					
25.0 Main Heating 2	None					
26.0 Heat Networks	None					
Heat Source Fuel Type Heating U Heat source 1 None Heat source 2 None	Jse Efficiency F	Percentage Of Heat	Heat Hea Pow Rati	er	ctrical Fuel Factor	Efficiency type
Heat source 3 None Heat source 4 None Heat source 5 None						
Heat source 4 None Heat source 5 None						
Heat source 4 None Heat source 5 None	Main Heating 1					
Heat source 4 None Heat source 5 None 28.0 Water Heating	Main Heating 1					
Heat source 4 Heat source 5 None None 28.0 Water Heating Water Heating						
Heat source 4 None Heat source 5 None 28.0 Water Heating Water Heating SAP Code	901					
Heat source 4 Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System	901 No					
Heat source 4 Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1	901 No No					
Heat source 4 None None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2	901 No No					
Heat source 4 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System Solar Panel	901 No No No					
Heat source 4 Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System	901 No No No No No					
Heat source 4 Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System Solar Panel Water use <= 125 litres/person/day	901 No No No No Yes					
Heat source 4 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System Solar Panel Water use <= 125 litres/person/day Summer Immersion	No No No No No Vo No No No No No					

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Immersion Only	Heating Hot V	Vater		No								
28.1 Showers												
Description			Shower Type				Flow Rate [I/min]	Rated Pov [kW]	ver C		Connected	I То
1			Combi boiler	or unvented	hot wat	er system	7.00			No		
28.3 Waste Water H	leat Recover	y System										
29.0 Hot Water Cyli	inder			Hot Water	Cylinder	Г						
Cylinder Stat				Yes								
Cylinder In Heat	ed Space			Yes								
Independent Tim	ne Control			Yes								
Insulation Type				Measured I	LOSS							
Cylinder Volume	:			150.00						L		
Loss				2.09						kWh/day	/	
Pipes insulation				Fully insula	ted prin	nary pipework	(
In Airing Cupboa	nrd			No								
31.0 Thermal Store				None								
32.0 Photovoltaic U	Jnit			One Dwelli	ng							
Export Capable	Meter?			Yes								
Connected To D	welling			No								
Diverter				No								
Battery Capacity	[kWh]			0.00								
PV Cells k	кWр	Orientation	Elevation	Overs	hading	FGHRS	MCS C	ertificate	Over	or T	MCS Certificate	Panel Manufacturer
1.04		South West	45°	None (Or Little	No	No		1.00		Reference	
34.0 Small-scale Hy	ydro			None								
Electricity Gener	rated			0.00								
Apportioned				0.00						kWh/Yea	аг	
Connected to dw	velling's electr	icity meter		Yes								
Electricity Gener	ration			Annual								
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Au	g S	ер	Oct	Nov	/ Dec
Recommendations Lower cost med None Further measur	asures	e even higher s		ypical Cost		Typical sav	ings per ye	ar <u>.</u>	R SAP ra		ter improven Enviror	nent nmental Impact
	Solar water	heating							0 0 0			0

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Property Reference	e	l	Jnit 4							Issu	ed on Da	ate	05/03/2024			
Assessment Refer	rence	I	PV					Prop Type F	Ref	Tebby	and Sor	Garage				
Property		· ·	Jnit 1, Highland	Square, Bristol												
SAP Rating					81 B		DER	3.	33		TER		11.51			
Environmental					97 A	9	% DER < TER						71.07			
CO ₂ Emissions (t/)	/ear)				0.27		DFEE	37	7.38		TFEE		38.13	38.13		
Compliance Check	Compliance Check						% DFEE < TFE	EE					1.97			
% DPER < TPER					38.50		DPER	37	7.13		TPEF	₹	60.37			
Assessor Details											Asse	ssor ID	U367-00	01		
Client																
SAP 10 WORKSHEET CALCULATION OF D						7 2022)			-							
1. Overall dwell	ing charact	teristic	3					Area	- - - St	orev h	neight		Volume			
Ground floor First floor Second floor Total floor area Dwelling volume	TFA = (la)+(lb)+(lc)+(ld)+(le	e)(ln)	9	1.9500		(m2) 4.8600 59.8100 27.2800) (lb) x (lc) x	2 2 2	(m) 2.5000 2.7000 2.4200	(2b) = (2c) = (2d) =	(m3) 12.1500 161.4870 66.0176	(lb) - (3h (lc) - (3c (ld) - (3c (4)		
2. Ventilation r									-				m3 per hour	:		
Number of open c Number of open f Number of chimne Number of flues Number of blocke Number of interm Number of passiv Number of fluele	lues ys / flues attached to attached to d chimneys ittent ext: e vents	o solid : o other l ract fan:	fuel boiler neater	fire								0 * 20 = 0 * 35 = 0 * 20 = 5 * 10 =	0.0000 0.0000 0.0000 0.0000 0.0000 50.0000	(6b) (6c) (6d) (6e) (6f) (7a)		
Infiltration due Pressure test Pressure Test Me Measured/design Infiltration rat Number of sides	thod AP50 e	ys, flue:	and fans	= (6a)+(6b)	+(6c)+(6d)+((6e)+(6f)+(6g)+(7a)+(7	7b)+(7c) =	=	5	60.0000	/ (5) =	yes per hour 0.2086 Yes Blower Door 4.5000 0.4336	(8) (17)		
Shelter factor Infiltration rat	e adjusted	to incl	ude shelter	factor								(19)] = x (20) =				
Wind speed Wind factor Adj infilt rate	Jan 5.1000 1.2750	Feb 5.0000 1.2500				Jun 3.8000 0.9500				4	Oct 1.3000 1.0750					
_	0.4285			0.3697 0.5683	0.3613 0.5653	0.3193 0.5510	0.3193 0.5510).3613).5653	0.3781 0.5715				
3. Heat losses a									-							
Element				Gross	Openings	Net	Area	U-value	A	хU		-value	AxK			
Windows (Uw = 1. Exposed Floor Cavity Wall Sloping Wall External Roof 1				13.0400 53.9800	m2 14.9900	14. 7. 71. 13. 53.	3400 0400 9800	W/m2K 1.2448 0.1800 0.1800 0.1800 0.1100	1.2	996	7 15 1	kJ/m2K 5.0000 0.0000 8.0000 9.0000	kJ/K 541.5000 10701.0000 234.7200 485.8200	(27) (28b) (29a) (29a) (30)		
Total net area of Fabric heat loss Party Wall 1 Party Floor 1 Internal Wall 1 Internal Floor 1 Internal Ceiling	, W/K = Sur					47. 139. 32.	(26) (3	30) + (32) 0.0000			10 1	0.0000 0.0000 0.0000 8.0000	4611.6000 1909.2000 13975.0000 578.5200 289.2600	(32d) (32c) (32d)		
Heat capacity Cm Thermal mass par List of Thermal	ameter (TM Bridges		TFA) in kJ/	m2K					(30) + (362.4428			
K1 Eleme E2 Other		includin	g other stee	el lintels)					Length 8.2000		0230		tal .886			

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E3 Sill E4 Jamb E40 Exposed floor E7 Party floor bet P7 Party Wall - E1 P3 Party wall - E1 E16 Corner (normal E25 Staggered part E18 Party wall bet E21 Exposed floor P4 Party wall - E2 E14 Flat roof R8 Roof to wall (1) E6 Intermediate f1 Thermal bridges (Sum(L x 1) Point Thermal bridges Total fabric heat loss Ventilation heat loss calc Jan (38)m 46.8031 Heat transfer coeff 100.2140	23 31 4 14 26 5 1 14 4 24	.2000 .6700 .6700 .1200 .4640 .6700 .4500 .6400 .8000 .2000 .5960 .4700 .3200 .0500	0.0210 0.0160 0.1160 0.0380 0.1850 0.0000 0.0430 0.3200 0.1010 0.1850 0.1600 0.1200 0.0010	0.17 0.37 0.36 1.19 0.86 0.00 0.71 0.96 0.23 0.48 1.46 0.85 3.91 0.51 0.51 0.51	87 19 39 00 55 48 92 00 35 03 55 03	(37)						
Average = Sum(39)m / 12 =		99.6557	98.3578	98.1149	96.9845	96.9845					98.3566	
HLP 1.0899	Feb 1.0868	Mar 1.0838	Apr 1.0697	May 1.0670	Jun 1.0548	Jul 1.0548	Aug 1.0525	Sep 1.0595	Oct 1.0670	Nov 1.0724	Dec 1.0780	
HLP (average) Days in mont 31	28	31	30	31	30	31	31	30	31	30	1.0697 31	
4. Water heating energy re Assumed occupancy Hot water usage for mixer 85.9974 Hot water usage for baths	showers 84.6808	kWh/year		77.0812	73.3397	70.3805	73.8400	75.5800	79.2858	83.1450	2.6515 85.9199	
0.0000 Hot water usage for other	0.0000 uses	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
41.7838 Average daily hot water us	40.2644 se (litres/	38.7450 /day)	37.2256	35.7062	34.1868	34.1868	35.7062	37.2256	38.7450	40.2644	41.7838 117.2682	
Jan Daily hot water use	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
127.7812	124.9452 165.3278	121.4855 173.6002	116.9811 152.8066	112.7874 145.3379	107.5265 124.3508	104.5672 115.5499	109.5462 128.9379	112.8056 130.8489	118.0308 152.0946 Total = S	123.4094 166.7919 um(45)m =	127.7037 187.5422 1831.3046	(45)
Distribution loss (46)m = 28.2174		45)m 26.0400	22.9210	21.8007	18.6526	17.3325	19.3407	19.6273	22.8142	25.0188	28.1313	(46)
Water storage loss: Store volume a) If manufacturer declar Temperature factor from Enter (49) or (54) in (55)	Table 2b	actor is km	own (kWh/d	lay):							150.0000 2.0900 0.5400 1.1286	(48) (49)
Total storage loss 34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(56)
If cylinder contains dedic 34.9866 Primary loss 23.2624	31.6008 21.0112	34.9866 23.2624	33.8580 22.5120	34.9866 23.2624	33.8580 22.5120	34.9866 23.2624	34.9866 23.2624	33.8580 22.5120	34.9866 23.2624	33.8580 22.5120	34.9866 23.2624	(59)
Combi loss 0.0000 Total heat required for wa				0.0000 month 203.5869	0.0000 180.7208	0.0000	0.0000 187.1869	0.0000	0.0000	0.0000	0.0000 245.7912	
WWHRS 0.0000 PV diverter -0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
Solar input 0.0000 FGHRS 0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
Output from w/h 246.3650	217.9398	231.8492	209.1766	203.5869	180.7208	173.7989	187.1869	187.2189	210.3436	223.1619	245.7912	(64)
12Total per year (kWh/year Electric shower(s)							lotal p	er year (xw	n/year) = 5	um(64)m =	2517.1396	
0.0000 Heat gains from water heat	0.0000	0.0000	0.0000 Tot	0.0000 al Energy u	0.0000 sed by inst	0.0000 antaneous e	0.0000 electric sho	0.0000 wer(s) (kWh	0.0000 /year) = Su	0.0000 m(64a)m =	0.0000	(64a) (64a)
Heat gains from water heat 109.1478	ting, kWh/m 97.0611	nonth 104.3213	95.9042	94.9241	86.4426	85.0195	89.4710	88.6032	97.1706	100.5543	108.9570	(65)
5. Internal gains (see Tab	ble 5 and 5	5a)										
Metabolic gains (Table 5), Jan						71	3		0		D	
(66)m 132.5741 Lighting gains (calculated	132.5741	132.5741	132.5741	132.5741	132.5741	Jul 132.5741	Aug 132.5741	Sep 132.5741	Oct 132.5741	Nov 132.5741	Dec 132.5741	(66)
127.2048 Appliances gains (calculate	140.8339	127.2048	131.4450	127.2048	131.4450	127.2048	127.2048	131.4450	127.2048	131.4450	127.2048	(67)
242.6198 Cooking gains (calculated	245.1374	238.7931	225.2867	208.2373	192.2133	181.5083	178.9906	185.3350	198.8414	215.8908	231.9148	(68)
36.2574 Pumps, fans 0.0000	36.2574 0.0000	36.2574 0.0000	36.2574 0.0000	36.2574 0.0000	36.2574 0.0000	36.2574 0.0000	36.2574 0.0000	36.2574 0.0000	36.2574 0.0000	36.2574 0.0000	36.2574 0.0000	(69) (70)
Losses e.g. evaporation (r -106.0593	negative va -106.0593	alues) (Tab	le 5)									
Water heating gains (Table 146.7040 Total internal gains		140.2168	133.2003	127.5861	120.0592	114.2736	120.2568	123.0601	130.6057	139.6587	146.4476	(72)
	593.1797	568.9869	552.7042	525.8005	506.4897	485.7589	489.2245	502.6123	519.4241	549.7667	568.3394	(73)
6. Solar gains												
[Jan]				Solar flux Table 6a W/m2				FF data le 6c	Acce fact Table	ss or 6d	Gains W	

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Northeast Southeast Southwest			1.0	800 600	11.2829 36.7938 36.7938		0.6300 0.6300 0.6300	0	.7000 .7000 .7000	0.770 0.770 0.770	00	39.8269 26.7623 11.9194	(77)
C-1									275 5026	171 0040	05 4440	CE (2001	(02)
Solar gains Total gains													
7. Mean inter	nal temperat												
Temperature d	uring heating	ng periods	in the livi	ng area from	n Table 9, 1							21.0000	(85)
Utilisation f	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau alpha	7.1584	92.6369 7.1758	92.8938 7.1929	94.1196 7.2746	94.3526 7.2902	95.4523 7.3635	95.4523 7.3635		95.0257 7.3350	94.3526 7.2902	93.8825 7.2588	93.3960 7.2264	
util living a	0.9992	0.9979	0.9933	0.9637	0.8491	0.6284	0.4595	0.5184	0.8068	0.9803	0.9977	0.9994	(86)
Mon living	20.1189	10 1521	10 4020	10 7506	10 0744	20 0250	20.9993 20.0378	20.9985		20.7020 19.7414			
24 / 16 24 / 9	0	0	0	0	0	0	0	0 0 0	0	0	0	0	
24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of	28 20.5492	0 20.2451	0 20.4402	0 20.7229	0 20.9252	0 0 20.9927	20.9993	20.9985	0 20.9614	0 0 20.7020 20.0278	0 20.3692	10 20.2294	(87)
Th 2 util rest of							20.0380						
MIT 2 Living area f	19.6023	0.9969 19.1521		0.9454 19.7586	0.7903 19.9744	0.5385 20.0350	0.3595 20.0378	0.4115 20.0395		0.9668 19.7414 Living area	19.3204	19.1651	(90)
MIT Temperature a	19.8832	19.4764	19.7100	20.0447	20.2565	20.3191	20.3231	20.3240		20.0264			
adjusted MIT		19.4764	19.7100	20.0447	20.2565	20.3191	20.3231	20.3240	20.2948	20.0264	19.6315	19.4809	(93)
8. Space heat	ing require												
	Jan	Feh	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation Useful gains	0.9988 657.0276	0.9962 737.3003	0.9885	0.9458	0.8054	0.5653	0.3893	0.4434 379.2180	0.7448	0.9668 668.3445	0.9957	0.9989	
Ext temp. Heat loss rat	4.3000 e W	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Space heating						554.6681	361.0821		603.4935			1514.6374	
Space heating Solar heating	requirement		387.2727 er year (kW		41.3438	0.0000	0.0000	0.0000	0.0000	190.8551	426.4398	655.7256 3031.5275	(98a)
Solar heating	0.0000		0.0000 per vear (ki		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Space heating	kWh			,,									
		483.3998	387.2727	173.4455	41.3438	0.0000	0.0000	0.0000	0.0000	190.8551	426.4398	655.7256	(98c)
Space heating Space heating	requirement						0.0000	0.0000	0.0000			655.7256 3031.5275 32.9693	
	requirement						0.0000	0.0000	0.0000			3031.5275	
Space heating	requirement	t after sol	ar contribu	tion - total	l per year	(kWh/year)			0.0000			3031.5275	
Space heating	requirement per m2 quirements	t after sol	ar contribu	tion - total	l per year	(kWh/year)			0.0000			3031.5275 32.9693	(99)
Space heating 9a. Energy re Fraction of s.	requirements quirements pace heat fi	t after sol	ar contribu	ystems, inc	l per year	(kWh/year)			0.0000			3031.5275 32.9693 0.0000 1.0000	(99) (201) (202)
Space heating 9a. Energy re Fraction of s	requirement per m2 quirements pace heat f: pace heat f: main space main space	- Individua - Individua - rom seconda rom main sy heating sy heating sy	ar contribu	tion - total ystems, incl ntary syster %)	l per year	(kWh/year)			0.0000			3031.5275 32.9693	(201) (202) (206) (207)
9a. Energy re- Fraction of s Fraction of s Efficiency of Efficiency of	requirement per m2 quirements pace heat fi main space main space secondary/: Jan	- Individua - Individua - rom seconda rom main sy heating sy supplementa Feb	ar contribu	tion - total ystems, incl ntary syster %)	l per year	(kWh/year)			0.0000 Sep			0.0000 1.0000 247.6858 0.0000	(201) (202) (206) (207)
9a. Energy re- Fraction of s Fraction of s Efficiency of Efficiency of Space heating	requirements quirements pace heat f: pace heat f: pace heat f: pace main space main space secondary/: Jan requirement 673.0450	Individua rom seconda rom main sy heating sy supplementa Feb t 483.3998	ar contribu 1 heating s ry/suppleme stem (s) stem 1 (in stem 2 (in ry heating Mar 387.2727	ystems, inci ntary system %) %) system, % Apr 173.4455	Luding micro	o-CHP				(98c)	/ (4) =	0.0000 1.0000 247.6858 0.0000	(201) (202) (206) (207) (208)
Space heating 9a. Energy re Fraction of s Fraction of s Efficiency of Efficiency of Efficiency of Space heating Space heating	requirement per m2 quirements	Individua Indivi	ar contribu l heating s	ystems, inci	L per year Luding micro n (Table 11)	O-CHP	Jul	Aug	Sep	(98c) Oct	/ (4) =	0.0000 1.0000 247.6858 0.0000 Dec	(99) (201) (202) (206) (207) (208)
9a. Energy re- Fraction of s Fraction of s Efficiency of Efficiency of Space heating	requirement per m2 quirements	- Individua rom main sy heating sy heating sy supplementa Feb t 483.3998 (main heat 247.6858 heating sy 195.1666	ar contribu	ystems, inci	Luding micro n (Table 11) May 41.3438	Jun	Jul 0.0000	Aug 0.0000	Sep 0.0000	(98c) Oct 190.8551	/ (4) = Nov 426.4398	0.0000 1.0000 247.6858 0.0000 Dec 655.7256	(201) (202) (202) (206) (207) (208) (98)
9a. Energy re- Fraction of s Fraction of s Efficiency of Efficiency of Space heating Space heating	requirement per m2 quirements	Individua Indivi	l heating s stem(s) stem 1 (in stem 2 (in ry heating Mar 387.2727 ing system 247.6858 stem() 156.3565 ing system 0.0000 stem 2)	ystems, inci- ntary system %) %) Apr 173.4455 1) 247.6858 70.0264 2) 0.0000	May 41.3438 247.6858 16.6920 0.0000	Jun 0.0000 0.0000 0.0000	Jul 0.0000 0.0000 0.0000	Aug 0.0000 0.0000 0.0000	Sep 0.0000 0.0000 0.0000 0.0000	Oct 190.8551 247.6858 77.0553 0.0000	Nov 426.4398 247.6858 172.1697 0.0000	0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409	(201) (202) (206) (207) (208) (98) (210) (211) (212)
9a. Energy re Fraction of s Fraction of s Efficiency of Efficiency of Space heating Space heating Space heating	quirements quirements quirements quirements pace heat fi main space main space secondary/: Jan requirement 673.0450 efficiency 247.6858 fuel (main 771.7334 efficiency 0.0000 fuel (main 0.0000 fuel (secondary) fuel (secondary)	- Individua - Individua - Tom main sy heating sy heating sy supplementa Feb t 483.3998 (main heat 247.6858 heating sy 195.1666 (main heat 0.0000 heating sy nounce	l heating s stem(s) stem(1) into year stem(1) stem(2) into year stem(2) into year 387.2727 ing system 247.6858 stem) 156.3565 ing system 0.0000 stem(2) 0.0000	ystems, inci	May 41.3438 247.6858 16.6920 0.0000	Jun 0.0000 0.0000 0.0000 0.0000	Jul 0.0000 0.0000 0.0000 0.0000	Aug 0.0000 0.0000 0.0000 0.0000	Sep 0.0000 0.0000 0.0000 0.0000	Oct 190.8551 247.6858 77.0553 0.0000	Nov 426.4398 247.6858 172.1697 0.0000 0.0000	0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409 0.0000	(201) (202) (206) (207) (208) (98) (210) (211) (212) (213)
9a. Energy re Fraction of s Fraction of s Efficiency of Efficiency of Efficiency of Space heating Space heating Space heating Space heating Space heating	requirements quirements pace heat f: pace		l heating s stem(s) stem 1 (in stem 2 (in ry heating Mar 387.2727 ing system 247.6858 stem() 156.3565 ing system 0.0000 stem 2)	ystems, inci- ntary system %) %) Apr 173.4455 1) 247.6858 70.0264 2) 0.0000	May 41.3438 247.6858 16.6920 0.0000	Jun 0.0000 0.0000 0.0000	Jul 0.0000 0.0000 0.0000	Aug 0.0000 0.0000 0.0000	Sep 0.0000 0.0000 0.0000 0.0000	Oct 190.8551 247.6858 77.0553 0.0000	Nov 426.4398 247.6858 172.1697 0.0000	0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409	(201) (202) (206) (207) (208) (98) (210) (211) (212) (213)
9a. Energy re- Fraction of s Fraction of s Efficiency of Efficiency of Efficiency of Space heating Space heating Space heating Space heating	requirement per m2 quirements	Tafter sol	ar contribu 1 heating s ry/suppleme stem 1 (in stem 2 (in ry heating Mar 387.2727 ing system 247.6858 stem) 156.3565 ing system 0.0000 stem 2) 0.0000 0.0000	ystems, incl ntary system %) %) system, % Apr 173.4455 1) 247.6858 70.0264 2) 0.0000 0.0000	May 41.3438 247.6858 16.6920 0.0000 0.0000	Jun 0.0000 0.0000 0.0000 0.0000	Jul 0.0000 0.0000 0.0000 0.0000 0.0000	Aug 0.0000 0.0000 0.0000 0.0000 0.0000	Sep 0.0000 0.0000 0.0000 0.0000 0.0000	Oct 190.8551 247.6858 77.0553 0.0000 0.0000	Nov 426.4398 247.6858 172.1697 0.0000 0.0000	0.0000 0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409 0.0000 0.0000	(99) (201) (202) (206) (207) (208) (98) (210) (211) (212) (213) (215)
9a. Energy re Fraction of s Fraction of s Efficiency of Efficiency of Space heating Water heating	requirement per m2 quirements	Tafter sol	l heating s stem(s) stem(1) into year stem(1) stem(2) into year stem(2) into year 387.2727 ing system 247.6858 stem) 156.3565 ing system 0.0000 stem(2) 0.0000	ystems, inci	May 41.3438 247.6858 16.6920 0.0000	Jun 0.0000 0.0000 0.0000 0.0000 0.0000	Jul 0.0000 0.0000 0.0000 0.0000	Aug 0.0000 0.0000 0.0000 0.0000	Sep 0.0000 0.0000 0.0000 0.0000	Oct 190.8551 247.6858 77.0553 0.0000	Nov 426.4398 247.6858 172.1697 0.0000 0.0000	0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409 0.0000 0.0000	(99) (201) (202) (206) (207) (208) (98) (210) (211) (212) (213) (215)
Space heating 9a. Energy re Fraction of s Fraction of s Fraction of s Efficiency of Efficiency of Space heating Efficiency of	quirements quirements quirements quirements pace heat fi main space main space secondary/s Jan requirement 673.0450 efficiency 247.6858 fuel (main 271.7334 efficiency 0.0000 fuel (main 0.0000 fuel (main 0.0000 requirement 246.3650 water heatet 188.7089 r heating, l	Tafter sol	ar contribu	ystems, inci- ntary system %) %) %) Apr 173.4455 1) 247.6858 70.0264 2) 0.0000 0.0000 0.0000	May 41.3438 247.6858 16.6920 0.0000 0.0000 203.5869 188.7089	Jun 0.0000 0.0000 0.0000 0.0000	Jul 0.0000 0.0000 0.0000 0.0000 0.0000 173.7989	Aug 0.0000 0.0000 0.0000 0.0000 0.0000	Sep 0.0000 0.0000 0.0000 0.0000 0.0000 187.2189	Oct 190.8551 247.6858 77.0553 0.0000 0.0000	Nov 426.4398 247.6858 172.1697 0.0000 0.0000 223.1619	0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409 0.0000 0.0000	(99) (201) (202) (206) (207) (208) (98) (210) (211) (212) (213) (215) (64) (216) (217)
Space heating 9a. Energy re Fraction of s Fraction of s Fraction of s Efficiency of Efficiency of Efficiency of Space heating Space heating Space heating Space heating Space heating Space heating Efficiency of (217)m Fuel for wate Space cooling (221)m	quirements quirements quirements pace heat f; pace heat f; main space main space secondary/s Jan requirement 673.0450 efficiency 247.6858 fuel (main 271.7334 efficiency 0.0000 fuel (main 0.0000 fuel (secon 0.0000 requirement 246.3650 water heat 188.7089 reating, 1 130.5530 fuel require 0.0000	Tafter sol Individua Indi	ar contribu l heating s ry/suppleme stem 1 (in stem 2 (in ry heating Mar 387.2727 ing system 247.6858 stem) 156.3565 ing system 0.0000 0.0000 231.8492 188.7089 122.8608 0.0000	ystems, inci	May 41.3438 247.6858 16.6920 0.0000 0.0000 203.5869 188.7089 107.8841 0.0000	Jun 0.0000 0.0000 0.0000 0.0000 0.0000 180.7208 188.7089 95.7670 0.0000	Jul 0.0000 0.0000 0.0000 0.0000 0.0000 173.7989 188.7089 92.0989 0.0000	Aug 0.0000 0.0000 0.0000 0.0000 0.0000 187.1869 188.7089 99.1935 0.0000	Sep 0.0000 0.0000 0.0000 0.0000 0.0000 187.2189 188.7089 99.2104 0.0000	Oct 190.8551 247.6858 77.0553 0.0000 0.0000 210.3436 188.7089 111.4646 0.0000	Nov 426.4398 247.6858 172.1697 0.0000 0.0000 223.1619 188.7089 118.2572 0.0000	0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409 0.0000 0.0000	(99) (201) (202) (206) (207) (208) (98) (210) (211) (212) (213) (215) (64) (216) (217) (219) (221)
Space heating 9a. Energy re Fraction of s Efficiency of Efficiency of Efficiency of Space heating Fuel heating Efficiency of (217)m Fuel for wate Space cooling (221)m Pumps and Fa Lighting	quirements quirements quirements quirements pace heat fi main space main space secondary/s Jan requirement 673.0450 efficiency 247.6858 fuel (main 0.0000 fuel (main 0.0000 fuel (secon 0.0000 requirement 246.3650 water heat 188.7089 r heating, 130.5530 fuel require 0.0000 0.0000 31.1079	Tafter solution to a feet a solution to a seconda crom main sy heating sy heating sy supplementa feb t 483.3998 (main heat 247.6858 heating sy 195.1666 (main heat 0.0000 heating sy 0.0000 to 217.9398 er 188.7089 kWh/month 115.4899 rement 0.0000 0.0000 24.9559	ar contribu 1 heating s	ystems, inci- ystems, inci- ntary system % % % T73.4455 10 247.6858 70.0264 20 0.0000 0.0000 209.1766 188.7089 110.8462 0.0000 0.0000 10.4625	May 41.3438 247.6858 16.6920 0.0000 0.0000 203.5869 188.7089 107.8841 0.0000 0.0000	Jun 0.0000 0.0000 0.0000 0.0000 0.0000 180.7208 188.7089 95.7670	Jul 0.0000 0.0000 0.0000 0.0000 0.0000 173.7989 188.7089 92.0989	Aug 0.0000 0.0000 0.0000 0.0000 0.0000 187.1869 188.7089 99.1935	Sep 0.0000 0.0000 0.0000 0.0000 0.0000 187.2189 188.7089 99.2104	Oct 190.8551 247.6858 77.0553 0.0000 0.0000 210.3436 188.7089	Nov 426.4398 247.6858 172.1697 0.0000 0.0000 223.1619 188.7089 118.2572	0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409 0.0000 0.0000	(99) (201) (202) (206) (207) (208) (98) (210) (211) (212) (213) (215) (64) (216) (217) (219) (221) (231)
Space heating 9a. Energy re	quirements quirement quire	Tafter solution to a feet a solution to the seconda cross and supplementa feb t 483.3998 (main heat 247.6858 heating sy 195.1666 (main heat 0.0000 heating sy 0.0000 to 199.00000 to 188.7089 kWh/month 115.4899 rement 0.0000 24.9559 PVs (Appen -31.7633	ar contribu 1 heating s ry/suppleme stem 1 (in stem 2 (in ry heating Mar 387.2727 ing system 247.6858 stem) 156.3565 ing system 0.0000 0.0000 231.8492 188.7089 122.8608 0.0000 0.0000 22.4700 d.0000 22.4700 d.49.3127	ystems, inci- ntary system %) %) %) %) %) ystems, inci- ntary system % Apr 173.4455 1) 247.6858 70.0264 2) 0.0000 0.0000 209.1766 188.7089 110.8462 0.0000 16.4625 atticum quantiti58.7771	May 41.3438 247.6858 16.6920 0.0000 0.0000 203.5869 188.7089 107.8841 0.0000 12.7161 ity) -65.5787	Jun 0.0000 0.0000 0.0000 0.0000 0.0000 180.7208 188.7089 95.7670 0.0000 10.3892 -61.7595	Jul 0.0000 0.0000 0.0000 0.0000 173.7989 188.7089 92.0989 0.0000 0.0000	Aug 0.0000 0.0000 0.0000 0.0000 187.1869 188.7089 99.1935 0.0000 0.0000	Sep 0.0000 0.0000 0.0000 0.0000 0.0000 187.2189 188.7089 99.2104 0.0000 0.0000	Oct 190.8551 247.6858 77.0553 0.0000 0.0000 210.3436 188.7089 111.4646 0.0000	Nov 426.4398 247.6858 172.1697 0.0000 0.0000 223.1619 188.7089 118.2572 0.0000 0.0000	0.0000 0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409 0.0000 0.0000	(99) (201) (202) (206) (207) (208) (98) (210) (211) (212) (213) (215) (64) (216) (217) (219) (221) (231) (232)
Space heating 9a. Energy re Fraction of s Fraction of s Fraction of s Efficiency of Efficiency of Efficiency of Space heating Efficiency of (217)m Fuel for wate Space cooling (221)m Fuel for wate Space cooling (221)m Fuel for wate Space cooling (221)m Electricity g (233a)m Electricity g (233a)m Electricity g (234a)m	requirement per m2 quirements	t after sol	ar contribu 1 heating s ry/suppleme stem 1 (in stem 2 (in ry heating Mar 387.2727 ing system 0.0000 0.0000 231.8492 188.7089 122.8608 0.0000 0.0000 dix M) (neg -49.3127 nes (Append	ystems, inci ntary system %) %) %) %ysystem, % Apr 173.4455 1) 247.6858 70.0264 2) 0.0000 0.0000 209.1766 188.7089 110.8462 0.0000 0.0000 16.4625 ative quant: -58.7771 ix M) (negative June 10.0000	May 41.3438 247.6858 16.6920 0.0000 0.0000 203.5869 188.7089 107.8841 0.0000 0.0000 12.7161 ity) -65.5787 ive quantive 0.0000	Jun 0.0000 0.0000 0.0000 0.0000 0.0000 180.7208 188.7089 95.7670 0.0000 0.0000 10.3892 -61.7595 by) 0.0000	Jul 0.0000 0.0000 0.0000 0.0000 0.0000 173.7989 188.7089 92.0989 0.0000 0.0000 11.6001 -60.8548 0.0000	Aug 0.0000 0.0000 0.0000 0.0000 0.0000 187.1869 188.7089 99.1935 0.0000 0.0000 15.0782	Sep 0.0000 0.0000 0.0000 0.0000 0.0000 187.2189 188.7089 99.2104 0.0000 0.0000 19.5851	Oct 190.8551 247.6858 77.0553 0.0000 0.0000 210.3436 188.7089 111.4646 0.0000 0.0000 25.6967	Nov 426.4398 247.6858 172.1697 0.0000 0.0000 223.1619 188.7089 118.2572 0.0000 0.0000 29.0244	3031.5275 32.9693 0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409 0.0000 0.0000 245.7912 188.7089 188.7089 130.2489 0.0000 0.0000 31.9725	(99) (201) (202) (206) (207) (208) (98) (210) (211) (212) (213) (215) (64) (216) (217) (219) (221) (231) (232) (233a)
Space heating 9a. Energy re Fraction of s Fraction of s Fraction of s Efficiency of Efficiency of Efficiency of Space heating Frace heating Space heating Space heating Space heating Space heating Efficiency of (21)m Fuel for wate Space cooling (221)m Pumps and Fa Lighting Electricity g (233a)m Electricity g Electricity g	quirements quirement quirem	t after sol	ar contribu 1 heating s	ystems, inci- ntary system %) %) %) %ystem, % Apr 173.4455 1) 247.6858 70.0264 2) 0.0000 0.0000 209.1766 188.7089 110.8462 0.0000 16.4625 ative quant: -58.7771 ix M) (negat 0.0000 tors (Appen: 0.0000 tors (Appen: 0.0000	May 41.3438 247.6858 16.6920 0.0000 0.0000 203.5869 188.7089 107.8841 0.0000 0.27161 ity) -65.5787 cive quantif 0.0000 ix M) (negg	Jun 0.0000 0.0000 0.0000 0.0000 0.0000 180.7208 188.7089 95.7670 0.0000 10.3892 -61.7595 ty) 0.0000 attive quant. 0.0000	Jul 0.0000 0.0000 0.0000 0.0000 173.7989 188.7089 92.0989 0.0000 11.6001 -60.8548 0.0000 ity) 0.0000 ye if net gr	Aug 0.0000 0.0000 0.0000 0.0000 0.0000 187.1869 188.7089 99.1935 0.0000 0.0000 15.0782 -55.9010 0.0000	Sep 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 187.2189 188.7089 99.2104 0.0000 0.0000 19.5851 -47.1454	Oct 190.8551 247.6858 77.0553 0.0000 0.0000 210.3436 188.7089 111.4646 0.0000 25.6967 -37.3828 0.0000 0.0000	Nov 426.4398 247.6858 172.1697 0.0000 0.0000 223.1619 188.7089 118.2572 0.0000 29.0244 -23.4887	3031.5275 32.9693 0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409 0.0000 0.0000 245.7912 188.7089 188.7089 130.2489 0.0000 0.0000 31.9725 -17.5738	(99) (201) (202) (206) (207) (208) (98) (210) (211) (212) (213) (215) (64) (217) (219) (221) (231) (232) (233a) (234a)
Space heating	requirement per m2 quirements quirements pace heat fi deficiency 247.6858 fuel (main 217.7334 efficiency 0.0000 fuel (secon 0.0000 requirement 246.3650 requirement 188.7089 130.530 fuel requir 0.0000 0.0000 31.1079 enerated by -20.6886 enerated by 0.0000 enerated by 0.0000 enerated by 0.0000 sed or net 6 0.0000 enerated by 0.0000 enerated by 0.0000 enerated by 0.0000	t after sol	ar contribu 1 heating s stem(s) stem(s) stem(s) stem 1 (in stem 2 (in ry heating Mar 387.2727 ing system 0.0000 co.0000 231.8492 188.7089 122.8608 0.0000 0.0000 22.4700 dix M) (neg -49.3127 nes (Append 0.0000 generated 1 0.0000 generated 3 0.00000 generated 3 0.0000 generated	ystems, inci ntary system %) %) %) %ystems, % Apr 173.4455 1) 247.6858 70.0264 2) 0.0000 0.0000 0.0000 209.1766 188.7089 110.8462 0.0000 16.4625 ative quant: -58.7771 ix M) (negat 0.0000 tors (Appencount) tors	May 41.3438 247.6858 16.6920 0.0000 0.0000 203.5869 188.7089 107.8841 0.0000 0.0000 ity) -65.5787 cive quanti 0.0000 ix M) (neg quanti 0.0000 (Appendix 0.0000)	Jun 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 180.7208 188.7089 95.7670 0.0000 0.0000 10.3892 -61.7595 ty) 0.0000 ative quant. 0.0000 N) (negation 0.0000 N) (negation 0.0000)	Jul 0.0000 0.0000 0.0000 0.0000 0.0000 173.7989 188.7089 92.0989 0.0000 0.0000 11.6001 -60.8548 0.0000 ity) 0.0000 ve if net go	Aug 0.0000 0.0000 0.0000 0.0000 0.0000 187.1869 188.7089 99.1935 0.0000 0.0000 15.0782 -55.9010 0.0000 0.0000 eneration) 0.0000	Sep 0.0000 0.0000 0.0000 0.0000 0.0000 187.2189 188.7089 99.2104 0.0000 0.0000 19.5851 -47.1454 0.0000 0.0000 0.0000	Oct 190.8551 247.6858 77.0553 0.0000 0.0000 210.3436 188.7089 111.4646 0.0000 25.6967 -37.3828 0.0000 0.0000	Nov 426.4398 247.6858 172.1697 0.0000 0.0000 223.1619 188.7089 118.2572 0.0000 29.0244 -23.4887 0.0000 0.0000 0.0000	3031.5275 32.9693 0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409 0.0000 0.0000 245.7912 188.7089 188.7089 130.2489 0.0000 0.0000 31.9725 -17.5738 0.0000 0.0000	(99) (201) (202) (206) (207) (208) (98) (210) (211) (212) (213) (215) (64) (216) (217) (219) (221) (231) (232) (233a) (234a) (235a) (235c)
Space heating	requirements quirements quirements quirements pace heat fi main space main space main space secondary/s Jan requirement 673.0450 efficiency 247.6858 fuel (main 0.0000 fuel (main 0.0000 fuel (secon 0.0000 fuel (secon 188.7089 requirement 246.3650 water heat 188.7089 requirement 246.3650 water heat 188.7089 colono 0.0000 guel requirement 0.0000 onerated by -20.6886 enerated by 0.0000 enerated by	t after sol	ar contribu l heating s l heating s ry/suppleme stem 1 (in stem 2 (in ry heating Mar 387.2727 ing system 247.6858 stem) 156.3565 ing system 0.0000 0.0000 231.8492 188.7089 122.8608 0.0000 022.4700 dix M) (neg -49.3127 nes (Append 0.0000 tric genera 0.0000 dix M) (neg -20.4190 mes (Append 0.0000 dix M) (neg -20.4190 nes (Append nes	ystems, inci- ntary system %) %) %) %ystem, % Apr 173.4455 1) 247.6858 70.0264 2) 0.0000 0.0000 0.0000 209.1766 188.7089 110.8462 0.0000 16.4625 ative quant: -58.7771 ix M) (negative quant: -38.9052 0.0000 ative quant: -33.8052 ix M) (negative quant:	May 41.3438 247.6858 16.6920 0.0000 0.0000 0.0000 203.5869 188.7089 107.8841 0.0000 0.27161 ity) -65.5787 cive quanti 0.0000 ity) -48.0148 cive quanti 0.0000 ity) -48.0148	Jun 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 180.7208 188.7089 95.7670 0.0000 0.03892 -61.7595 ty) 0.0000 ative quant 0.0000 N) (negati 0.0000 -49.5922	Jul 0.0000 0.0000 0.0000 0.0000 0.0000 173.7989 188.7089 92.0989 0.0000 0.0000 11.6001 -60.8548 0.0000 ity) 0.0000 ve if net gr 0.00000 -49.1648	Aug 0.0000 0.0000 0.0000 0.0000 0.0000 187.1869 188.7089 99.1935 0.0000 0.0000 15.0782 -55.9010 0.0000 0.0000 eneration) 0.0000 -40.7525	Sep 0.0000 0.0000 0.0000 0.0000 0.0000 187.2189 188.7089 99.2104 0.0000 0.0000 19.5851 -47.1454 0.0000 0.0000 0.0000 0.0000 -29.2122	Oct 190.8551 247.6858 77.0553 0.0000 0.0000 210.3436 188.7089 111.4646 0.0000 25.6967 -37.3828 0.0000 0.0000 0.0000 -15.2366	Nov 426.4398 247.6858 172.1697 0.0000 0.0000 223.1619 188.7089 118.2572 0.0000 29.0244 -23.4887 0.0000 0.0000 0.0000 -5.9628	3031.5275 32.9693 0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409 0.0000 0.0000 245.7912 188.7089 188.7089 130.2489 0.0000 0.0000 31.9725 -17.5738 0.0000 0.0000 -3.2602	(99) (201) (202) (206) (207) (208) (98) (210) (211) (212) (213) (215) (64) (216) (217) (219) (221) (2331) (233a) (234a) (235a) (235c) (233b)
Space heating	quirements	t after sol	ar contribu 1 heating s 1	ystems, inci- ntary system } Apr 173.4455 173.4455 170.0264 290.0000 0.0000 0.0000 209.1766 188.7089 110.8462 0.0000 0.0000 16.4625 ative quanti -58.7771 ix M) (negat 0.0000 by micro-CHi 0.0000	May 41.3438 247.6858 16.6920 0.0000 0.0000 0.0000 203.5869 188.7089 107.8841 0.0000 12.7161 ity) -65.5787 tive quanti 0.0000 ity) -48.0148 tive quanti 0.0000 ity) -48.0148	Jun 0.0000 0.0000 0.0000 0.0000 0.0000 180.7208 188.7089 95.7670 0.0000 0.0000 10.3892 -61.7595 ty) 0.0000 ative quant 0.0000 N) (negati: 0.0000 -49.5922 ty) 0.0000 ative quant	Jul 0.0000 0.0000 0.0000 0.0000 173.7989 188.7089 92.0989 0.0000 0.0000 11.6001 -60.8548 0.0000 ve if net gr 0.0000 -49.1648 0.0000	Aug 0.0000 0.0000 0.0000 0.0000 0.0000 187.1869 188.7089 99.1935 0.0000 0.0000 15.0782 -55.9010 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 0.0000 0.0000 0.0000 0.0000 0.0000	Sep 0.0000 0.0000 0.0000 0.0000 0.0000 187.2189 188.7089 99.2104 0.0000 0.0000 1.5851 -47.1454 0.0000 0.0000 0.0000 -29.2122 0.0000	Oct 190.8551 247.6858 77.0553 0.0000 0.0000 210.3436 188.7089 111.4646 0.0000 0.0000 25.6967 -37.3828 0.0000 0.0000 -15.2366 0.0000	Nov 426.4398 247.6858 172.1697 0.0000 0.0000 223.1619 188.7089 118.2572 0.0000 0.0000 29.0244 -23.4887 0.0000 0.0000 -5.9628 0.0000	3031.5275 32.9693 0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409 0.0000 0.0000 245.7912 188.7089 188.7089 130.2489 0.0000 0.0000 31.9725 -17.5738 0.0000 0.0000 0.0000 -3.2602 0.0000	(99) (201) (202) (206) (207) (208) (98) (210) (211) (212) (213) (215) (64) (216) (217) (219) (221) (231) (232) (233a) (234a) (235a) (235c) (233b) (234b)
Space heating	requirement per m2 quirements quirements pace heat fi main space main space main space secondary/s Jan requirement 673.0450 efficiency 247.6858 fuel (main 271.7334 efficiency 0.0000 fuel (main 0.0000 fuel (secon 0.0000 fuel (secon 188.7089 requirement 246.3650 water heatt 188.7089 requirement 0.0000 fuel (requirement 0.0000 nerated by -20.6886 enerated by 0.0000 enerated by -4.1753 enerated by -4.1753 enerated by 0.0000	t after sol	ar contribu 1 heating s 1	ystems, inci- ntary system %) %) %) %ystem, % Apr 173.4455 1) 247.6858 70.0264 2) 0.0000 0.0000 0.0000 209.1766 188.7089 110.8462 0.0000 16.4625 ative quant: -58.7771 ix M) (negat 0.0000 tors (Appens 0.0000 ative quant: -33.8052 ix M) (negat 0.0000 ative quant: -33.8052 ix M) (negat 0.0000 tors (Appens	May 41.3438 247.6858 16.6920 0.0000 0.0000 0.0000 203.5869 188.7089 107.8841 0.0000 12.7161 ity) -65.5787 cive quanti 0.0000 ity) -48.0148 cive quanti 0.0000 ity) -48.0148 ive quanti 0.0000 ity) 1.0000	Jun 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 180.7208 188.7089 95.7670 0.0000 10.3892 -61.7595 ty) 0.0000 ative quant. 0.0000 -49.5922 ty) 0.0000 ative quant. 0.0000 colour quant. 0.0000 10.0000 colour quant. 0.0000 colour quant. 0.0000 colour quant. 0.0000 colour quant. 0.0000	Jul 0.0000 0.0000 0.0000 0.0000 0.0000 173.7989 188.7089 92.0989 0.0000 0.0000 11.6001 -60.8548 0.0000 ity) 0.0000 ve if net gr 0.0000 -49.1648 0.0000 ity) 0.0000	Aug 0.0000 0.0000 0.0000 0.0000 0.0000 187.1869 188.7089 99.1935 0.0000 0.0000 15.0782 -55.9010 0.0000 0.0000 eneration) 0.0000 -40.7525 0.0000 0.0000	Sep 0.0000 0.0000 0.0000 0.0000 0.0000 187.2189 188.7089 99.2104 0.0000 0.0000 19.5851 -47.1454 0.0000 0.0000 0.0000 0.0000 -29.2122	Oct 190.8551 247.6858 77.0553 0.0000 0.0000 210.3436 188.7089 111.4646 0.0000 25.6967 -37.3828 0.0000 0.0000 0.0000 -15.2366	Nov 426.4398 247.6858 172.1697 0.0000 0.0000 223.1619 188.7089 118.2572 0.0000 29.0244 -23.4887 0.0000 0.0000 0.0000 -5.9628	3031.5275 32.9693 0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409 0.0000 0.0000 245.7912 188.7089 188.7089 130.2489 0.0000 0.0000 31.9725 -17.5738 0.0000 0.0000 -3.2602	(99) (201) (202) (206) (207) (208) (98) (210) (211) (212) (213) (215) (64) (216) (217) (221) (231) (232) (233a) (234a) (235a) (235c) (233b) (234b) (235b)

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Space heating fuel - main system 1 Space heating fuel - main system 2 Space heating fuel - secondary Efficiency of water heater Water heating fuel used Space cooling fuel Electricity for pumps and fans: Total electricity for the above, kWh/year Electricity for lighting (calculated in Appendix L) Energy saving/generation technologies (Appendices M ,N and Q) PV generation Wind generation Hydro-electric generation (Appendix N) Electricity generated - Micro CHP (Appendix N) Appendix Q - special features Energy saved or generated Energy used Total delivered energy for all uses				1223.9409 0.0000 0.0000 188.7089 1333.8746 0.0000 251.0584 -839.3408 0.0000 0.0000 0.0000 -0.0000 0.0000 1969.5330	(213) (215) (219) (221) (231) (232) (233) (234) (235a) (235a) (235) (236) (237)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies	Energy kWh/year 1223.9409 1333.8746 0.0000 251.0584	kg CO2/kWh 0.1563 0.1408 0.0000 0.1443	kg	Emissions CO2/year 191.2888 0.0000 187.8229 379.1117 0.0000 36.2355	(373) (264) (265) (267)
PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Dwelling Carbon Dioxide Emission Rate (DER)	-530.2265 -309.1143			-70.7348 -38.1022 -108.8370 306.5101 3.3300	(272)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies	Energy	1.5207 0.0000	:	ry energy kWh/year 1932.1217 0.0000 0228.3682 3960.4899 0.0000 385.0818	(473) (278) (279) (281)
PV Unit electricity used in dwelling PV Unit electricity exported Total Total Primary energy kWh/year Dwelling Primary energy Rate (DPER)	-530.2265 -309.1143			-791.6190 -139.8203 -931.4394 3414.1323 37.1300	(286)
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS					
1. Overall dwelling characteristics Ground floor First floor Second floor Total floor area TFA = (la)+(lb)+(lc)+(ld)+(le)(ln) Dwelling volume 91.9500	59.8100 27.2800		(2b) = (2c) = (2d) =	161.4870 66.0176	(1c) - (3c) (1d) - (3d) (4)
2. Ventilation rate			-2	}	
Number of open chimneys Number of open flues Number of chimneys / flues attached to closed fire Number of flues attached to solid fuel boiler Number of flues attached to other heater Number of blocked chimneys Number of intermittent extract fans Number of passive vents Number of flueless gas fires			0 * 80 = 0 * 20 = 0 * 10 =	0.0000 30.0000 0.0000	(6b) (6c) (6d) (6e) (6f) (7a) (7b)
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+$ Pressure test Pressure Test Method Measured/design AP50 Infiltration rate	(7b)+(7c) =	30.0000	Air changes) / (5) = Blo	per hour 0.1252 Yes ower Door 5.0000 0.3752	(17)

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Number of sides	sheltered												(19)
Shelter factor Infiltration rat	e adjusted	to includ	de shelter i	factor					(20) = 1 -	[0.075 x 1) = (18)		0.7750 0.2908	
Wind speed Wind factor	Jan 5.1000 1.2750	Feb 5.0000 1.2500	Mar 4.9000 1.2250	Apr 4.4000 1.1000	May 4.3000 1.0750	Jun 3.8000 0.9500	Jul 3.8000 0.9500	Aug 3.7000 0.9250	Sep 4.0000 1.0000	Oct 4.3000 1.0750	Nov 4.5000 1.1250	Dec 4.7000 1.1750	
Adj infilt rate Effective ac	0.3707 0.5687	0.3635 0.5661	0.3562 0.5634	0.3198 0.5511	0.3126 0.5489	0.2762 0.5382	0.2762 0.5382			0.3126 0.5489			
3. Heat losses a	nd heat lo	ss paramet	er										
Element				Gross m2	Openings m2	2	tArea m2	U-value W/m2K	A x W/	K	-value kJ/m2K	A x K kJ/K	
TER Opening Type Exposed Floor Cavity Wall Sloping Wall External Roof 1 Total net area o Fabric heat loss Party Wall 1	f external	elements	Aum(A, m2)	86.3300 13.0400 53.9800	14.9900	71 13 53 160	.9900 .2200 .3400 .0400 .9800 .5700 (26)(5	1.1450 0.1300 0.1800 0.1800 0.1100 30) + (32)		6 2 2 8 9			(27) (28b) (29a) (29a) (30) (31) (33) (32)
Thermal mass par		IP = Cm / T	TFA) in kJ/r	n2K								362.4428	(35)
E3 Sill E4 Jamb E20 Expo E7 Party P7 Party P3 Party E16 Corn E25 Stag E18 Part E21 Expo P4 Party P8 Party E14 Flat R8 Roof	nt sed floor floor bet Wall - Ex wall - In Intels (wall - Intel floor bet wall - Intel floor bet wall bet wall bet wall - Ro wall - Ro floor wall - Ex roof to wall (r	(normal) ween dwell posed floo termediate) y wall bet ween dwell (inverted) of (insule posed floo after)	or (normal) e floor betw tween dwell: lings	locks of fla ween dwellir ings iling level)	gs (in bloo	cks of flat	s)	8 8 23 3 31 4 14 16 26 5 1 14 4 24	.2500 .2000 .2000 .1200 .4640 .4500 .4500 .6400 .8000 .2000 .5960 .4700 .3200	si-value 0.0500 0.0500 0.0500 0.3200 0.1600 0.0900 0.0600 0.0600 0.1200 0.1200 0.1200 0.1200 0.0800 0.0800 0.0600 0.0600 0.0600 0.0600 0.0600 0.0600 0.0600 0.0600 0.0600 0.0600 0.0600 0.0600 0.0600 0.0600	Tot 0.41 0.41 1.18 0.99 2.20 0.74 0.00 1.49 1.60 0.31 0.48 1.73 1.10	00 00 35 84 27 27 00 80 20 00 88 80 30 76 89	
Thermal bridges Point Thermal br Total fabric hea	(Sum(L x P idges										(36a) = + (36a) =	14.9078 0.0000	
Ventilation heat	loss calc	ulated mor	nthly (38)m Mar	= 0.33 x (2	25)m x (5) Mav	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer co	44.9777 eff 99.1144	44.7666 98.9034	44.5598 98.6965	43.5882 97.7249	43.4064 97.5432	42.5602 96.6969	42.5602 96.6969	42.4035 96.5402	42.8861 97.0229	43.4064 97.5432	43.7742 97.9109	44.1586 98.2954	
Average = Sum(39)m / 12 =	Feb	Mar			Jun	Jul			Oct	Nov	97.7241	
HLP HLP (average)	1.0779	1.0756	1.0734	Apr 1.0628	May 1.0608	1.0516	1.0516	Aug 1.0499	Sep 1.0552	1.0608	1.0648	Dec 1.0690 1.0628	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
4. Water heating	energy re)									
Assumed occupanc Hot water usage	for mixer		04.0505	01 0710	50 5400	DE 5016	B0 BB00	TF 6000	77 7016	01 0501	04 0040	2.6515	
Hot water usage	88.2264 for baths 0.0000		84.9685 0.0000	0.0000	78.5438 0.0000	75.5016	73.7723	75.6898	77.7916 0.0000	0.0000	84.8342 0.0000	0.0000	
	for other 41.7838	uses 40.2644	38.7450	37.2256		34.1868	34.1868		37.2256	38.7450	40.2644	41.7838	(42c)
Average daily ho	t water us Jan	e (litres/ Feb	day) Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	119.3271 Dec	(43)
	use 30.0103	127.1650	123.7135	118.4975	114.2500	109.6883	107.9591	111.3959	115.0172	119.8031	125.0986	129.6722	
Energy conte 2 Energy content (Distribution los	annual)			162.2171	153.8025	134.8746	130.5672	137.9315	141.8277		178.2258 um(45)m =		
Water storage lo	30.8857	27.1622	28.5215	24.3326	23.0704	20.2312	19.5851	20.6897	21.2742	24.3858	26.7339	30.4553	(46)
Store volume a) If manufactu Temperature fa Enter (49) or (5 Total storage lo	ctor from 4) in (55)		actor is kno	own (kWh/da	чу):							150.0000 1.3938 0.5400 0.7527	(48) (49)
	23.3325	21.0745 ated solar	23.3325 storage	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
Primary loss Combi loss	23.3325 23.2624 0.0000	21.0745 21.0112 0.0000	23.3325 23.2624 0.0000	22.5798 22.5120 0.0000	23.3325 23.2624 0.0000	22.5798 22.5120 0.0000	23.3325 23.2624 0.0000	23.3325 23.2624 0.0000	22.5798 22.5120 0.0000	23.3325 23.2624 0.0000	22.5798 22.5120 0.0000	23.3325 23.2624 0.0000	(59)
WWHRS - PV diverter Solar input FGHRS	52.4994 40.3334	223.1669 -35.6712 -0.0000 0.0000	236.7379 -37.3529	ed for each 207.3089 -30.9296 -0.0000 0.0000	200.3974 -28.8253				186.9196 -25.5204 -0.0000 0.0000 0.0000	-30.0858		249.6303 -39.5865 -0.0000 0.0000 0.0000	(63a) (63b) (63c)
			199.3851	176.3793	171.5721	155.3004	154.0416		161.3992 er year (kWh			2156.0381	(64)
12Total per year Electric shower(0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	2156 0.0000	(64)
Heat gains from									wer(s) (kWh/			0.0000	

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	105.7392	93.8781	100.4985	90.0107	88.4152	80.9193	80.6895	83.1381	83.2312	91.3310	95.3336	104.7852	(65)
5. Internal ga													
Metabolic gair		, Watts							C	0-4	V	D	
(66)m Lighting gains	132.5741	132.5741	132.5741	132.5741					Sep 132.5741	Oct 132.5741	Nov 132.5741		(66)
Appliances gai	127.2048	140.8339	127.2048	131.4450	127.2048	131.4450	127.2048	127.2048	131.4450	127.2048	131.4450	127.2048	(67)
Cooking gains	242.6198 (calculated	245.1374 d in Append	238.7931 lix L, equat:	225.2867 ion L15 or 1	208.2373 L15a), also	192.2133 see Table 5	181.5083 5			198.8414		231.9148	
Pumps, fans	36.2574 3.0000	36.2574 3.0000	36.2574 3.0000	36.2574 3.0000	36.2574 3.0000	36.2574 0.0000	36.2574 0.0000	36.2574 0.0000	36.2574 0.0000	36.2574 3.0000	36.2574 3.0000	36.2574 3.0000	
Losses e.g. ev Water heating	-106.0593	-106.0593			-106.0593	-106.0593	-106.0593	-106.0593	-106.0593	-106.0593	-106.0593	-106.0593	(71)
Total internal	142.1225	139.6995	135.0786	125.0148	118.8377	112.3879	108.4536	111.7448	115.5989	122.7567	132.4077	140.8403	(72)
		591.4431	566.8487	547.5187	520.0521	498.8184	479.9390	480.7125	495.1511	514.5751	545.5157	565.7321	(73)
6. Solar gains	3												
[Jan]			A	rea m2	Solar flux Table 6a W/m2	Specif or 1	g fic data Table 6b	Specific or Tab	FF data le 6c	Acces facto Table 6	ss or id	Gains W	
Northeast													
Southeast Southwest			2.30 1.00	800 600 	36.7938 36.7938		0.6300 0.6300	0: 0:	.7000 .7000	0.770 0.770 0.770	10 10	26.7623 11.9194	(77) (79)
Solar gains Total gains													
7. Mean intern													
Temperature du Utilisation fa	actor for ga	ains for li	ving area, n	nil,m (see '	Table 9a)							21.0000	(85)
tau alpha	Jan 93.4011	Feb 93.6004	Mar 93.7966	Apr 94.7291	May 94.9056	Jun 95.7362	Jul 95.7362	Aug 95.8916	Sep 95.4146	Oct 94.9056	Nov 94.5492	Dec 94.1794	
util living ar	rea		0.9933	0.9640	0.8497	0.6314	0.4610		0.8101	0.9808	0.9978		
MIT		20.2569	20.4496	20.7252	20.9260	20.9926	20.9993		20.9607	20.7030			
Th 2 util rest of h			20.0226	20.0313	20.0330	20.0405	20.0405	20.0419		20.0330			
MIT 2 Living area fr	19.0132	0.9969 19.1743	0.9898 19.4208	0.9458 19.7662	0.7911 19.9801	0.5414 20.0375	0.3610 20.0404	0.4148 20.0416		0.9675 19.7470 Living area		18.9944	(90)
MIT Temperature ad	19.3451	19.4955	19.7260	20.0508	20.2607	20.3209	20.3249	20.3255		20.0307			(92)
adjusted MIT	19.3451	19.4955	19.7260	20.0508	20.2607	20.3209	20.3249	20.3255	20.2968	20.0307	19.6399	19.3262	(93)
8. Space heati	ing require	nent											
Utilisation	Jan 0.9985	Feb 0.9962	Mar 0.9884	Apr 0.9463	May 0.8062	Jun 0.5682	Jul 0.3907	Aug 0.4469	Sep 0.7485	Oct 0.9674	Nov 0.9958	Dec 0.9989	(94)
Useful gains Ext temp.	655.2518	735.5760	793.7790	850.8043		549.3161 14.6000				664.1153 10.6000		630.6473	(95)
	1491.1909	1443.5434	1305.3629	1089.7065	835.0394	553.1912	360.1867	378.9659	601.2294	919.8963	1227.7950	1486.8361	(97)
Space heating Space heating	621.9387		380.6185 er year (kW)		40.9112	0.0000	0.0000	0.0000	0.0000	190.3010	423.7455	637.0045 2942.2832	
Solar heating	0.0000 contribution	0.0000 on - total		0.0000 Wh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Space heating Space heating Space heating	621.9387 requirement	475.7541 after sol	380.6185 ar contribu	172.0096 tion - tota	40.9112 1 per year	0.0000 (kWh/year)	0.0000	0.0000	0.0000	190.3010 (98c)	423.7455 / (4) =	2942.2832	
9a. Energy req													
Fraction of sp	ace heat fi	rom seconda	ry/supplemen									0.0000	
Fraction of sp Efficiency of Efficiency of Efficiency of	main space main space	heating sy heating sy	stem 1 (in stem 2 (in	%)								1.0000 92.3000 0.0000 0.0000	(206) (207)
Space hostin-	Jan remuirement	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating Space heating	621.9387	475.7541	380.6185		40.9112	0.0000	0.0000	0.0000	0.0000	190.3010	423.7455	637.0045	(98)
Space heating	92.3000 fuel (main	92.3000 heating sy	92.3000 stem)	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating	673.8231 efficiency	515.4432 (main heat	412.3710 ing system 2	2)	44.3241	0.0000	0.0000	0.0000	0.0000	206.1766		690.1457	
Space heating		heating sy			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Space heating	fuel (secon	ndary)	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	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	0.0000	(213)

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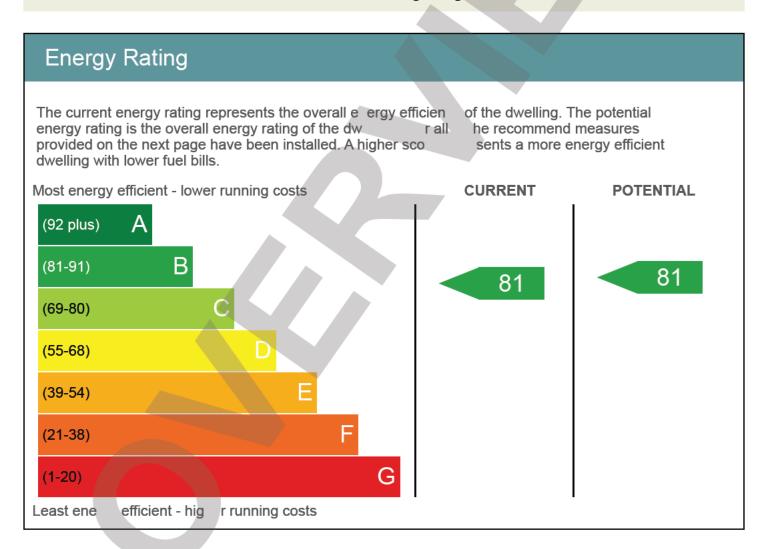
Water heating						
Water heating requirement 212.1659 187.4957 199.3851 176.3793 171.5721 155.3004 154.	0416 159.9401	161.3992	179.0808	189.2342		
Efficiency of water heater (217)m 86.3236 86.0563 85.4857 84.0035 81.3882 79.8000 79.	8000 79.8000	79.8000	84.1963	85.8123	79.8000 86.3841	
Fuel for water heating, kWh/month 245.7798 217.8756 233.2380 209.9665 210.8070 194.6121 193.	0346 200.4261	202.2546	212.6944	220.5211	243.1509	(219)
Space cooling fuel requirement (221)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	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 7.5 Lighting 26.4306 21.2036 19.0915 13.9873 10.8042 8.8271 9.5	3041 7.3041 8559 12.8111		7.3041 21.8331		7.3041 27.1652	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m -30.8211 -44.6104 -65.8046 -75.9780 -83.6196 -78.6382 -77.					-26.5114	
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	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0000 0.0000	0.0000	0.0000	0.0000	0.0000	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if		0.0000	0.0000	0.0000	0.0000	
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m -14.0566 -29.9011 -60.0562 -91.1267 -121.4089 -122.3440 -120.					-11.0925	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0000 0.0000	0.0000	0.0000	0.0000	0.0000	
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	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if 1 (235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	net generation)		0.0000	0.0000		
Annual totals kWh/year	0.0000	0.0000	0.0000	0.0000	0.0000	
Space heating fuel - main system 1 Space heating fuel - main system 2					3187.7391	(213)
Space heating fuel - secondary Efficiency of water heater					0.0000 79.8000	
Water heating fuel used Space cooling fuel					2584.3607 0.0000	
Electricity for pumps and fans:						
Total electricity for the above, kWh/year Electricity for lighting (calculated in Appendix L)					86.0000 213.3105	
Energy saving/generation technologies (Appendices M ,N and Q)						
PV generation Wind generation					-1514.9530 0.0000	
Hydro-electric generation (Appendix N) Electricity generated - Micro CHP (Appendix N)					0.0000	
Appendix Q - special features Energy saved or generated					-0.0000	(236)
Energy saved or generated Energy used					0.0000	(237)
Energy saved or generated						(237)
Energy saved or generated Energy used					0.0000	(237)
Energy saved or generated Energy used Total delivered energy for all uses					0.0000 4556.4572	(237)
Energy saved or generated Energy used Total delivered energy for all uses	Energy kWh/year		ion factor kg CO2/kWh		0.0000	(237)
Energy saved or generated Energy used Total delivered energy for all uses	 Energy		kg CO2/kWh 0.2100	k	0.0000 4556.4572 Emissions	(237) (238)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1	Energy kWh/year	1	0.2100	k	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158	(237) (238) (261) (373) (264)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot	Energy kWh/year 3187.7391	1	0.2100	k	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293	(237) (238) (261) (373) (264) (265) (267)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting	Energy kWh/year 3187.7391 2584.3607 86.0000	1	kg CO2/kWh 0.2100	k	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410	(237) (238) (261) (373) (264) (265) (267)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105	1	0.2100 0.2100 0.2100 0.1387 0.1443	k	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873	(237) (238) (261) (373) (264) (265) (267)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105	1	0.2100 0.2100 0.2100 0.1387 0.1443	k	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326	(261) (373) (264) (267) (268)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system l Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105	1	0.2100 0.2100 0.2100 0.1387 0.1443	k	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873	(261) (373) (264) (265) (267) (268) (269) (272)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105	1	0.2100 0.2100 0.2100 0.1387 0.1443	k	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326 1058.6249	(261) (373) (264) (265) (267) (268) (269) (272)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER)	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105	1	0.2100 0.2100 0.2100 0.1387 0.1443	k	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326 1058.6249	(261) (373) (264) (265) (267) (268) (269) (272)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105 -705.8886 -809.0645	1	CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1340 0.1256	k	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326 1058.6249 11.5100	(261) (373) (264) (265) (267) (268) (269) (272)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER)	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105 -705.8886 -809.0645	Primary enem	0.2100 0.2100 0.2100 0.1387 0.1443	k	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326 1058.6249	(261) (373) (264) (264) (267) (268) (269) (272) (273)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105 -705.8886 -809.0645 Energy kWh/year 3187.7391	Primary ene	CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1340 0.1256 crgy factor kg CO2/kWh 1.1300	k	Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.923 30.7873 -94.6205 -101.6121 -196.2326 1058.6249 11.5100 ary energy kWh/year 3602.1451 0.0000	(261) (373) (264) (265) (268) (269) (272) (273)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating (other fuel) Space and water heating	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105 -705.8886 -809.0645 Energy kWh/year 3187.7391 2584.3607	Primary ene:	cg CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1340 0.1256 cgg factor kg CO2/kWh 1.1300 1.1300	k Prim	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326 1058.6249 11.5100 ary energy kWh/year 3602.1451 0.0000 2920.3276 6522.4728	(261) (373) (264) (265) (267) (268) (272) (273) (273) (275) (473) (279)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel)	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105 -705.8886 -809.0645 Energy kWh/year 3187.7391	Primary ene:	CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1340 0.1256 crgy factor kg CO2/kWh 1.1300	k	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326 1058.6249 11.5100 ary energy kWh/year 3602.1451 0.0000 0.920.3276	(261) (373) (261) (373) (264) (265) (267) (268) (272) (273) (273) (273)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105 -705.8886 -809.0645 Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105	Primary ener	cg CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1340 0.1256 cg CO2/kWh 1.1300 1.5128 1.5338	Prim	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326 1058.6249 11.5100 ary energy kWh/year 3602.1451 0.0000 2920.3276 6522.4728 130.10827	(261) (373) (261) (373) (264) (265) (267) (268) (272) (273) (273) (273)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105 -705.8886 -809.0645 Energy kWh/year 3187.7391 2584.3607 86.0000	Primary ene)	CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1340 0.1256 crgy factor kg CO2/kWh 1.1300 1.5128	Prim	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326 1058.6249 11.5100 ary energy kWh/year 3602.1451 0.0000 2920.3276 6522.4728 130.1008 327.1827	(261) (373) (261) (373) (264) (265) (267) (268) (272) (273) (273) (273) (278) (278) (278) (278) (281) (282)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP 13a. Carbon dioxide emissions - Individual heating systems including micro-CHP 15pace heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) 13a. Primary energy - Individual heating systems including micro-CHP 13a. Primary energy - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105 -705.8886 -809.0645 Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105 -705.8886	Primary ene)	rgy factor rgy factor 1.1300 1.1300 1.1300 1.1300 1.1300 1.1300 1.14954	Prim	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326 1058.6249 11.5100 ary energy kWh/year 3602.1451 0.0000 2920.3276 6522.4728 130.1008 327.1827	(261) (373) (264) (265) (267) (268) (272) (273) (273) (273) (275) (473) (279) (281) (282)

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Dwelling Address	Unit 1, Highland Square , Bristol
Report Date	05/03/2024
Property Type	Maisonette, Mid-Terrace
Floor Area [m ²]	92

This document is not an Energy Performance Certificat EPC) s required by the Energy Performance of Buildings Reg io



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Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good		
Feature	Description			gy Performance		
Walls	Average thermal transmi	ttance 0.18 W/m²K	5///	Very Good		
Roof	Average thermal transmi	ttance 0.11 W/m²K		Very Good		
Floor	Average thermal transmi	Average thermal transmittance 0.18 W/m²K				
Windows	High performance glazin	High performance glazing				
Main heating	Air source heat pump, ra	diators, electric		Good		
Main heating controls	Time and temperature z	contro		Very Good		
Secondary heating	None					
Hot water	From main sys m	Average				
Lighting	Good ligh g efficien			Good		
Air tightness	Air perme 50] =	4.5 h.m² (assumed)		Good		

Primary Energy use

The primary energy use for this property per year is 33 kilowatt hour (kWh) per square metre

Estim ted CO₂ missions of the dwelling

The estimated ing provides an indication of the dwelling's impact on the environment in terms of carbon dioxide emissions; the higher the rating the less impact it has on the environment.

The estimated CO emissions for this dwellings is: 0.3 per year

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With the recommended measures the potential CO emissions could be:

per year

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelli To reach the dwelling's potential energy rating all of the recommended measures shown d to be installed. Having these measures installed individually or in any other order may give a different result d with the cumulative potential rating.

Recommended measure	Typical	Potential Rati	C ulative	Cumulative
	Yearly	after	avings	Potential
	Saving	measure insta	(per year)	Rating

Estimated energy use and potential aving

Estimated energy cost for this property over a year

£654

Over a year you could

The estimated cost and saving how much the average hou would spend in this property heating, lighting and hot water. It not based on how e is used by the people living at the pr p

save

Containg the ssessor and the accreditation scheme

As	ssessor contact details
Assessor name	
Assessor's accreditation number	
Email Address	

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Accreditation scheme contact details						
Accreditation scheme	Elmhurst Energy Systems Ltd					
Telephone						
Email Address						

Assessment details							
Related party disclosure	No related pa						
Date of assessment	05/03/202						
Date of certificate	05/03/202						
Type of assessment	SAP w dwellin						



Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Tue 05 Mar 2024 08:41:58

Project Information			
Assessed By		Building Type	Maisonette, Semi-detached
OCDEA Registration	EES/025661	Assessment Date	2024-03-05

Dwelling Details			
Assessment Type	As designed	Total Floor Area	61 m ²
Site Reference	Unit 5	Plot Reference	Residual
Address	Unit 1 Highland Square, Bristol		

Client Details	
Name	Tebby & Son
Company	SF Tebby & Son
Address	Unit 11 Avon Gorge Industrial Estate , Bristol, BS2 9XX

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	15.38 kgCO ₂ /m ²	
Dwelling carbon dioxide emission rate	5.8 kgCO ₂ /m ²	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	81.31 kWh _{PE} /m ²	
Dwelling primary energy	60.62 kWh _{PE} /m ²	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	48.5 kWh/m ²	
Dwelling fabric energy efficiency	47.6 kWh/m ²	OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m²K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.18	Walls (1) (0.18)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	N/A	N/A	N/A
Roofs	0.16	0.11	Roof (1) (0.11)	ОК
Windows, doors,	1.6	1.31	W01 (1.31)	ОК
and roof windows				
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))			
Name	Net area [m ²]	U-Value [W/m ² K]	
Exposed wall: Walls (1)	77.37	0.18	
Party wall: Party Wall (1)	23.29	0 (!)	
Exposed roof: Roof (1)	60.65	0.11	

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
W01, Windows	4.41	North East	0.7	1.31
W02, Windows	1.26	North East	0.7	1.31
W03, Windows	4.41	North East	0.7	1.31
W04, Windows	1.26	South West	0.7	1.31
W05, Windows	3.49	South West	0.7	1.31
W06, Windows	2.29	South West	0.7	1.31

2d Thermal brid	2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))			
Building part 1 -	Main Dwelling: Thermal bridging ca	alculated from linear thermal transm	ittances for each j	unction
Main element				_
External wall	E2: Other lintels (including other steel lintels)	Not government-approved scheme	0.023 (!)	

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E3: Sill	Calculated by person with suitable expertise	0.021 (!)	
External wall	E4: Jamb	Calculated by person with suitable expertise	0.016 (!)	
External wall	E24: Eaves (insulation at ceiling level - inverted)	SAP table default	0.15	
Party wall	P3: Intermediate floor between dwellings (in blocks of flats)	SAP table default	0 (!)	
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.043	
External wall	E25: Staggered party wall between dwellings	Calculated by person with suitable expertise	0.036 (!)	
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.046	
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.101	
External wall	E14: Flat roof	SAP table default	0.16	
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.073	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))			
Maximum permitted air permeability at 50Pa	8 m³/hm²		
Dwelling air permeability at 50Pa	4.5 m ³ /hm ² , Design value	OK	
Air permeability test certificate reference			

4 Space heating		
Main heating system 1: Heat pump with	radiators or underfloor heating - Electricity	
Efficiency	244.8%	
Emitter type	Radiators	
Flow temperature	55°C	
System type	Heat Pump	
Manufacturer	Atlantic	
Model	Logic Air 8kW	
Commissioning		
Secondary heating system: N/A		
Fuel	N/A	
Efficiency	N/A	
Commissioning		

5 Hot water			
Cylinder/store - type: Cylinder	Cylinder/store - type: Cylinder		
Capacity	150 litres		
Declared heat loss	2.09 kWh/day		
Primary pipework insulated	Yes		
Manufacturer			
Model			
Commissioning			
Waste water heat recovery system 1 - type: N/A			
Efficiency			
Manufacturer			
Model			

6 Controls		
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting			
Minimum permitted light source efficacy	75 lm/W		
Lowest light source efficacy	80 lm/W		OK
External lights control	N/A		
8 Mechanical ventilation			
System type: N/A			
Maximum permitted specific fan power	N/A		
Specific fan power	N/A		N/A
Minimum permitted heat recovery	N/A		14/74
efficiency			
Heat recovery efficiency	N/A		N/A
Manufacturer/Model	1471		1471
Commissioning			
9 Local generation			
N/A			
10 Heat networks			
N/A			
11 Supporting documentary evidence			
N/A			
12 Declarations			
a. Assessor Declaration			
	enfirmation that the ac	Intents of this BREL Compliance Report	
		Interns of this BREE Compliance Report	
the purpose of carrying out the "As de			
evidence (SAP Conventions, Appendi			
documentary evidence required) has		•	
Compliance Report.	been reviewed in the	course or preparing this bitch	
Острианос Кероп.			
Signed:		Assessor ID:	
Name:		Date:	

b. Client Declaration

N/A



Property Reference	Unit 5								Issued	on Date	05/0	03/202	4
Assessment Reference	Resido	ıal				Prop	Type F	Ref	Tebby a	nd Son G	arage		
Property	Unit 1	Highla	nd Square	, Bristol									
SAP Rating				79 C	DER		5.80		-	ΓER	1	15.38	
Environmental				96 A	% DE	R < TER					6	32.29	
CO ₂ Emissions (t/year)				0.33	DFEE		47.5	9	-	TFEE	4	18.55	
Compliance Check				See BREL	% DFI	EE < TFEE					1	1.98	
% DPER < TPER				25.44	DPER		60.6	2		[PER	8	31.31	
Assessor Details										Assessor	·ID (J367-0	001
Client													
SUMMARY FOR INPU	T DATA FO	R: Nev	v Build (<i>F</i>	As Designed)									
Orientation				Southwest									
Property Tenture				1									
Transaction Type				6									
Terrain Type				Urban									
1.0 Property Type				Maisonette, Semi-I	Detached								
Position of Flat				Top-floor flat									
Which Floor				1									
2.0 Number of Storeys				1									
3.0 Date Built				2024									
3.0 Property Age Band				L									
4.0 Sheltered Sides				3									
5.0 Sunlight/Shade				Average or unknow	m								
6.0 Thermal Mass Parame	ter			Precise calculation									
Thermal Mass				N/A					k	J/m²K			
7.0 Electricity Tariff				Standard									
Smart electricity meter f	itted			No									
Smart gas meter fitted				No									
7.0 Measurements													
				Basem Ground flo 1st Stor 2nd Stor 3rd Stor 4th Stor 5th Stor 7th Stor	ent: por: rey: rey: rey: rey: rey:	14.97 m 39.08 m 39.08 m 14.97 m 18.05 m 0.00 m 0.00 m 0.00 m 0.00 m	1	r In	ternal Flo 0.00 n 60.65 s 59.81 n 27.28 n 0.00 n 0.00 n 0.00 n 0.00 n	1 ² 11 ² 11 ² 1 ² 1 ² 1 ² 1 ²	Averaç	9e Stor 0.00 2.50 2.70 2.42 0.00 0.00 0.00 0.00	m m m m m m
8.0 Living Area				19.68					п	ı²			
9.0 External Walls Description	Туре	Constr	uction		U-Valu	е Карра	Gross	Nett Area	Shelter	Shelter	Openin	ngs Are	a Calculati
Cavity Wall	Cavity Wall	Cavity		oard on dabs, dense block de structure	(W/m²K) (kJ/m²K) A			Res 0.00	None	17.12	_	Type er Gross A
9.1 Party Walls			_							_			
Description	Type		Construc	tion					Kappa (kJ/m²K)	Area (m²)	Shelter Res	S	helter
Party Wall 1	Filled Cav Edge Seal		Single pla cavity	sterboard on both si	des, dens	e cellular bl		` 0.00 ´	`70.00 ′	23.29	0.00		None
9.2 Internal Walls Description			Constructi	on								арра	Area (r
Internal Wall 1			Dense bloc	k, dense plaster								/m²K) 00.00	135.6
10.0 External Roofs				, p									

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Description	Туре	Construc	tion		Kappa G kJ/m²K)Ar	ea(m²)			Shelter Factor	Calculation Type	Opening
External Roof 1	External Flat Roof	Plasterbo	ard, insulated flat roof	0.11	9.00 6		(m²) 60.65	None	0.00	Enter Gross Area	s 0.00
11.1 Party Floors											
Description		Storey Index	Construction							Kappa (kJ/m²K)	Area (m²
Party Floor 1		Lowest occupied	Precast concrete planks floo	or, screed, carp	eted					30.00	60.65
12.0 Opening Types Description	Data Source	Туре	Glazing		Glazing	Fillin		G-value	Frame	Frame	U Value
Windows	Manufacturer	Window	Double Low-E So	oft 0.05	Gap	Type Air Fill		0.63	Type Wood	Factor 0.70	(W/m²K) 1.31
13.0 Openings											
Name	Opening Ty	pe	Location		Orient			Area (Pit	ch
W01 W02	Windows Windows		Cavity Wall Cavity Wall		North North			4.41 1.26		() 1
W03	Windows		Cavity Wall		North			4.4			j
W04	Windows		Cavity Wall		South			1.26)
W05 W06	Windows Windows		Cavity Wall Cavity Wall		South South			3.49 2.29		())
	Tilldotts		,		Coddi	11000					
14.0 Conservatory			None								
15.0 Draught Proofing			100					%			
16.0 Draught Lobby			No								
17.0 Thermal Bridging			Calculate Bridges								
17.1 List of Bridges											
Bridge Type			Source Type	Length	Psi	Adjust	ed R	eference:			Imported
E2 Other lintels (includin E3 Sill	g other steel linte	ls)	Non Gov Approved Scheme Independently assessed	s 8.15 8.15	0.02 0.02	0.02 0.02					No No
E4 Jamb			Independently assessed	25.20	0.02	0.02					No
E24 Eaves (insulation at			Table K1 - Default	42.25	0.15	0.15					No
P3 Party wall - Intermed (in blocks of flats)	iate floor between	dwellings	Table K1 - Default	15.04	0.00	0.00	ı				No
È16 Comer (normal)			Independently assessed	16.50	0.04	0.04					No
E25 Staggered party wa	ll between dwellin	gs	Independently assessed	2.00	0.04	0.04					No
E18 Party wall between P4 Party wall - Roof (ins		evel)	Independently assessed Independently assessed	5.00 5.50	0.05 0.10	0.05 0.10					No No
E14 Flat roof		,	Table K1 - Default	39.08	0.16	0.16					No
E17 Corner (inverted – in external area)	nternal area great	er than	Independently assessed	5.50	-0.07	-0.07					No
Y-value			0.09					W/m²K			
18.0 Pressure Testing			Yes								
Designed APso			4.50					m³/(h.m²	2) @ EN I	Pa	
•								111-7(11.111-) (@ 50 1	r a	
Property Tested?			Yes								
Test Method			Blower Door								
19.0 Mechanical Ventilation											
Mechanical Ventilation		ont	No								
Mechanical Ventila		ent ———	No								
20.0 Fans, Open Fireplace	s, Flues										
21.0 Fixed Cooling System	1		No								
22.0 Lighting											
No Fixed Lighting			No								
			Name Lighting 1	Efficacy 80.00		ower 15		Capa 120			unt 5
24 0 Main Hastin a 4			Database					120			-
24.0 Main Heating 1			100.00					%			
Percentage of Heat								70			
Database Ref. No.			106764								
Fuel Type			Electricity								
SAP Code			0								
In Winter			244.75								

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In Summer	190.28	
Model Name	Logic Air 8kW]
Manufacturer	Atlantic]
System Type	Heat Pump	
Controls SAP Code	2207]
Delayed Start Stat	No]
HETAS approved System	No	
Oil Pump Inside	No	
FI Case	0.00]
Flue Type	None or Unknown]
Fan Assisted Flue	No]
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	No	
5.0 Main Heating 2	None]
5.0 Heat Networks	None]
Heat Source Fuel Type Heating U Heat source 1 None Heat source 2 None Heat source 3 None Heat source 4 None Heat source 5 None	Jse Efficiency Percentage Of Heat Heat Ele Heat Power Ratio	ctrical Fuel Factor Efficiency type
8.0 Water Heating		
Water Heating	Main Heating 1]
SAP Code	901	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No]
Solar Panel	No]
Water use <= 125 litres/person/day	Yes]
Summer Immersion	No]
Cold Water Source	From header tank]
Bath Count	0]
Supplementary Immersion	No]
Immersion Only Heating Hot Water	No	
3.1 Showers		
Description Shower Ty	pe Flow Rate Rated Power (Connected Connected To
1 Combi boile	[l/min] [kW] er or unvented hot water system 7.00	No
8.3 Waste Water Heat Recovery System		
	Het Water Cylinder	7
9.0 Hot Water Cylinder	Hot Water Cylinder Yes]
Cylinder In Heated Space		J 7
Cylinder In Heated Space	Yes]]
Independent Time Control Insulation Type	Yes]
Insulation IVDA	Measured Loss	T. Control of the Con

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Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Electricity Ge	eneration			Annual							
Connected to	dwelling's ele	ectricity meter		Yes							
Apportioned				0.00					kWh/Year		
Electricity Ge	enerated			0.00							
34.0 Small-scale	e Hydro			None							
31.0 Thermal St	ore			None							
In Airing Cup	board			No							
Pipes insulat	ion			Fully insu	ulated primary	/ pipework					
Loss				2.09					kWh/day		
Cylinder Volu	ıme			150.00					_ L		

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Tomical Coast	Tomical actions necessar	Ratings aft	er improvement
	Typical Cost	Typical savings per year	SAP rating	Environmental Impact
Solar water heating			0	0
_			0	0
			0	0

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Property Reference			nit 5				1 =	D		ssued on Dat		05/03/2024	
Assessment Refer	rence		esidual					Prop Type Ref	Те	bby and Son	Garage		
Property		Ur	nit 1, Highland	Square , Bristol									
SAP Rating					79 C		DER	5.80		TER		15.38	
Environmental					96 A		% DER < TE	₹				62.29	
CO ₂ Emissions (t/)	year)				0.33		DFEE	47.59	9	TFEE		48.55	
Compliance Check	k				See BREL		% DFEE < TF					1.98	
% DPER < TPER					25.44		DPER	60.62	2	TPER		81.31	
Assessor Details										Asses	sor ID	U367-000)1
SAP 10 WORKSHEET CALCULATION OF D						2022)							
1. Overall dwell	ing charac	cteristics											
Ground floor Total floor area Dwelling volume	a TFA = (1	a)+(lb)+(lc	c)+(ld)+(le	e)(ln)	6	0.6500		Area (m2) 60.6500 (2b) =		(4)
2. Ventilation r	ate											m3 per hour	
Number of open of Number of open f Number of chimne Number of flues Number of flues Number of interm Number of passiv Number of fluele	Tlues ys / flues attached f attached f d chimneys attent exive vents	to solid fu to other he s tract fans	uel boiler	fire							0 * 80 = 0 * 20 = 0 * 10 = 0 * 20 = 0 * 35 = 0 * 20 = 5 * 10 =	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 50.0000	(6b) (6c) (6d) (6e) (6f) (7a) (7b)
Infiltration due Pressure test Pressure Test Me Measured/design Infiltration rat Number of sides	ethod AP50 Se		and fans	= (6a)+(6b)	+ (6c) + (6d) + (6e)+(6f)+	+(6g)+(7a)+	(7b)+(7c) =			/ (5) =	Yes Blower Door 4.5000 0.5548	(17)
Shelter factor Infiltration rat	ce adjusted	d to includ	de shelter	factor				((20) = 1 - (21	[0.075 x) = (18) x			
Wind speed Wind factor Adi infilt rate	Jan 5.1000 1.2750			Apr 4.4000 1.1000		Jun 3.8000 0.9500	3.8000		Sep 4.0000 1.0000				
	0.5482			0.4729 0.6118				0.3977 0.5791		0.4622 0.6068			
3. Heat losses a	and heat lo	oss paramet	ter										
Element				Gross	Openings	Ne	etArea	U-value	A x U	K-	value	AxK	
Vindows (Uw = 1.	31)			m2	m2	17	m2 7.1200	W/m2K 1.2448	W/K 21.3105	k	J/m2K	kJ/K	(27)
Cavity Wall External Roof 1	-			94.4900 60.6500	17.1200	77	7.3700 0.6500	0.1800 0.1100	W/K 21.3105 13.9266 6.6715	150 9	.0000	11605.5000 545.8500	(29a) (30)
Cotal net area o Fabric heat loss Party Wall l Party Floor l				*		23 60	(26) (26) 3.2900 0.6500		41.9086	70 40	.0000	1630.3000 2426.0000	(31) (33) (32) (32d)
Internal Wall 1 Heat capacity Cm Thermal mass par	ameter (T		IFA) in kJ/	m2K		135	5.6000	(28)	.(30) + (32)				(34)
E3 Sill E4 Jamb E24 Eave P3 Party E16 Corn	ent : lintels es (insular / wall - In her (norma)	tion at cei	iling level e floor bet	l lintels) - inverted) ween dwellin		s of flat	ts)	8. 8. 25. 42. 15. 16.	1480 2000 2500 0400 5000	0.0230 0.0210 0.0160 0.1500 0.0000 0.0430 0.0360		874 711 032 375 000 095	

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P4 Part E14 Fla	at roof rner (inver	coof (insulated - inte	ation at ce: rnal area g:	reater than	external ar	rea)		5. 39.	.0000 .5000 .0750 .5000	0.0460 0.1010 0.1600 -0.0730	0.23 0.55 6.25 -0.40	55 20	(36)
Point Thermal h Total fabric he	oridges								C	33) + (36)	(36a) = + (36a) =	0.0000 56.4253	
Ventilation hea	at loss cal Jan 32.5359	culated mo Feb 32.2440	nthly (38)m Mar 31.9578	= 0.33 x (Apr 30.6138	25)m x (5) May 30.3624	Jun 29.1918	Jul 29.1918	Aug 28.9750	Sep 29.6427	Oct 30.3624	Nov 30.8711	Dec 31.4029	(38)
Heat transfer of Average = Sum(3	88.9613	88.6693	88.3832	87.0392	86.7877	85.6171	85.6171	85.4003	86.0680	86.7877	87.2964	87.8282 87.0380	(39)
HLP	Jan 1.4668	Feb 1.4620	Mar 1.4573	Apr 1.4351	May 1.4310	Jun 1.4117	Jul 1.4117	Aug 1.4081	Sep 1.4191	Oct 1.4310	Nov 1.4393	Dec 1.4481	
HLP (average) Days in mont	31	28	31	30	31	30	31	31	30	31	30	1.4351	
4. Water heating													
Assumed occupar Hot water usage	ncy											2.0000	(42)
Hot water usage	72.2731 e for baths	71.1666	69.5359	67.0274	64.7798	61.6354	59.1485	62.0559	63.5182	66.6325	69.8758	72.2079	
Hot water usage	0.0000 for other 35.1115	0.0000 uses 33.8347	0.0000 32.5579	0.0000	0.0000 30.0044	0.0000 28.7276	0.0000 28.7276	0.0000 30.0044	0.0000	0.0000 32.5579	0.0000 33.8347	0.0000 35.1115	
Average daily h	hot water u		/day)									98.5497	
Daily hot water		Feb 105.0013	Mar 102.0938	Apr 98.3085	May 94.7842	Jun 90.3630	Jul 87.8760	Aug 92.0602	Sep 94.7993	Oct 99.1905	Nov 103.7106	Dec 107.3194	(44)
Energy conte Energy content Distribution lo	158.0886 (annual)	138.9379	145.8900	128.4155	122.1390	104.5018	97.1056	108.3566	109.9625	127.8170	140.1683 um(45)m =	157.6064 1538.9892	(45)
Water storage 1	23.7133	20.8407	21.8835	19.2623	18.3208	15.6753	14.5658	16.2535	16.4944	19.1725	21.0252	23.6410	(46)
Store volume a) If manufact Temperature i Enter (49) or	factor from	Table 2b	actor is kno	own (kWh/d	ay):							150.0000 2.0900 0.5400 1.1286	(48) (49)
Total storage 1 If cylinder cor	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(56)
Primary loss Combi loss	34.9866 23.2624 0.0000	31.6008 21.0112 0.0000	34.9866 23.2624 0.0000	33.8580 22.5120 0.0000	34.9866 23.2624 0.0000	33.8580 22.5120 0.0000	34.9866 23.2624 0.0000	34.9866 23.2624 0.0000	33.8580 22.5120 0.0000	34.9866 23.2624 0.0000	33.8580 22.5120 0.0000	34.9866 23.2624 0.0000	(59)
Total heat requ		191.5499 0.0000	ng calculate 204.1390 0.0000	184.7855 0.0000	180.3880 0.0000	160.8718 0.0000	155.3546 0.0000	166.6056 0.0000	166.3325 0.0000	186.0660 0.0000	196.5383 0.0000	215.8554	
PV diverter Solar input FGHRS	0.0000 0.0000 0.0000	0.0000 0.0000 0.0000	0.0000 0.0000 0.0000	0.0000 0.0000 0.0000	0.0000 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 0.0000	0.0000 0.0000 0.0000	0.0000 0.0000 0.0000	0.0000 0.0000 0.0000	(63c)
Output from w/h			204.1390	184.7855	180.3880	160.8718	155.3546	166.6056	166.3325	186.0660	196.5383	215.8554	(64)
12Total per yea		r)						Total pe	er year (kW	h/year) = S	um(64)m =	2224.8242 2225	(64) (64)
	0.0000	0.0000	0.0000	0.0000 Tot	0.0000 al Energy us	0.0000 sed by inst	0.0000 antaneous e	0.0000 lectric show	0.0000 wer(s) (kWh	0.0000 /year) = Su	0.0000 m(64a)m =	0.0000 0.0000	
Heat gains from	99.1637	88.2865	95.1076	87.7942	87.2104	79.8429	78.8868	82.6278	81.6585	89.0983	91.7020	99.0033	(65)
5. Internal gai			5a) 										
Metabolic gains (66)m	Jan 99.9976	, Watts Feb 99.9976	Mar 99.9976	Apr 99.9976	May 99.9976	Jun 99.9976	Jul 99.9976	Aug 99.9976	Sep 99.9976	Oct 99.9976	Nov 99.9976	Dec 99.9976	(66)
Lighting gains	(calculate 88.0572	d in Appen 97.4919	dix L, equat 88.0572	00.9924	L9a), also s 88.0572	see Table 5 90.9924	88.0572			88.0572	90.9924	88.0572	(67)
Appliances gair Cooking gains	174.5832	176.3949	171.8296	162.1107	149.8424	138.3119	130.6089	128.7972	133.3625	143.0813	155.3497	166.8802	(68)
Pumps, fans	32.9998	32.9998 0.0000	32.9998 0.0000	32.9998 0.0000	32.9998 0.0000	32.9998	32.9998					32.9998 0.0000	
Losses e.g. eva	-79.9981	-79.9981			-79.9981	-79.9981	-79.9981	-79.9981	-79.9981	-79.9981	-79.9981	-79.9981	(71)
	133.2845 gains	131.3787			117.2183				113.4146	119.7558	127.3638	133.0690	(72)
	448.9242	458.2647	440.7189	428.0388	408.1172	393.1965	377.6960	380.9125	390.7688	403.8936	426.7052	441.0056	(73)
6. Solar gains													
[Jan]			7.	 rea	Solar floor				FF	Acce	99	Gains	
				m2	Solar flux Table 6a W/m2	Speci or	fic data Table 6b	Specific or Tab	data le 6c	fact Table	or	Gains W	
Northeast Southwest			10.00	300 400	11.2829 36.7938		0.6300 0.6300	0 0	.7000 .7000	0.77 0.77	00 00	34.7580 79.1625	
Solar gains Total gains													

7. Mean internal temperature (heating season)

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Temperature dur Utilisation fac						Th1 (C)						21.0000	(85)
tau alpha	Jan 92.9482 7.1965	Feb 93.2542 7.2169	Mar 93.5562 7.2371	Apr 95.0008 7.3334	May 95.2761 7.3517	Jun 96.5787 7.4386	Jul 96.5787 7.4386	Aug 96.8239 7.4549	Sep 96.0728 7.4049	Oct 95.2761 7.3517	Nov 94.7209 7.3147	Dec 94.1473 7.2765	
util living are		0.9979	0.9911	0.9474	0.8004	0.5742	0.4166	0.4728	0.7610	0.9755	0.9980	0.9996	(86)
Living Non living 24 / 16	20.1031 18.7041 0	20.2563 18.9025 0	20.4792 19.1867 0	20.7731 19.5469 0	20.9509 19.7131 0	20.9961 19.7534 0	20.9997 19.7544 0	20.9992 19.7571 0	20.9744 19.7396 0	20.7281 19.5091 0	20.3674 19.0586 0	20.0864 18.6938 0	
24 / 9 16 / 9 MIT	3 28 20.5412	0 0 20.2563	0 0 20.4792	0 0 20.7731	0 0 20.9509	0 0 20.9961	0 0 20.9997	0 0 20.9992	0 0 20.9744	0 0 20.7281	0 0 20.3674	0 10 20.2142	(87)
Th 2 util rest of ho	0.9990	19.7161 0.9964	19.7197 0.9848	19.7365 0.9141	19.7397 0.7154	19.7544 0.4650	19.7544 0.2989	19.7571 0.3457	19.7487 0.6420	19.7397 0.9524	19.7333	19.7266 0.9993	(89)
MIT 2 Living area fra MIT	19.3105 action 19.7098	18.9025 19.3418	19.1867 19.6061	19.5469 19.9448	19.7131	19.7534 20.1566	19.7544	19.7571	19.7396 fLA = 20.1402	19.5091 Living are 19.9047	19.0586 a / (4) = 19.4833	18.8799 0.3245 19.3129	(91)
Temperature adj adjusted MIT	justment 19.7098	19.3418	19.6061	19.9448	20.1147	20.1566	20.1585	20.1601	20.1402	19.9047	19.4833	0.0000 19.3129	
8. Space heatin													
Ext temp.	Jan 0.9990 562.2966 4.3000	Feb 0.9958 661.0559 4.9000	Mar 0.9841 740.7035 6.5000	Apr 0.9207 797.2879 8.9000	May 0.7426 702.1564 11.7000	Jun 0.5007 474.3298 14.6000	Jul 0.3372 304.6028 16.6000	Aug 0.3870 320.9487 16.4000	Sep 0.6817 508.4442 14.1000	Oct 0.9564 611.4927 10.6000	Nov 0.9958 562.8971 7.1000	Dec 0.9992 536.6946 4.2000	(95)
Heat loss rate 1 Space heating k	1370.8783	1280.5453	1158.3573	961.3285	730.2967	475.7437	304.6649	321.1157	519.8712	807.5296	1081.0192	1327.3356	(97)
	601.5848 requirement	416.2969 t - total p		118.1092 h/year)	20.9364	0.0000	0.0000	0.0000	0.0000	145.8515	373.0479	588.2369 2574.7980	
Solar heating of Space heating k	0.0000 contribution	0.0000 on - total	0.0000 per year (k	0.0000 Wh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
	601.5848 requirement		310.7344 ar contribu		20.9364 L per year	0.0000 (kWh/year)	0.0000	0.0000	0.0000	145.8515 (98c	373.0479) / (4) =	588.2369 2574.7980 42.4534	
9a. Energy requ	irements	 - Individua	l heating s	vstems. incl	luding micr	no-CHP							
Fraction of spa Fraction of spa Efficiency of m Efficiency of m Efficiency of s	ace heat fi ace heat fi ace heat fi main space	rom seconda rom main sy heating sy heating sy	ry/suppleme stem(s) stem 1 (in stem 2 (in	 ntary system %) %)								0.0000 1.0000 244.7539 0.0000 0.0000	(202) (206) (207)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	601.5848	416.2969	310.7344	118.1092	20.9364	0.0000	0.0000	0.0000	0.0000	145.8515	373.0479	588.2369	(98)
Space heating e	244.7539	244.7539	244.7539	244.7539	244.7539	0.0000	0.0000	0.0000	0.0000	244.7539	244.7539	244.7539	(210)
	245.7917 efficiency	170.0880 (main heat	126.9579 ing system		8.5541	0.0000	0.0000	0.0000	0.0000	59.5911	152.4176	240.3381	
Space heating f	0.0000 fuel (main	0.0000 heating sy	0.0000 stem 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Space heating f		0.0000 ndary) 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Water heating													(===,
Water heating r Efficiency of w	216.3376	191.5499	204.1390	184.7855	180.3880	160.8718	155.3546	166.6056	166.3325	186.0660	196.5383	215.8554 190.2848	
(217)m Fuel for water	190.2848 heating. }	190.2848 Wh/month		190.2848	190.2848	190.2848	190.2848	190.2848	190.2848	190.2848	190.2848	190.2848	(217)
Space cooling f		100.6649 rement 0.0000	0.0000	97.1100 0.0000	94.7990	84.5427 0.0000	0.0000	87.5559 0.0000	87.4124 0.0000	97.7829	0.0000	0.0000	
Pumps and Fa Lighting	0.0000 19.0977	0.0000 15.3209	0.0000 13.7947	0.0000 10.1066	0.0000 7.8066	0.0000	0.0000 7.1215	0.0000 9.2568	0.0000 12.0236	0.0000 15.7756	0.0000 17.8186	0.0000 19.6285	(231)
Electricity gen (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 gen (234a)m Electricity gen	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)
(235a)m Electricity use	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 eneration)	0.0000	0.0000	0.0000	0.0000	(235a)
(235c)m Electricity gen	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
(233b)m Electricity gen	0.0000 nerated by				0.0000 tive quanti		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
(234b)m Electricity gen								0.0000	0.0000	0.0000	0.0000		(234b)
(235b)m Electricity use						(N) (negati			0.0000	0.0000	0.0000		(235b)
(235d)m Annual totals k Space heating f		0.0000 n system 1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1051.9948	(235d) (211)
Space heating f Space heating f	fuel - mair fuel - seco	n system 2 ondary										0.0000	(213) (215)
Efficiency of w	ester best	ar.										190.2848	
Water heating f Space cooling f	fuel used											1169.2078 0.0000	
	fuel used fuel r pumps and ity for the	i fans: e above, kW		lix L)									(221)

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



PV generation Wind generation Hydro-electric g Electricity gene Appendix Q - spe Energy saved or Energy used Total delivered	erated - Mic ecial featur generated	cro CHP (Ap										0.0000 0.0000 0.0000 0.0000 -0.0000 0.0000 2375.3317	(234) (235a) (235) (236) (237)
12a. Carbon diox				ting systems	including m	icro-CHP							
Space heating - Total CO2 associ Water heating (o Space and water Pumps, fans and Energy for light Total CO2, kg/ye EPC Dwelling Can	main system iated with o other fuel) heating electric ke ting	m 1 community s eep-hot	ystems					Energy kWh/year 1051.9948 1169.2078 0.0000 154.1291	kg	n factor CO2/kWh 0.1569 0.1407 0.0000 0.1443	1	Emissions cg CO2/year 165.0270 0.0000 164.5155 329.5425 0.0000 22.2456 351.7881 5.8000	(261) (373) (264) (265) (267) (268) (272)
13a. Primary ene				ms including									
Space heating - Total CO2 associ Water heating (c Space and water Pumps, fans and Energy for light Total Primary Dwelling Primary	iated with (other fuel) heating electric ke ting nergy kWh/ye	community s eep-hot ear	ystems									mary energy kWh/year 1662.9244 0.0000 1777.5141 3440.4385 0.0000 236.4084 3676.8469 60.6200	(275) (473) (278) (279) (281) (282) (286)
SAP 10 WORKSHEE: CALCULATION OF 1	FOR New B	uild (As De		(Version 10									
1. Overall dwell	ling charact	teristics											
Ground floor Total floor area Dwelling volume	a TFA = (la)+(1b)+(1c)	+(ld)+(le)(ln)	6	0.6500					(2b) =		(1b) - (3b) (4)
2. Ventilation													
Number of open of Number of open in Number of chimne Number of flues Number of block Number of intern Number of passiv Number of flues	chimneys flues eys / flues attached to attached to ed chimneys ittent ext: ve vents	attached t o solid fue o other hea ract fans	o closed								0 * 80 = 0 * 20 = 0 * 10 = 0 * 20 = 0 * 35 = 0 * 20 = 2 * 10 = 0 * 10 =	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	(6a) (6b) (6c) (6d) (6e) (6f) (7a) (7b)
Infiltration due Pressure test Pressure Test Me Measured/design Infiltration rat Number of sides	ethod AP50 te	ys, flues a	and fans	= (6a)+(6b)·	+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000	/ (5) =	es per hour 0.1319 Yes Blower Door 5.0000 0.3819	(8)
Shelter factor Infiltration rat	te adjusted	to include	shelter	factor					(20) = 1 -	[0.075 x) = (18)	(19)] = x (20) =	0.7750 0.2960	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor Adj infilt rate	1.2750	1.2500	1.2250	4.4000 1.1000	4.3000 1.0750	0.9500	0.9500		1.0000	1.0750		1.1750	(22a)
Effective ac	0.3774			0.3256 0.5530					0.2960 0.5438				
3. Heat losses a	and heat lo	ss paramete	r	Gross	Openings	 Net	 Area	 U-value	ΑxU		-value	АхК	
TER Opening Type Cavity Wall External Roof 1	e (Uw = 1.20	0)		m2 94.4900 60.6500	m2 15.1800	15. 79. 60.	m2 1800 3100 6500	W/m2K 1.1450 0.1800 0.1100	W/K 17.3817 14.2758 6.6715		kJ/m2K	kJ/K	(27) (29a) (30)

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Total net area of external elements A Fabric heat loss, W/K = Sum (A x U) Party Wall 1	um(A, m2)			.1400 (26)(3	30) + (32) = 0.0000	= 38.32 0.00				(31) (33) (32)
Thermal mass parameter (TMP = Cm / TF. List of Thermal Bridges K1 Element E2 Other lintels (including o E3 Sill E4 Jamb E24 Eaves (insulation at ceil P3 Party wall - Intermediate E16 Corner (normal) E25 Staggered party wall betwe E18 Party wall between dwelli P4 Party wall - Roof (insulat E14 Flat roof E17 Corner (inverted - interm Thermal bridges (Sum(L x Psi) calcula	ing level - inverted floor between dwell: eeen dwellings ngs ion at ceiling level	ings (in bloo l) n external an		s)	8. 8 25. 42. 15. 16. 2. 5. 39	ength 1480 1480 22000 2500 0400 55000 0000 0000 0750 55000	Psi-value 0.0500 0.0500 0.0500 0.2400 0.0000 0.0600 0.0600 0.1200 0.0800 -0.0900	Tot 0.40 0.40 1.26 10.14 0.00 1.48 0.12 0.30 0.66 3.12 -0.49	74 74 74 00 00 00 00 50 00 00 00 00 60 50 17.4108	
Point Thermal bridges Total fabric heat loss Ventilation heat loss calculated mont	hlv (38)m = 0.33 x	(25)m × (5)				(33) + (36)	(36a) = + (36a) =	0.0000 55.7398	(37)
Jan Feb (38)m 28.5809 28.4425 Heat transfer coeff 84.3207 84.1823	Mar Apr 28.3069 27.6700 84.0467 83.4098	May 27.5508 83.2906	Jun 26.9961 82.7359	Jul 26.9961 82.7359	Aug 26.8933 82.6331	Sep 27.2098 82.9495	Oct 27.5508 83.2906	Nov 27.7919 83.5317	Dec 28.0439 83.7837	
Average = Sum(39)m / 12 = Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	83.4092 Dec	(40)
HLP 1.3903 1.3880 HLP (average) Days in mont 31 28	1.3858 1.3753 31 30	1.3733	1.3642	1.3642	1.3625	1.3677	1.3733	1.3773	1.3814 1.3753 31	(40)
4. Water heating energy requirements										
Assumed occupancy									2.0000	(42)
Hot water usage for mixer showers 74.1464 73.0321 Hot water usage for baths	71.4084 68.3017	66.0090	63.4523	61.9990	63.6104	65.3769	68.1220	71.2955	73.8623	(42a)
0.0000 0.0000 Hot water usage for other uses	0.0000 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
35.1115 33.8347 Average daily hot water use (litres/d	32.5579 31.2812 lay)	30.0044	28.7276	28.7276	30.0044	31.2812	32.5579	33.8347	35.1115 100.2800	
Jan Feb Daily hot water use	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
109.2579 106.8668 Energy conte 173.0377 152.1769 Energy content (annual)	103.9663 99.5828 159.7923 136.3239	96.0134 129.2525	92.1799 113.3459	90.7266 109.7260	93.6148 115.9147	96.6580 119.1890	100.6800 136.6218 Total = S	105.1302 149.7772 um(45)m =	108.9738 170.6266 1665.7845	
Distribution loss (46)m = 0.15 x (45 25.9557 22.8265 Water storage loss:	23.9689 20.4486	19.3879	17.0019	16.4589	17.3872	17.8783	20.4933	22.4666	25.5940	(46)
a) If manufacturer declared loss fac Temperature factor from Table 2b Enter (49) or (54) in (55) Total storage loss	tor is known (kWh/c	day):							150.0000 1.3938 0.5400 0.7527	(48) (49)
23.3325 21.0745 If cylinder contains dedicated solar	23.3325 22.5798 storage	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
23.3325 21.0745 Primary loss 23.2624 21.0112 Combi loss 0.0000 0.0000	23.3325 22.5798 23.2624 22.5120 0.0000 0.0000	23.3325 23.2624 0.0000	22.5798 22.5120 0.0000	23.3325 23.2624 0.0000	23.3325 23.2624 0.0000	22.5798 22.5120 0.0000	23.3325 23.2624 0.0000	22.5798 22.5120 0.0000	23.3325 23.2624 0.0000	(59)
Total heat required for water heating 219.6327 194.2626 WWHRS -33.8966 -29.9784	calculated for each 206.3872 181.4158 -31.3917 -25.9936	n month 175.8474 -24.2251	158.4377	156.3209 -19.4307	162.5096 -20.6626	164.2808 -21.4476	183.2167 -25.2844	194.8691 -28.6441	217.2215 -33.2689	(62)
Solar input 0.0000 0.0000 FGHRS 0.0000 0.0000	0.0000 0.0000	0.0000	-0.0000 0.0000 0.0000	-0.0000 0.0000 0.0000	-0.0000 0.0000 0.0000	0.0000	-0.0000 0.0000 0.0000	0.0000	0.0000	(63c)
Output from w/h 185.7360 164.2842	174.9955 155.4222	151.6223	137.7082	136.8902			157.9323 h/year) = S		1899.4487	(64)
12Total per year (kWh/year) Electric shower(s) 0.0000 0.0000	0.0000 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1899 0.0000	
Heat gains from water heating, kWh/mo:	nth	tal Energy us	sed by insta	antaneous el	lectric show	wer(s) (kWh	/year) = Su	m(64a)m =	0.0000	(64a)
94.8110 84.2674	90.4069 81.4012	80.2524	73.7610	73.7598	75.8176	75.7038	82.7027	85.8744	94.0093	(65)
5. Internal gains (see Table 5 and 5a										
Metabolic gains (Table 5), Watts								_		
Jan Feb (66)m 99.9976 99.9976 Lighting gains (calculated in Appendi					Aug 99.9976	Sep 99.9976	Oct 99.9976	Nov 99.9976	Dec 99.9976	(66)
88.0572 97.4919 Appliances gains (calculated in Append	88.0572 90.9924	88.0572	90.9924	88.0572	88.0572	90.9924	88.0572	90.9924	88.0572	(67)
174.5832 176.3949 Cooking gains (calculated in Appendix	171.8296 162.1107 L, equation L15 or	149.8424 L15a), also	138.3119	130.6089	128.7972	133.3625	143.0813	155.3497	166.8802	(68)
32.9998 32.9998 Pumps, fans 3.0000 3.0000	32.9998 32.9998 3.0000 3.0000	32.9998		32.9998 0.0000	32.9998 0.0000	32.9998 0.0000	32.9998 3.0000	32.9998 3.0000	32.9998 3.0000	
Losses e.g. evaporation (negative val -79.9981 -79.9981	ues) (Table 5) -79.9981 -79.9981	-79.9981		-79.9981	-79.9981		-79.9981	-79.9981	-79.9981	
Water heating gains (Table 5) 127.4341 125.3979	121.5146 113.0572	107.8661	102.4458	99.1395	101.9053	105.1442	111.1595	119.2700	126.3565	(72)
Total internal gains 446.0738 455.2839	437.4007 422.1596	401.7650	384.7495	370.8049	371.7590	382.4984	398.2973	421.6114	437.2932	(73)
6. Solar gains										
[Jan]	Area	Solar flux		g		FF	Acce	55	Gains	

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				m2	Table 6a W/m2	or	fic data Table 6b	Specific or Tab	data le 6c	fact Table		W	
Northeast Southwest			8.9 6.2	400 400	11.2829 36.7938			0	.7000 .7000	0.77 0.77		30.8270 70.1668	
Solar gains Total gains		182.2693 637.5532			476.5302 878.2951		466.1328 836.9377				122.8320 544.4434	85.2230 522.5162	
7. Mean inter	nal tempera												
Temperature d	uring heati	ng periods :	in the livi	ng area fro	m Table 9, I	Th1 (C)						21.0000	(85)
Utilisation f	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau alpha util living a		98.2248 7.5483 0.9982	98.3833 7.5589 0.9926	99.1346 7.6090 0.9563	99.2764 7.6184 0.8215	99.9421 7.6628 0.5993	99.9421 7.6628 0.4345	100.0663 7.6711 0.4930	99.6846 7.6456 0.7811	99.2764 7.6184 0.9791	98.9899 7.5993 0.9983	98.6921 7.5795 0.9997	
MIT	20.1567	20.2960	20.5005	20.7703	20.9479	20.9956	20.9997	20.9992	20.9728	20.7334	20.3946	20.1325	
Th 2 util rest of	19.7708	19.7725	19.7743	19.7823	19.7839	19.7909	19.7909	19.7922	19.7882	19.7839	19.7808	19.7776	
MIT 2	0.9992 18.8186	0.9970 18.9980	0.9874 19.2581	0.9274 19.5860	0.7403 19.7548	0.4891 19.7898	0.3154 19.7909	0.3643 19.7921	0.6652 19.7782	0.9589 19.5538	0.9969 19.1311	0.9994 18.7931	(90)
Living area f	19.2528	19.4192	19.6612	19.9703	20.1420	20.1810	20.1831	20.1838		Living are 19.9366			(92)
Temperature a adjusted MIT		19.4192	19.6612	19.9703	20.1420	20.1810	20.1831	20.1838	20.1658	19.9366	19.5410	0.0000 19.2277	
8. Space heat	ing require	ment											
												_	
Utilisation Useful gains Ext temp.			Mar 0.9867 704.5126 6.5000	Apr 0.9328 756.0033 8.9000	May 0.7662 672.9395 11.7000	Jun 0.5252 460.1319 14.6000	Jul 0.3541 296.3849 16.6000	Aug 0.4062 312.4807 16.4000	Sep 0.7039 490.8696 14.1000	0.9623 584.1794 10.6000	Nov 0.9965 542.5301 7.1000	Dec 0.9993 522.1267 4.2000	(95)
Heat loss rat		1222.2567		923.3680	703.1360	461.7515	296.4522	312.6667	503.1568		1039.2216		
Space heating Space heating	531.4654 requirement	394.4337 t - total pe			22.4662	0.0000	0.0000	0.0000	0.0000	143.9413	357.6179	548.2916 2417.5429	
Solar heating	0.0000 contributi	0.0000 on - total p	0.0000 per year (ki	0.0000 Wh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 0.0000	
Space heating Space heating	531.4654			120.5026 tion - tota		0.0000 (kWh/year)	0.0000	0.0000	0.0000		357.6179	2417.5429	
Space heating	•									,	:) / (4) =	39.8606	(/
9a. Energy re		- Individua	l heating s	ystems, inc	luding micro	-CHP							
Fraction of s Fraction of s Efficiency of Efficiency of Efficiency of	pace heat f main space main space	rom main sy: heating sy: heating sy:	stem(s) stem 1 (in s stem 2 (in s	%) %)	m (Table 11)							0.0000 1.0000 92.3000 0.0000 0.0000	(202) (206) (207)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating	531.4654	394.4337			22.4662	0.0000	0.0000	0.0000	0.0000	143.9413	357.6179	548.2916	(98)
Space heating	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 Space heating	575.8021	427.3388	323.7533	130.5553	24.3404	0.0000	0.0000	0.0000	0.0000	155.9494	387.4517	594.0321	(211)
Space heating	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	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)
	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	requiremen												
Efficiency of	water heat		174.9955	155.4222	151.6223	137.7082	136.8902	141.8470	142.8332	157.9323	166.2249	183.9526 79.8000	(216)
(217)m Fuel for wate		kWh/month	85.2491	83.4957	80.8576	79.8000	79.8000	79.8000	79.8000	83.8523	85.7318	86.3534	
Space cooling	fuel requi			186.1439	187.5178	172.5666	171.5416	177.7532	178.9890	188.3458	193.8894	213.0231	
(221)m Pumps and Fa Lighting	0.0000 7.3041 18.2965	0.0000 6.5973 14.6782	0.0000 7.3041 13.2161	0.0000 7.0685 9.6827	0.0000 7.3041 7.4792	0.0000 7.0685 6.1105	0.0000 7.3041 6.8227	0.0000 7.3041 8.8685	0.0000 7.0685 11.5192	0.0000 7.3041 15.1139	0.0000 7.0685 17.0711	0.0000 7.3041 18.8051	(231)
Electricity g (233a)m	enerated by		dix M) (neg	ative quant:					-43.8532	-35.3978	-23.1639	-17.8192	
Electricity g (234a)m							0.0000	0.0000	0.0000	0.0000	0.0000		(234a)
Electricity g (235a)m								0.0000	0.0000	0.0000	0.0000		(235a)
Electricity u (235c)m									0.0000	0.0000	0.0000		(235c)
Electricity g (233b)m	enerated by -8.8584	PVs (Append -18.9004	dix M) (nega -38.0558	ative quant: -57.8717	ity) -77.2095	-77.8112			-47.0528	-27.2471	-11.8990	-6.9842	
Electricity g (234b)m	enerated by 0.0000	wind turbin 0.0000	nes (Append: 0.0000	ix M) (nega 0.0000	tive quantit 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity g (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 u (235d)m	0.0000	electricity 0.0000	generated 1 0.0000	0.0000	P (Appendix 0.0000	N) (negati 0.0000	ve if net g 0.0000	eneration) 0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals Space heating	fuel - main											2619.2231	
Space heating Space heating												0.0000	

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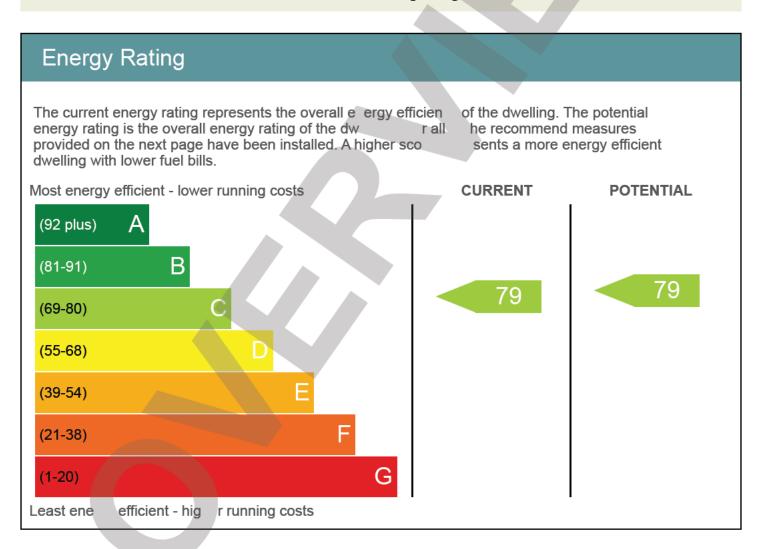
Residence of when because			70.0000
Efficiency of water heater Water heating fuel used Space cooling fuel			79.8000 2281.4570 (219) 0.0000 (221)
Electricity for pumps and fans: Total electricity for the above, kWh/year Electricity for lighting (calculated in Appendix L)			86.0000 (231) 147.6636 (232)
Energy saving/generation technologies (Appendices M ,N and Q) PV generation Wind generation Hydro-electric generation (Appendix N) Electricity generated - Micro CHP (Appendix N) Appendix Q - special features			-999.2594 (233) 0.0000 (234) 0.0000 (235a) 0.0000 (235)
Energy saved or generated Energy used Total delivered energy for all uses			-0.0000 (236) 0.0000 (237) 4135.0843 (238)
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP			
Space heating - main system 1	Energy kWh/year 2619.2231	0.2100	550.0369 (261)
Total CO2 associated with community systems Water heating (other fuel) Space and water heating	2281.4570	0.2100	0.0000 (373) 479.1060 (264) 1029.1428 (265)
Pumps, fans and electric keep-hot Energy for lighting	86.0000 147.6636	0.1387	11 9293 (267)
Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER)	-485.7234 -513.5360		-65.0218 -64.4684 -129.4902 (269) 932.8943 (272) 15.3800 (273)
13a. Primary energy - Individual heating systems including micro-CHP			
Space heating - main system 1 Total CO2 associated with community systems	kWh/year 2619.2231		kWh/year 2959.7221 (275) 0.0000 (473)
Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot	2281.4570 86.0000	1.1300 1.5128	2578.0464 (278) 5537.7685 (279) 130.1008 (281)
Energy for lighting	147.6636	1.5338	226.4914 (282)
Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total Primary energy kWh/year Target Primary Energy Rate (TPER)	-485.7234 -513.5360		-726.0131 -236.6349 -962.6480 (283) 4931.7127 (286) 81.3100 (287)

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Dwelling Address	Unit 1, Highland Square , Bristol
Report Date	05/03/2024
Property Type	Maisonette, Semi-Detached
Floor Area [m ²]	61

This document is not an Energy Performance Certificat EPC) s required by the Energy Performance of Buildings Reg io



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Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good
Feature	Description			gy Performance
Walls	Average thermal transmi	ttance 0.18 W/m²K		Very Good
Roof	Average thermal transmi	ttance 0.11 W/m²K		Very Good
Windows	High performance glazing			Good
Main heating	Air source heat pump, radiators, electric			Good
Main heating controls	Time and temperature zone control			Very Good
Secondary heating	None			
Hot water	From main system			Average
Lighting	Good lighting e iciency			Good
Air tightness	Air perm ity [AP5	4.5 m³/h.m² (assumed)		Good

Primary Energy e

The primary ener e for this operty per year is 56 kilowatt hour (kWh) per square metre

Estimat d C emissions of the dwelling

The estimed CO rating rovides an indication of the dwelling's impact on the environment in terms of carbon dio emissio; the higher the rating the less impact it has on the environment.

The estimated CO emissions for this dwellings is: 0.3 per year

With the recommended measures the potential CO emissions could be: per year

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Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.

To reach the dwelling's potential energy rating all of the recommended measures shown below would need t installed. Having these measures installed individually or in any other order may give a different result wh pared w the cumulative potential rating.

Recommended measure	Typical	Potential Rating	lative	Cumulative
	Yearly	after	s	Potential
	Saving	measure installed	(per yea	Rating

Estimated energy use and potential savin s

Estimated energy cost for this property over a year

£555

Over a year you could save

£0

The estimated cost and savings show how much the average househ would spend in this property heating, lighting and hot water. It not based on how energy is ed by the people living at the propert

Contacting asses or and the accreditation scheme

Assessor contact details				
Asse r name				
Assess accredita n number				
Email Address				

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Accreditation scheme contact details				
Accreditation scheme Elmhurst Energy Systems Ltd				
Telephone				
Email Address				

Assessment details				
Related party disclosure	No related pa			
Date of assessment	05/03/202			
Date of certificate	05/03/202			
Type of assessment	SAP w dwellin			



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Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Tue 05 Mar 2024 08:41:59

Project Information					
Assessed By		Building Type	Maisonette, Mid-terrace		
OCDEA Registration	EES/025661	Assessment Date	2024-03-05		

Dwelling Details				
Assessment Type	As designed	Total Floor Area	92 m ²	
Site Reference	Unit 4	Plot Reference	PV	
Address	Unit 1 Highland Squa	are, Bristol	•	

Client Details		
Name	Tebby & Son	
Company	SF Tebby & Son	
Address	Unit 11 Avon Gorge Industrial Estate , Bristol, BS2 9XX	

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission	rate			
Fuel for main heating system	Electricity			
Target carbon dioxide emission rate	11.51 kgCO ₂ /m ²			
Dwelling carbon dioxide emission rate	3.33 kgCO ₂ /m ²	OK		
1b Target primary energy rate and dwelling primary energy				
Target primary energy	60.37 kWh _{PE} /m ²			
Dwelling primary energy	37.13 kWh _{PE} /m ²	OK		
1c Target fabric energy efficiency and dwelling fabric energy efficiency				
Target fabric energy efficiency	38.1 kWh/m²			
Dwelling fabric energy efficiency	37.4 kWh/m ²	OK		

2a Fabric U-values					
Element	Maximum permitted average U-Value [W/m²K]	Dwelling average U-Value [W/m²K]	Element with highest individual U-Value		
External walls	0.26	0.18	Walls (1) (0.18)	OK	
Party walls	0.2	0	Party Wall (1) (0)	N/A	
Curtain walls	1.6	0	N/A	N/A	
Floors	0.18	0.18	Exposed Floor (0.18)	OK	
Roofs	0.16	0.11	Roof (1) (0.11)	OK	
Windows, doors, and roof windows	1.6	1.31	W01 (1.31)	OK	
Rooflights	2.2	N/A	N/A	N/A	

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))				
Name	Net area [m ²]	U-Value [W/m ² K]		
Exposed wall: Walls (1)	71.34	0.18		
Exposed wall: Walls (2)	13.04	0.18		
Party wall: Party Wall (1)	65.88	0 (!)		
Party floor: Exposed Floor, Exposed Floor	7.22	0.18		
Exposed roof: Roof (1)	53.98	0.11		

2c Openings (better than typically expected values are flagged with a subsequent (!))					
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]	
W01, Windows	2.38	North East	0.7	1.31	
W02, Windows	2.38	North East	0.7	1.31	
W03, Windows	2.38	North East	0.7	1.31	
W04, Windows	4.41	North East	0.7	1.31	
W05, Windows	2.38	South East	0.7	1.31	
W06, Windows	0.53	South West	0.7	1.31	
W07, Windows	0.53	South West	0.7	1.31	

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))
Building part 1 - Main Dwelling: Thermal bridging calculated from linear thermal transmittances for each junction

Date generated: 2024-03-05 08:41:59

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Not government-approved scheme	0.023 (!)	
External wall	E3: Sill	Calculated by person with suitable expertise	0.021 (!)	
External wall	E4: Jamb	Calculated by person with suitable expertise	0.016 (!)	
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.116	
External wall	E7: Party floor between dwellings (in blocks of flats)	Calculated by person with suitable expertise	0.038 (!)	
Party wall	P7: Exposed floor (normal)	Calculated by person with suitable expertise	0.185	
Party wall	P3: Intermediate floor between dwellings (in blocks of flats)	SAP table default	0 (!)	
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.043	
External wall	E25: Staggered party wall between dwellings	Calculated by person with suitable expertise	0.036 (!)	
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.046	
External wall	E21: Exposed floor (inverted)	SAP table default	0.32	
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.101	
Party wall	P8: Exposed floor (inverted)	Calculated by person with suitable expertise	0.185	
External wall	E14: Flat roof	SAP table default	0.16	
Roof	R8: Roof to wall (rafter)	SAP table default	0.12	
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.001 (!)	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))									
Maximum permitted air permeability at 50Pa	8 m ³ /hm ²								
Dwelling air permeability at 50Pa	4.5 m ³ /hm ² , Design value	OK							
Air permeability test certificate reference		·							

4 Space heating									
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity									
Efficiency	247.7%								
Emitter type	Radiators								
Flow temperature	55°C								
System type	Heat Pump								
Manufacturer	Atlantic								
Model	Logic Air 8kW								
Commissioning									
Secondary heating system: N/A									
Fuel	N/A								
Efficiency	N/A								
Commissioning									

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	150 litres
Declared heat loss	2.09 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 -	type: N/A
Efficiency	
Manufacturer	
Model	

6 Controls			
Main heating 1 - type: Time and tempera	ature zone control by	arrangement of plumbing and electrical s	ervices
Function			
Ecodesign class			
Manufacturer			
Model			
Water heating - type: Cylinder thermosta	at and HW separately	timed	
Manufacturer			
Model			
7 Lighting			
Minimum permitted light source efficacy	75 lm/W		
Lowest light source efficacy	80 lm/W		OK
External lights control	N/A		
_			
8 Mechanical ventilation			
System type: N/A Maximum permitted specific fan power	N//A		
Specific fan power	N/A N/A		N/A
Minimum permitted heat recovery	N/A		IVA
efficiency	17/7		
Heat recovery efficiency	N/A		N/A
Manufacturer/Model	14/7		14/7
Commissioning			
9 Local generation	(4)		
Technology type: Photovoltaic system			
Peak power	1.045 kWp		
Orientation Pitch	South West 45°		
Overshading	None or very little		
Manufacturer	None or very little		
MCS certificate			
10 Heat networks			
N/A			
11 Supporting documentary evidence			
N/A			
12 Declarations			
a. Assessor Declaration	office of the state of	starts of this DDEL Occupions Depart	
		entents of this BREL Compliance Report	
		nformation submitted for this dwelling for and that the supporting documentary	
evidence (SAP Conventions, Appendi	•	•	
documentary evidence required) has			
Compliance Report.	been reviewed in the	course of preparing this BREL	
оопірнаное пероп.			
Signed:		Assessor ID:	
Oignou.		7.000000110.	
Name:		Date:	
h Client Declaration		<u> </u>	

N/A



Property Reference	Unit 4								Issued	on Date	05/03	/2024	
Assessment Reference	PV					Pro	p Type l	Ref	Tebby an	d Son G	arage		
Property	Unit 1	, Highla	nd Square	, Bristol									
SAP Rating				81 B	DER		3.33		Т	ER	11	.51	
Environmental				97 A	% DEF	? < TER						.07	
CO ₂ Emissions (t/year)				0.27	DFEE		37.3	18	Т	FEE		.13	
Compliance Check				See BREL	% DFE	E < TFE					1.9		
% DPER < TPER				38.50	DPER		37.1	3	Т	PER		.37	
Assessor Details									A	\ssessoi	· ID U3	367-00	001
Client													
SUMMARY FOR INPU	T DATA FO	R: Nev	v Build (A	As Designed)									
Orientation			(.	Southwest									
Property Tenture				1									
Transaction Type				6									
Transaction Type Terrain Type				Urban									
2.				Maisonette, Mid-Te	rraco								
1.0 Property Type Position of Flat				Top-floor flat	iiace								
				•									
Which Floor				1									
2.0 Number of Storeys				3									
3.0 Date Built				2024									
3.0 Property Age Band				L									
4.0 Sheltered Sides				3									
5.0 Sunlight/Shade				Average or unknow									
6.0 Thermal Mass Parame	ter			Precise calculation									
Thermal Mass				N/A					kJ	l/m²K			
7.0 Electricity Tariff				Standard									
Smart electricity meter fi	itted			No									
Smart gas meter fitted				No									
7.0 Measurements					Наз	t Loss Po	orimete	r In	ternal Floo	or Area	Average	Stor	ey Heigh
				Basem	ent:	0.00 r	n		0.00 m	2	_	0.00 r	n .
				Ground flo 1st Sto	rey:	3.30 r 14.97	m		4.86 m 59.81 n	n²		2.50 r 2.70 r	n
				2nd Sto 3rd Sto		18.05 0.00 r			27.28 n 0.00 m			2.42 r 0.00 r	
				4th Sto	rey:	0.00 r 0.00 r	n		0.00 m 0.00 m	2		0.00 r 0.00 r	n
				6th Sto	reý:	0.00 r	n		0.00 m	2		0.00 r	n
				7th Sto	rey:	0.00 r	n		0.00 m			0.00 r	n ———
8.0 Living Area				27.28					m				
9.0 External Walls Description	Туре	Constr	ruction			Карра		Nett Area	Shelter	Shelter	Opening	s Area	Calculation
	Cavity Wall			oard on dabs, dense bloc	(W/m²K)	(kJ/m²K) 150.00	Area(m²) 86.33	(m²) 71.34	Res 0.00	None	14.99		Type r Gross Are
Sloping Wall	Timber Frame		avity, any outsi framed wall (t	ide structure two layers of plasterboard	0.18	18.00	13.04	13.04	0.00	None	0.00	Ente	r Gross Are
9.1 Party Walls	_		_							_			_
Description	Type		Construc	tion					Kappa (kJ/m²K)	Area (m²)	Shelter Res	SI	nelter
Party Wall 1	Filled Cav Edge Sea		Single pla cavity	sterboard on both si	des, dense	cellular	blocks,	0.00	70.00	65.88	0.00	١	lone
9.2 Internal Walls		-	-										
memai mana													
Description			Constructi	ion							Kap (k.l/n		Area (m
				ion ck, dense plaster							Kap (kJ/n 100	n²K)	Area (m 139.75

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Description	Туре	Construc	ction		Kappa G (kJ/m²K)Ar	ea(m²) /	Nett Area		Shelter Factor	Calculatio Type	nOpenings
External Roof 1	External Flat Roof	Plasterbo	ard, insulated flat roof	0.11	9.00 5		(m²) 53.98	None	0.00	Enter Gros Area	s 0.00
10.2 Internal Ceilings											
Description Internal Ceiling 1		Storey +1	Construction Plasterboard ceili	ng, carpeted chip	board floor						e a (m²) 2.14
11.0 Heat Loss Floors	_										
Description Exposed Floor	Type Exposed Floor - Solid	Storey Inde			U-Va (W/m 0.1	¹K)		Iter Code None	F	nelter Kapp actor (kJ/m).00 75.0	
11.1 Party Floors											
Description		Storey	Construction								Area (m²
Party Floor 1		Index Lowest occupied	Precast concrete planks	floor, screed, car	peted					(kJ/m²K) 30.00	47.73
11.2 Internal Floors											
Description		Storey Index	Construction							Kappa	
Internal Floor 1		index	Plasterboard ceiling, car	peted chipboard f	loor					(kJ/m²K) 9.00	32.14
12.0 Opening Types											
Description	Data Source	Type	Glazing		Glazing Gap	Filling Type		-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double Low-l	Soft 0.05		Air Fille	ed	0.63	Wood	0.70	1.31
13.0 Openings									_		
Name W01	Opening Ty Windows	pe	Location Cavity Wall		Orient North			Area (2.38			tch 0
W02	Windows		Cavity Wall		North	East		2.38	3		0
W03 W04	Windows Windows		Cavity Wall		North North			2.38 4.4			0 0
W05	Windows		Cavity Wall Cavity Wall		South			2.38			0
W06	Windows		Cavity Wall		South	West		0.53	3		0
W07	Windows		Cavity Wall		South	West		0.53	3		0
			-								
14.0 Conservatory			None								
14.0 Conservatory 15.0 Draught Proofing			None					%			
-								%			
15.0 Draught Proofing 16.0 Draught Lobby			100 No					%			
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging			100					%			
15.0 Draught Proofing 16.0 Draught Lobby			100 No	Length	Psi	Adjusto	ed Re	%			Imported
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin	ng other steel linte	els)	100 No Calculate Bridges Source Type Non Gov Approved Scho	emes 8.20	0.02	0.02					No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill	ng other steel linte	els)	100 No Calculate Bridges Source Type Non Gov Approved Sch Independently assessed	emes 8.20 8.20	0.02 0.02	0.02 0.02					No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm	nal)	•	100 No Calculate Bridges Source Type Non Gov Approved Schi Independently assessed Independently assessed Independently assessed	emes 8.20 8.20 23.67 3.12	0.02 0.02 0.02 0.12	0.02 0.02 0.02 0.12					No No No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between d	nal) dwellings (in block	•	No Calculate Bridges Source Type Non Gov Approved Scholndependently assessed Independently Index I	emes 8.20 8.20 23.67 3.12 31.46	0.02 0.02 0.02 0.12 0.04	0.02 0.02 0.02 0.12 0.04					No No No No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between d P7 Party Wall - Exposed	nal) dwellings (in block I floor (normal)	ss of flats)	100 No Calculate Bridges Source Type Non Gov Approved Schi Independently assessed Independently assessed Independently assessed	8.20 8.20 23.67 3.12 31.46 4.67	0.02 0.02 0.02 0.12	0.02 0.02 0.02 0.12					No No No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between d P7 Party Wall - Exposed P3 Party wall - Intermedi (in blocks of flats)	nal) dwellings (in block I floor (normal)	ss of flats)	100 No Calculate Bridges Source Type Non Gov Approved Schelndependently assessed Independently Atlanta (Independently Independently Independ	8.20 8.20 23.67 3.12 31.46 4.67 14.45	0.02 0.02 0.02 0.12 0.04 0.18 0.00	0.02 0.02 0.02 0.12 0.04 0.18 0.00					No No No No No No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between of P7 Party Wall - Exposed P3 Party Wall - Intermedi (in blocks of flats) E16 Comer (normal)	nal) dwellings (in block I floor (normal) iate floor betweer	ss of flats)	No Calculate Bridges Source Type Non Gov Approved Scholadependently assessed Independently Indepen	8.20 8.20 23.67 3.12 31.46 4.67 14.45	0.02 0.02 0.02 0.12 0.04 0.18 0.00	0.02 0.02 0.02 0.12 0.04 0.18 0.00					No No No No No No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between d P7 Party Wall - Exposed P3 Party wall - Intermedi (in blocks of flats)	nal) dwellings (in block d floor (normal) liate floor betweer	ss of flats)	100 No Calculate Bridges Source Type Non Gov Approved Schelndependently assessed Independently Assessed Indepe	8.20 8.20 23.67 3.12 31.46 4.67 14.45	0.02 0.02 0.02 0.12 0.04 0.18 0.00	0.02 0.02 0.02 0.12 0.04 0.18 0.00					No No No No No No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between of P7 Party Wall - Exposed P3 Party wall - Intermedi (in blocks of flats) E16 Comer (normal) E25 Staggered party wall E18 Party wall between e121 Exposed floor (invertible)	nal) dwellings (in block floor (normal) liate floor betweer ll between dwellin dwellings rted)	ss of flats) n dwellings	Too No Calculate Bridges Source Type Non Gov Approved Schindependently assessed Independently assessed Table K1 - Default	8.20 8.20 23.67 3.12 31.46 4.67 14.45 16.64 26.80 5.20 1.50	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.04 0.05 0.32	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.04 0.05 0.32					No No No No No No No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between d P7 Party Wall - Exposed P3 Party wall - Intermedi (in blocks of flats) E16 Comer (normal) E25 Staggered party wal E18 Party wall between E21 Exposed floor (inver P4 Party wall - Roof (insi	nal) dwellings (in block difloor (normal) liate floor betweer all between dwellin dwellings rted) sulation at ceiling be	ss of flats) n dwellings	Too No Calculate Bridges Source Type Non Gov Approved Schelindependently assessed Independently Indep	8.20 8.20 23.67 3.12 31.46 4.67 14.45 16.64 26.80 5.20 1.50	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.04 0.05 0.32 0.10	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.04 0.05 0.32 0.10					No No No No No No No No No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between of P7 Party Wall - Exposed P3 Party Wall - Intermedi (in blocks of flats) E16 Corner (normal) E25 Staggered party wall E18 Party wall between of E21 Exposed floor (inver P4 Party Wall - Roof (insight P8 Party Wall - Exposed E14 Flat roof	nal) dwellings (in block difloor (normal) liate floor betweer all between dwellin dwellings rted) sulation at ceiling be	ss of flats) n dwellings	No Calculate Bridges Source Type Non Gov Approved Schindependently assessed Independently assessed Table K1 - Default	8.20 8.20 23.67 3.12 31.46 4.67 14.45 16.64 26.80 5.20 1.50	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.04 0.05 0.32	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.04 0.05 0.32					No No No No No No No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between of P7 Party Wall - Exposed P3 Party Wall - Intermedi (in blocks of flats) E16 Comer (normal) E25 Staggered party wall E18 Party wall between e21 Exposed floor (inver P4 Party wall - Roof (ins) P8 Party Wall - Exposed	nal) dwellings (in block of floor (normal) iate floor between all between dwellin dwellings rted) ulation at ceiling of floor (inverted)	ss of flats) n dwellings	No Calculate Bridges Source Type Non Gov Approved Scholadependently assessed Independently Independen	emes 8.20 8.20 23.67 3.12 31.46 4.67 14.45 16.64 26.80 5.20 1.50 14.49 4.60 24.47	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.04 0.05 0.32 0.10 0.18	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.18					No No No No No No No No No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between of P7 Party Wall - Exposed P3 Party wall - Intermedi (in blocks of flats) E16 Comer (normal) E25 Staggered party wal E18 Party wall between of E21 Exposed floor (inver P4 Party Wall - Roof (insi P8 Party Wall - Exposed E14 Flat roof R8 Roof to wall (rafter)	nal) dwellings (in block of floor (normal) iate floor between all between dwellin dwellings rted) ulation at ceiling of floor (inverted)	ss of flats) n dwellings	No Calculate Bridges Source Type Non Gov Approved Schindependently assessed Independently Applications Individual Independently Individual Individ	emes 8.20 8.20 23.67 3.12 31.46 4.67 14.45 16.64 26.80 5.20 1.50 14.49 4.60 24.47	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.18 0.16 0.12	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.16					No N
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between of P7 Party Wall - Exposed P3 Party Wall - Intermedi (in blocks of flats) E16 Comer (normal) E25 Staggered party wall E18 Party wall between of E21 Exposed floor (inver P4 Party Wall - Exposed E14 Flat roof R8 Roof to wall (rafter) E6 Intermediate floor with	nal) dwellings (in block of floor (normal) iate floor between all between dwellin dwellings rted) ulation at ceiling of floor (inverted)	ss of flats) n dwellings	No Calculate Bridges Source Type Non Gov Approved Schindependently assessed Independently I	emes 8.20 8.20 23.67 3.12 31.46 4.67 14.45 16.64 26.80 5.20 1.50 14.49 4.60 24.47	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.18 0.16 0.12	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.16		ference:			No N
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between d P7 Party Wall - Exposed P3 Party wall - Intermedi (in blocks of flats) E16 Comer (normal) E25 Staggered party wal E18 Party wall between E21 Exposed floor (inver P4 Party Wall - Roof (ins P8 Party Wall - Exposed E14 Flat roof R8 Roof to wall (rafter) E6 Intermediate floor with Y-value	nal) dwellings (in block of floor (normal) iate floor between all between dwellin dwellings rted) ulation at ceiling of floor (inverted)	ss of flats) n dwellings	No Calculate Bridges Source Type Non Gov Approved Schindependently assessed Independently	emes 8.20 8.20 23.67 3.12 31.46 4.67 14.45 16.64 26.80 5.20 1.50 14.49 4.60 24.47	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.18 0.16 0.12	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.16		eference:		ra	No N
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between of P7 Party Wall - Exposed P3 Party Wall - Intermedi (in blocks of flats) E16 Corner (normal) E25 Staggered party wall E18 Party wall between E21 Exposed floor (inver P4 Party Wall - Roof (inser P8 Party Wall - Exposed E14 Flat roof R8 Roof to wall (rafter) E6 Intermediate floor with Y-value 18.0 Pressure Testing	nal) dwellings (in block of floor (normal) iate floor between all between dwellin dwellings rted) ulation at ceiling of floor (inverted)	ss of flats) n dwellings	No Calculate Bridges Source Type Non Gov Approved Schindependently assessed Independently In	emes 8.20 8.20 23.67 3.12 31.46 4.67 14.45 16.64 26.80 5.20 1.50 14.49 4.60 24.47	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.18 0.16 0.12	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.16		eference:		d'a	No No No No No No No No No No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between of P7 Party Wall - Exposed P3 Party wall - Intermedi (in blocks of flats) E16 Comer (normal) E25 Staggered party wall E18 Party wall between of E21 Exposed floor (inverteam of P8 Party Wall - Exposed E14 Flat roof R8 Roof to wall (rafter) E6 Intermediate floor with Y-value 18.0 Pressure Testing Designed APso	nal) dwellings (in block of floor (normal) iate floor between all between dwellin dwellings rted) ulation at ceiling of floor (inverted)	ss of flats) n dwellings	No Calculate Bridges Source Type Non Gov Approved Scholadependently assessed Independently In	emes 8.20 8.20 23.67 3.12 31.46 4.67 14.45 16.64 26.80 5.20 1.50 14.49 4.60 24.47	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.18 0.16 0.12	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.16		eference:		°a	No No No No No No No No No No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between d P7 Party Wall - Exposed P3 Party wall - Intermedi (in blocks of flats) E16 Corner (normal) E25 Staggered party wall E18 Party wall between dE21 Exposed floor (inver P4 Party wall - Roof (insigher P8 Party Wall - Exposed E14 Flat roof R8 Roof to wall (rafter) E6 Intermediate floor with Y-value 18.0 Pressure Testing Designed APso Property Tested?	nal) dwellings (in block difloor (normal) iate floor between dwellings rted) ulation at ceiling if floor (inverted) thin a dwelling	ss of flats) n dwellings	No Calculate Bridges Source Type Non Gov Approved Schindependently assessed Independently Independent	emes 8.20 8.20 23.67 3.12 31.46 4.67 14.45 16.64 26.80 5.20 1.50 14.49 4.60 24.47	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.18 0.16 0.12	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.16		eference:		°a	No No No No No No No No No No No
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between of P7 Party Wall - Exposed P3 Party wall - Intermedi (in blocks of flats) E16 Comer (normal) E25 Staggered party wall E18 Party wall between of E21 Exposed floor (inverse P4 Party wall - Exposed E14 Flat roof R8 Roof to wall (rafter) E6 Intermediate floor with Y-value 18.0 Pressure Testing Designed APso Property Tested? Test Method	nal) dwellings (in block of floor (normal) iate floor between all between dwellin dwellings rted) sulation at ceiling of floor (inverted) thin a dwelling	ss of flats) n dwellings	No Calculate Bridges Source Type Non Gov Approved Schindependently assessed Independently Independent	emes 8.20 8.20 23.67 3.12 31.46 4.67 14.45 16.64 26.80 5.20 1.50 14.49 4.60 24.47	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.18 0.16 0.12	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.16		eference:		'a	No N
15.0 Draught Proofing 16.0 Draught Lobby 17.0 Thermal Bridging 17.1 List of Bridges Bridge Type E2 Other lintels (includin E3 Sill E4 Jamb E20 Exposed floor (norm E7 Party floor between d P7 Party Wall - Exposed P3 Party wall - Intermedi (in blocks of flats) E16 Corner (normal) E25 Staggered party wall E18 Party wall between E21 Exposed floor (inver P4 Party Wall - Roof (insi P8 Party Wall - Exposed E14 Flat roof R8 Roof to wall (rafter) E6 Intermediate floor with Y-value 18.0 Pressure Testing Designed APso Property Tested? Test Method 19.0 Mechanical Ventilation	nal) dwellings (in block difloor (normal) liate floor between dwellings rted) ulation at ceiling of floor (inverted) thin a dwelling	as of flats) a dwellings ags devel)	No Calculate Bridges Source Type Non Gov Approved Schindependently assessed Independently Independent	emes 8.20 8.20 23.67 3.12 31.46 4.67 14.45 16.64 26.80 5.20 1.50 14.49 4.60 24.47	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.18 0.16 0.12	0.02 0.02 0.02 0.12 0.04 0.18 0.00 0.04 0.05 0.32 0.10 0.16		eference:		·°a	No N

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21.0 Fixed Cooling System	No					
22.0 Lighting						
No Fixed Lighting	No					
	Name Lighting 1	Efficacy 80.00	Power 15	'	Capacity 1200	Count 5
24.0 Main Heating 1	Database					
Percentage of Heat	100.00				%	
Database Ref. No.	106764					
Fuel Type	Electricity					
SAP Code	0					
In Winter	247.69					
In Summer	188.71					
Model Name	Logic Air 8kW					
Manufacturer	Atlantic					
System Type	Heat Pump					
Controls SAP Code	2207					
Delayed Start Stat	No					
HETAS approved System	No					
Oil Pump Inside	No					
FI Case	0.00					
Flue Type	None or Unknown					
Fan Assisted Flue	No					
Is MHS Pumped	Pump in heated sp	ace				
Heating Pump Age	2013 or later					
Heat Emitter	Radiators					
Flow Temperature	Enter value					
Flow Temperature Value	55.00					
Boiler Interlock	No					
25.0 Main Heating 2	None					
26.0 Heat Networks	None					
Heat Source Fuel Type Heating U Heat source 1 None Heat source 2 None	Jse Efficiency F	Percentage Of Heat	Heat Hea Pow Rati	er	ctrical Fuel Factor	Efficiency type
Heat source 3 None Heat source 4 None Heat source 5 None						
Heat source 4 None Heat source 5 None						
Heat source 4 None Heat source 5 None	Main Heating 1					
Heat source 4 None Heat source 5 None 28.0 Water Heating	Main Heating 1					
Heat source 4 Heat source 5 None None 28.0 Water Heating Water Heating						
Heat source 4 None Heat source 5 None 28.0 Water Heating Water Heating SAP Code	901					
Heat source 4 Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System	901 No					
Heat source 4 Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1	901 No No					
Heat source 4 None None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2	901 No No					
Heat source 4 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System Solar Panel	901 No No No					
Heat source 4 Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System	901 No No No No No					
Heat source 4 Heat source 5 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System Solar Panel Water use <= 125 litres/person/day	901 No No No No Yes					
Heat source 4 None 28.0 Water Heating Water Heating SAP Code Flue Gas Heat Recovery System Waste Water Heat Recovery Instantaneous System 1 Waste Water Heat Recovery Instantaneous System 2 Waste Water Heat Recovery Storage System Solar Panel Water use <= 125 litres/person/day Summer Immersion	No No No No No Vo No No No No No					

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Immersion Only	Heating Hot V	Vater		No								
28.1 Showers												
Description			Shower Type				Flow Rate [I/min]	Rated Pov [kW]	ver C		Connected	I То
1			Combi boiler	or unvented	hot wat	er system	7.00			No		
28.3 Waste Water H	leat Recover	y System										
29.0 Hot Water Cyli	inder			Hot Water	Cylinder	Г						
Cylinder Stat				Yes								
Cylinder In Heat	ed Space			Yes								
Independent Tim	ne Control			Yes								
Insulation Type				Measured I	LOSS							
Cylinder Volume	:			150.00						L		
Loss				2.09						kWh/day	/	
Pipes insulation				Fully insula	ted prin	nary pipework	(
In Airing Cupboa	nrd			No								
31.0 Thermal Store				None								
32.0 Photovoltaic U	Jnit			One Dwelli	ng							
Export Capable	Meter?			Yes								
Connected To D	welling			No								
Diverter				No								
Battery Capacity	[kWh]			0.00								
PV Cells k	кWр	Orientation	Elevation	Overs	hading	FGHRS	MCS C	ertificate	Over	or T	MCS Certificate	Panel Manufacturer
1.04		South West	45°	None (Or Little	No	No		1.00		Reference	
34.0 Small-scale Hy	ydro			None								
Electricity Gener	rated			0.00								
Apportioned				0.00						kWh/Yea	аг	
Connected to dw	velling's electr	icity meter		Yes								
Electricity Gener	ration			Annual								
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g S	ер	Oct	Nov	/ Dec
Recommendations Lower cost med None Further measur	asures	e even higher s		ypical Cost		Typical sav	ings per ye	ar <u>.</u>	R SAP ra		ter improven Enviror	nent nmental Impact
	Solar water	heating							0 0 0			0

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Property Reference	e	l	Jnit 4							Issu	ed on Da	ate	05/03/2024			
Assessment Refer	rence	I	PV					Prop Type F	Ref	Tebby	and Sor	Garage				
Property		· ·	Jnit 1, Highland	Square, Bristol												
SAP Rating					81 B		DER	3.	33		TER		11.51			
Environmental					97 A	9	% DER < TER						71.07			
CO ₂ Emissions (t/)	/ear)				0.27		DFEE	37	7.38		TFEE		38.13	38.13		
Compliance Check	Compliance Check						% DFEE < TFE	EE					1.97			
% DPER < TPER					38.50		DPER	37	7.13		TPEF	₹	60.37			
Assessor Details											Asse	ssor ID	U367-00	01		
Client																
SAP 10 WORKSHEET CALCULATION OF D						7 2022)			-							
1. Overall dwell	ing charact	teristic	3					Area	- - - St	orev h	neight		Volume			
Ground floor First floor Second floor Total floor area Dwelling volume	TFA = (la)+(lb)+(lc)+(ld)+(le	e)(ln)	9	1.9500		(m2) 4.8600 59.8100 27.2800) (lb) x (lc) x	2 2 2	(m) 2.5000 2.7000 2.4200	(2b) = (2c) = (2d) =	(m3) 12.1500 161.4870 66.0176	(lb) - (3h (lc) - (3c (ld) - (3c (4)		
2. Ventilation r									-				m3 per hour	:		
Number of open c Number of open f Number of chimne Number of flues Number of blocke Number of interm Number of passiv Number of fluele	lues ys / flues attached to attached to d chimneys ittent ext: e vents	o solid : o other l ract fan:	fuel boiler neater	fire								0 * 20 = 0 * 35 = 0 * 20 = 5 * 10 =	0.0000 0.0000 0.0000 0.0000 0.0000 50.0000	(6b) (6c) (6d) (6e) (6f) (7a)		
Infiltration due Pressure test Pressure Test Me Measured/design Infiltration rat Number of sides	thod AP50 e	ys, flue:	and fans	= (6a)+(6b)	+(6c)+(6d)+((6e)+(6f)+(6g)+(7a)+(7	7b)+(7c) =	=	5	60.0000	/ (5) =	yes per hour 0.2086 Yes Blower Door 4.5000 0.4336	(8)		
Shelter factor Infiltration rat	e adjusted	to incl	ude shelter	factor								(19)] = x (20) =				
Wind speed Wind factor Adj infilt rate	Jan 5.1000 1.2750	Feb 5.0000 1.2500				Jun 3.8000 0.9500				4	Oct 1.3000 1.0750					
_	0.4285			0.3697 0.5683	0.3613 0.5653	0.3193 0.5510	0.3193 0.5510				.3613).5653	0.3781 0.5715				
3. Heat losses a									-							
Element				Gross	Openings	Net	Area	U-value	A	хU		-value	AxK			
Windows (Uw = 1. Exposed Floor Cavity Wall Sloping Wall External Roof 1				13.0400 53.9800	m2 14.9900	14. 7. 71. 13. 53.	3400 0400 9800	W/m2K 1.2448 0.1800 0.1800 0.1800 0.1100	1.2	996	7 15 1	kJ/m2K 5.0000 0.0000 8.0000 9.0000	kJ/K 541.5000 10701.0000 234.7200 485.8200	(27) (28b) (29a) (29a) (30)		
Total net area of Fabric heat loss Party Wall 1 Party Floor 1 Internal Wall 1 Internal Floor 1 Internal Ceiling	, W/K = Sur					47. 139. 32.	(26) (3	30) + (32) 0.0000			10 1	0.0000 0.0000 0.0000 8.0000	4611.6000 1909.2000 13975.0000 578.5200 289.2600	(32d) (32c) (32d)		
Heat capacity Cm Thermal mass par List of Thermal	ameter (TM Bridges		TFA) in kJ/	m2K					(30) + (362.4428			
K1 Eleme E2 Other		includin	g other stee	el lintels)					Length 8.2000		0230		tal .886			

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E3 Sill E4 Jamb E40 Exposed floor E7 Party floor bet P7 Party Wall - E1 P3 Party wall - E1 E16 Corner (normal E25 Staggered part E18 Party wall bet E21 Exposed floor P4 Party wall - E2 E14 Flat roof R8 Roof to wall (1) E6 Intermediate f1 Thermal bridges (Sum(L x 1) Point Thermal bridges Total fabric heat loss Ventilation heat loss calc Jan (38)m 46.8031 Heat transfer coeff 100.2140	23 31 4 14 16 26 5 1 14 4 24	.2000 .6700 .6700 .1200 .4640 .6700 .4500 .6400 .8000 .2000 .5960 .4700 .3200 .0500	0.0210 0.0160 0.1160 0.0380 0.1850 0.0000 0.0430 0.3200 0.1010 0.1850 0.1600 0.1200 0.0010	0.17 0.37 0.36 1.19 0.86 0.00 0.71 0.96 0.23 0.48 1.46 0.85 3.91 0.51 0.51 0.51	87 19 39 00 55 48 92 00 35 03 55 03	(37)						
Average = Sum(39)m / 12 =		99.6557	98.3578	98.1149	96.9845	96.9845					98.3566	
HLP 1.0899	Feb 1.0868	Mar 1.0838	Apr 1.0697	May 1.0670	Jun 1.0548	Jul 1.0548	Aug 1.0525	Sep 1.0595	Oct 1.0670	Nov 1.0724	Dec 1.0780	
HLP (average) Days in mont 31	28	31	30	31	30	31	31	30	31	30	1.0697 31	
4. Water heating energy re Assumed occupancy Hot water usage for mixer 85.9974 Hot water usage for baths	showers 84.6808	kWh/year		77.0812	73.3397	70.3805	73.8400	75.5800	79.2858	83.1450	2.6515 85.9199	
0.0000 Hot water usage for other	0.0000 uses	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
41.7838 Average daily hot water us	40.2644 se (litres/	38.7450 /day)	37.2256	35.7062	34.1868	34.1868	35.7062	37.2256	38.7450	40.2644	41.7838 117.2682	
Jan Daily hot water use	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
127.7812	124.9452 165.3278	121.4855 173.6002	116.9811 152.8066	112.7874 145.3379	107.5265 124.3508	104.5672 115.5499	109.5462 128.9379	112.8056 130.8489	118.0308 152.0946 Total = S	123.4094 166.7919 um(45)m =	127.7037 187.5422 1831.3046	(45)
Distribution loss (46)m = 28.2174		45)m 26.0400	22.9210	21.8007	18.6526	17.3325	19.3407	19.6273	22.8142	25.0188	28.1313	(46)
Water storage loss: Store volume a) If manufacturer declar Temperature factor from Enter (49) or (54) in (55)	Table 2b	actor is km	own (kWh/d	lay):							150.0000 2.0900 0.5400 1.1286	(48) (49)
Total storage loss 34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(56)
If cylinder contains dedic 34.9866 Primary loss 23.2624	31.6008 21.0112	34.9866 23.2624	33.8580 22.5120	34.9866 23.2624	33.8580 22.5120	34.9866 23.2624	34.9866 23.2624	33.8580 22.5120	34.9866 23.2624	33.8580 22.5120	34.9866 23.2624	(59)
Combi loss 0.0000 Total heat required for wa				0.0000 month 203.5869	0.0000 180.7208	0.0000	0.0000 187.1869	0.0000	0.0000	0.0000	0.0000 245.7912	
WWHRS 0.0000 PV diverter -0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
Solar input 0.0000 FGHRS 0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
Output from w/h 246.3650	217.9398	231.8492	209.1766	203.5869	180.7208	173.7989	187.1869	187.2189	210.3436	223.1619	245.7912	(64)
12Total per year (kWh/year Electric shower(s)							lotal p	er year (xw	n/year) = 5	um(64)m =	2517.1396	
0.0000 Heat gains from water heat	0.0000	0.0000	0.0000 Tot	0.0000 al Energy u	0.0000 sed by inst	0.0000 antaneous e	0.0000 electric sho	0.0000 wer(s) (kWh	0.0000 /year) = Su	0.0000 m(64a)m =	0.0000	(64a) (64a)
Heat gains from water heat 109.1478	ting, kWh/m 97.0611	nonth 104.3213	95.9042	94.9241	86.4426	85.0195	89.4710	88.6032	97.1706	100.5543	108.9570	(65)
5. Internal gains (see Tab	ble 5 and 5	5a)										
Metabolic gains (Table 5), Jan						71	3		0		D	
(66)m 132.5741 Lighting gains (calculated	132.5741	132.5741	132.5741	132.5741	132.5741	Jul 132.5741	Aug 132.5741	Sep 132.5741	Oct 132.5741	Nov 132.5741	Dec 132.5741	(66)
127.2048 Appliances gains (calculate	140.8339	127.2048	131.4450	127.2048	131.4450	127.2048	127.2048	131.4450	127.2048	131.4450	127.2048	(67)
242.6198 Cooking gains (calculated	245.1374	238.7931	225.2867	208.2373	192.2133	181.5083	178.9906	185.3350	198.8414	215.8908	231.9148	(68)
36.2574 Pumps, fans 0.0000	36.2574 0.0000	36.2574 0.0000	36.2574 0.0000	36.2574 0.0000	36.2574 0.0000	36.2574 0.0000	36.2574 0.0000	36.2574 0.0000	36.2574 0.0000	36.2574 0.0000	36.2574 0.0000	(69) (70)
Losses e.g. evaporation (r -106.0593	negative va -106.0593	alues) (Tab	le 5)									
Water heating gains (Table 146.7040 Total internal gains		140.2168	133.2003	127.5861	120.0592	114.2736	120.2568	123.0601	130.6057	139.6587	146.4476	(72)
	593.1797	568.9869	552.7042	525.8005	506.4897	485.7589	489.2245	502.6123	519.4241	549.7667	568.3394	(73)
6. Solar gains												
[Jan]				Solar flux Table 6a W/m2				FF data le 6c	Acce fact Table	ss or 6d	Gains W	

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Northeast Southeast Southwest			1.0	800 600	11.2829 36.7938 36.7938		0.6300 0.6300 0.6300	0	.7000 .7000 .7000	0.770 0.770 0.770	00	39.8269 26.7623 11.9194	(77)
C-1									275 5026	171 0040	05 4440	CE (2001	(02)
Solar gains Total gains													
7. Mean inter	nal temperat												
Temperature d	uring heating	ng periods	in the livi	ng area from	n Table 9, 1							21.0000	(85)
Utilisation f	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau alpha	7.1584	92.6369 7.1758	92.8938 7.1929	94.1196 7.2746	94.3526 7.2902	95.4523 7.3635	95.4523 7.3635		95.0257 7.3350	94.3526 7.2902	93.8825 7.2588	93.3960 7.2264	
util living a	0.9992	0.9979	0.9933	0.9637	0.8491	0.6284	0.4595	0.5184	0.8068	0.9803	0.9977	0.9994	(86)
Mon living	20.1189	10 1521	10 4020	10 7506	10 0744	20 0250	20.9993 20.0378	20.9985		20.7020 19.7414			
24 / 16 24 / 9	0	0	0	0	0	0	0	0 0 0	0	0	0	0	
24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of	28 20.5492	0 20.2451	0 20.4402	0 20.7229	0 20.9252	0 0 20.9927	20.9993	20.9985	0 20.9614	0 0 20.7020 20.0278	0 20.3692	10 20.2294	(87)
Th 2 util rest of							20.0380						
MIT 2 Living area f	19.6023	0.9969 19.1521		0.9454 19.7586	0.7903 19.9744	0.5385 20.0350	0.3595 20.0378	0.4115 20.0395		0.9668 19.7414 Living area	19.3204	19.1651	(90)
MIT Temperature a	19.8832	19.4764	19.7100	20.0447	20.2565	20.3191	20.3231	20.3240		20.0264			
adjusted MIT		19.4764	19.7100	20.0447	20.2565	20.3191	20.3231	20.3240	20.2948	20.0264	19.6315	19.4809	(93)
8. Space heat	ing require												
	Jan	Feh	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation Useful gains	0.9988 657.0276	0.9962 737.3003	0.9885	0.9458	0.8054	0.5653	0.3893	0.4434 379.2180	0.7448	0.9668 668.3445	0.9957	0.9989	
Ext temp. Heat loss rat	4.3000 e W	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Space heating						554.6681	361.0821		603.4935			1514.6374	
Space heating Solar heating	requirement		387.2727 er year (kW		41.3438	0.0000	0.0000	0.0000	0.0000	190.8551	426.4398	655.7256 3031.5275	(98a)
Solar heating	0.0000		0.0000 per vear (ki		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Space heating	kWh			,,									
		483.3998	387.2727	173.4455	41.3438	0.0000	0.0000	0.0000	0.0000	190.8551	426.4398	655.7256	(98c)
Space heating Space heating	requirement						0.0000	0.0000	0.0000			655.7256 3031.5275 32.9693	
	requirement						0.0000	0.0000	0.0000			3031.5275	
Space heating	requirement	t after sol	ar contribu	tion - total	l per year	(kWh/year)			0.0000			3031.5275	
Space heating	requirement per m2 quirements	t after sol	ar contribu	tion - total	l per year	(kWh/year)			0.0000			3031.5275 32.9693	(99)
Space heating 9a. Energy re Fraction of s.	requirements quirements pace heat fi	t after sol	ar contribu	ystems, inc	l per year	(kWh/year)			0.0000			3031.5275 32.9693 0.0000 1.0000	(99) (201) (202)
Space heating 9a. Energy re Fraction of s	requirement per m2 quirements pace heat f: pace heat f: main space main space	- Individua - Individua - rom seconda rom main sy heating sy heating sy	ar contribu	tion - total ystems, incl ntary syster %)	l per year	(kWh/year)			0.0000			3031.5275 32.9693	(201) (202) (206) (207)
9a. Energy re Fraction of s Fraction of s Efficiency of Efficiency of	requirement per m2 quirements pace heat fi main space main space secondary/: Jan	- Individua - Individua - rom seconda rom main sy heating sy supplementa Feb	ar contribu	tion - total ystems, incl ntary syster %)	l per year	(kWh/year)			0.0000 Sep			0.0000 1.0000 247.6858 0.0000	(201) (202) (206) (207)
9a. Energy re- Fraction of s Fraction of s Efficiency of Efficiency of Space heating	requirements quirements pace heat f: pace heat f: pace heat f: pace main space main space secondary/: Jan requirement 673.0450	Individua rom seconda rom main sy heating sy supplementa Feb t 483.3998	ar contribu 1 heating s ry/suppleme stem (s) stem 1 (in stem 2 (in ry heating Mar 387.2727	ystems, inci ntary system %) %) system, % Apr 173.4455	Luding micro	o-CHP				(98c)	/ (4) =	0.0000 1.0000 247.6858 0.0000	(201) (202) (206) (207) (208)
Space heating 9a. Energy re Fraction of s Fraction of s Efficiency of Efficiency of Efficiency of Space heating Space heating	requirements quirements quirements pace heat fi pace heat fi pace nain space main space secondary/: Jan requirement 673.0450 efficiency 247.6858	Individua Indivi	ar contribu l heating s ry/suppleme stem 1 (in stem 2 (in ry heating Mar 387.2727 ing system 247.6858	ystems, inci	L per year Luding micro n (Table 11)	O-CHP	Jul	Aug	Sep	(98c) Oct	/ (4) =	0.0000 1.0000 247.6858 0.0000 Dec	(99) (201) (202) (206) (207) (208)
9a. Energy re- Fraction of s Fraction of s Efficiency of Efficiency of Space heating	requirement per m2 quirements	- Individua - Indi	ar contribu	ystems, inci	Luding micro n (Table 11) May 41.3438	Jun	Jul 0.0000	Aug 0.0000	Sep 0.0000	(98c) Oct 190.8551	/ (4) = Nov 426.4398	0.0000 1.0000 247.6858 0.0000 Dec 655.7256	(201) (202) (202) (206) (207) (208)
9a. Energy re- Fraction of s Fraction of s Efficiency of Efficiency of Space heating Space heating	requirement per m2 quirements	Individua Indivi	l heating s stem(s) stem 1 (in stem 2 (in ry heating Mar 387.2727 ing system 247.6858 stem() 156.3565 ing system 0.0000 stem 2)	ystems, inci- ntary system %) %) Apr 173.4455 1) 247.6858 70.0264 2) 0.0000	May 41.3438 247.6858 16.6920 0.0000	Jun 0.0000 0.0000 0.0000	Jul 0.0000 0.0000 0.0000	Aug 0.0000 0.0000 0.0000	Sep 0.0000 0.0000 0.0000 0.0000	Oct 190.8551 247.6858 77.0553 0.0000	Nov 426.4398 247.6858 172.1697 0.0000	0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409	(201) (202) (206) (207) (208) (98) (210) (211) (212)
9a. Energy re Fraction of s Fraction of s Efficiency of Efficiency of Space heating Space heating Space heating	quirements quirements quirements quirements pace heat fi main space main space secondary/: Jan requirement 673.0450 efficiency 247.6858 fuel (main 771.7334 efficiency 0.0000 fuel (main 0.0000 fuel (secondary) fuel (secondary)	- Individua - Individua - Tom main sy heating sy heating sy supplementa Feb t 483.3998 (main heat 247.6858 heating sy 195.1666 (main heat 0.0000 heating sy 0.0000 ndary)	ar contribu l heating s ry/suppleme stem 1 (in stem 2 (in ry heating Mar 387.2727 ing system 247.6858 stem) 156.3565 ing system 0.0000 stem 2) 0.0000	ystems, inci- ntary system %) %) %) Apr 173.4455 170.0264 2) 0.0000 0.0000	May 41.3438 247.6858 16.6920 0.0000	Jun 0.0000 0.0000 0.0000 0.0000	Jul 0.0000 0.0000 0.0000 0.0000	Aug 0.0000 0.0000 0.0000 0.0000	Sep 0.0000 0.0000 0.0000 0.0000	Oct 190.8551 247.6858 77.0553 0.0000	Nov 426.4398 247.6858 172.1697 0.0000 0.0000	0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409 0.0000	(201) (202) (206) (207) (208) (98) (210) (211) (212) (213)
9a. Energy re Fraction of s Fraction of s Efficiency of Efficiency of Efficiency of Space heating Space heating Space heating Space heating Space heating	requirements quirements pace heat f: pace		l heating s stem(s) stem 1 (in stem 2 (in ry heating Mar 387.2727 ing system 247.6858 stem() 156.3565 ing system 0.0000 stem 2)	ystems, inci- ntary system %) %) Apr 173.4455 1) 247.6858 70.0264 2) 0.0000	May 41.3438 247.6858 16.6920 0.0000	Jun 0.0000 0.0000 0.0000	Jul 0.0000 0.0000 0.0000	Aug 0.0000 0.0000 0.0000	Sep 0.0000 0.0000 0.0000 0.0000	Oct 190.8551 247.6858 77.0553 0.0000	Nov 426.4398 247.6858 172.1697 0.0000	0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409	(201) (202) (206) (207) (208) (98) (210) (211) (212) (213)
9a. Energy re- Fraction of s Fraction of s Efficiency of Efficiency of Efficiency of Space heating Space heating Space heating Space heating	requirements per m2 quirements pace heat f; an requirement 673.0450 efficiency 247.6858 fuel (main 271.7334 efficiency 0.0000 fuel (main 0.0000 fuel (main 0.0000 fuel (secon 0.0000) requirement	Tafter sol	ar contribu 1 heating s ry/suppleme stem 1 (in stem 2 (in ry heating Mar 387.2727 ing system 247.6858 stem) 156.3565 ing system 0.0000 stem 2) 0.0000 0.0000	ystems, incl ntary system %) %) system, % Apr 173.4455 1) 247.6858 70.0264 2) 0.0000 0.0000	May 41.3438 247.6858 16.6920 0.0000 0.0000	Jun 0.0000 0.0000 0.0000 0.0000	Jul 0.0000 0.0000 0.0000 0.0000 0.0000	Aug 0.0000 0.0000 0.0000 0.0000 0.0000	Sep 0.0000 0.0000 0.0000 0.0000 0.0000	Oct 190.8551 247.6858 77.0553 0.0000 0.0000	Nov 426.4398 247.6858 172.1697 0.0000 0.0000	0.0000 0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409 0.0000 0.0000	(99) (201) (202) (206) (207) (208) (98) (210) (211) (212) (213) (215)
9a. Energy re Fraction of s Fraction of s Efficiency of Efficiency of Space heating Water heating	requirement per m2 quirements	Tafter sol	ar contribu l heating s ry/suppleme stem 1 (in stem 2 (in ry heating Mar 387.2727 ing system 247.6858 stem) 156.3565 ing system 0.0000 stem 2) 0.0000	ystems, inci- ntary system %) %) %) Apr 173.4455 170.0264 2) 0.0000 0.0000	May 41.3438 247.6858 16.6920 0.0000	Jun 0.0000 0.0000 0.0000 0.0000 0.0000	Jul 0.0000 0.0000 0.0000 0.0000	Aug 0.0000 0.0000 0.0000 0.0000	Sep 0.0000 0.0000 0.0000 0.0000	Oct 190.8551 247.6858 77.0553 0.0000	Nov 426.4398 247.6858 172.1697 0.0000 0.0000	0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409 0.0000 0.0000	(99) (201) (202) (206) (207) (208) (98) (210) (211) (212) (213) (215)
Space heating 9a. Energy re Fraction of s Fraction of s Fraction of s Efficiency of Efficiency of Space heating Efficiency of	quirements quirements quirements quirements pace heat fi main space main space secondary/s Jan requirement 673.0450 efficiency 247.6858 fuel (main 271.7334 efficiency 0.0000 fuel (main 0.0000 fuel (main 0.0000 requirement 246.3650 water heatet 188.7089 r heating, l	Tafter sol	ar contribu	ystems, inci- ntary system %) %) %) Apr 173.4455 1) 247.6858 70.0264 2) 0.0000 0.0000 0.0000	May 41.3438 247.6858 16.6920 0.0000 0.0000 203.5869 188.7089	Jun 0.0000 0.0000 0.0000 0.0000	Jul 0.0000 0.0000 0.0000 0.0000 0.0000 173.7989	Aug 0.0000 0.0000 0.0000 0.0000 0.0000	Sep 0.0000 0.0000 0.0000 0.0000 0.0000 187.2189	Oct 190.8551 247.6858 77.0553 0.0000 0.0000	Nov 426.4398 247.6858 172.1697 0.0000 0.0000 223.1619	0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409 0.0000 0.0000	(99) (201) (202) (206) (207) (208) (98) (210) (211) (212) (213) (215) (64) (216) (217)
Space heating 9a. Energy re Fraction of s Fraction of s Fraction of s Efficiency of Efficiency of Efficiency of Space heating Space heating Space heating Space heating Space heating Space heating Efficiency of (217)m Fuel for wate Space cooling (221)m	quirements quirements quirements pace heat f; pace heat f; main space main space secondary/s Jan requirement 673.0450 efficiency 247.6858 fuel (main 271.7334 efficiency 0.0000 fuel (main 0.0000 fuel (secon 0.0000 requirement 246.3650 water heat 188.7089 reating, 1 130.5530 fuel require 0.0000	Tafter sol Individua Indi	ar contribu l heating s ry/suppleme stem 1 (in stem 2 (in ry heating Mar 387.2727 ing system 247.6858 stem) 156.3565 ing system 0.0000 0.0000 231.8492 188.7089 122.8608 0.0000	ystems, inci	May 41.3438 247.6858 16.6920 0.0000 0.0000 203.5869 188.7089 107.8841 0.0000	Jun 0.0000 0.0000 0.0000 0.0000 0.0000 180.7208 188.7089 95.7670 0.0000	Jul 0.0000 0.0000 0.0000 0.0000 0.0000 173.7989 188.7089 92.0989 0.0000	Aug 0.0000 0.0000 0.0000 0.0000 0.0000 187.1869 188.7089 99.1935 0.0000	Sep 0.0000 0.0000 0.0000 0.0000 0.0000 187.2189 188.7089 99.2104 0.0000	Oct 190.8551 247.6858 77.0553 0.0000 0.0000 210.3436 188.7089 111.4646 0.0000	Nov 426.4398 247.6858 172.1697 0.0000 0.0000 223.1619 188.7089 118.2572 0.0000	0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409 0.0000 0.0000	(99) (201) (202) (206) (207) (208) (98) (210) (211) (212) (213) (215) (64) (216) (217) (219) (221)
Space heating 9a. Energy re Fraction of s Fraction of s Efficiency of Efficiency of Efficiency of Space heating Water heating Water heating Efficiency of (217)m Fuel for wate Space cooling (221)m Pumps and Fa Lighting	quirements quirements quirements quirements pace heat fi main space main space secondary/s Jan requirement 673.0450 efficiency 247.6858 fuel (main 0.0000 fuel (main 0.0000 fuel (secon 0.0000 requirement 246.3650 water heat 188.7089 r heating, 130.5530 fuel requirement 0.0000 0.0000 31.1079	Tafter solution to a feet a solution to a seconda crom main sy heating sy heating sy supplementa feb t 483.3998 (main heat 247.6858 heating sy 195.1666 (main heat 0.0000 heating sy 0.0000 to 217.9398 er 188.7089 kWh/month 115.4899 rement 0.0000 0.0000 24.9559	ar contribu 1 heating s	ystems, inci- ystems, inci- ntary system % % % T73.4455 10 247.6858 70.0264 20 0.0000 0.0000 209.1766 188.7089 110.8462 0.0000 0.0000 10.4625	May 41.3438 247.6858 16.6920 0.0000 0.0000 203.5869 188.7089 107.8841 0.0000 0.0000	Jun 0.0000 0.0000 0.0000 0.0000 0.0000 180.7208 188.7089 95.7670	Jul 0.0000 0.0000 0.0000 0.0000 0.0000 173.7989 188.7089 92.0989	Aug 0.0000 0.0000 0.0000 0.0000 0.0000 187.1869 188.7089 99.1935	Sep 0.0000 0.0000 0.0000 0.0000 0.0000 187.2189 188.7089 99.2104	Oct 190.8551 247.6858 77.0553 0.0000 0.0000 210.3436 188.7089	Nov 426.4398 247.6858 172.1697 0.0000 0.0000 223.1619 188.7089 118.2572	0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409 0.0000 0.0000	(99) (201) (202) (206) (207) (208) (98) (210) (211) (212) (213) (215) (64) (216) (217) (219) (221) (231)
Space heating 9a. Energy re	quirements quirement quire	Tafter solution to a feet a solution to the seconda cross and supplementa feb t 483.3998 (main heat 247.6858 heating sy 195.1666 (main heat 0.0000 heating sy 0.0000 the secondary) 0.0000 the secondary 0	ar contribu 1 heating s ry/suppleme stem 1 (in stem 2 (in ry heating Mar 387.2727 ing system 247.6858 stem) 156.3565 ing system 0.0000 0.0000 231.8492 188.7089 122.8608 0.0000 0.0000 22.4700 d.0000 22.4700 d.49.3127	ystems, inci- ntary system %) %) %) %) %) ystems, inci- ntary system % Apr 173.4455 1) 247.6858 70.0264 2) 0.0000 0.0000 209.1766 188.7089 110.8462 0.0000 16.4625 atch -58.7771	May 41.3438 247.6858 16.6920 0.0000 0.0000 203.5869 188.7089 107.8841 0.0000 12.7161 ity) -65.5787	Jun 0.0000 0.0000 0.0000 0.0000 0.0000 180.7208 188.7089 95.7670 0.0000 10.3892 -61.7595	Jul 0.0000 0.0000 0.0000 0.0000 173.7989 188.7089 92.0989 0.0000 0.0000	Aug 0.0000 0.0000 0.0000 0.0000 187.1869 188.7089 99.1935 0.0000 0.0000	Sep 0.0000 0.0000 0.0000 0.0000 0.0000 187.2189 188.7089 99.2104 0.0000 0.0000	Oct 190.8551 247.6858 77.0553 0.0000 0.0000 210.3436 188.7089 111.4646 0.0000	Nov 426.4398 247.6858 172.1697 0.0000 0.0000 223.1619 188.7089 118.2572 0.0000 0.0000	0.0000 0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409 0.0000 0.0000	(99) (201) (202) (206) (207) (208) (98) (210) (211) (212) (213) (215) (64) (216) (217) (219) (221) (231) (232)
Space heating 9a. Energy re Fraction of s Fraction of s Fraction of s Efficiency of Efficiency of Efficiency of Space heating Fraction of s Space heating Space heating Fraction of s Space heating Fraction of (217) m Fuel for wate Space cooling (221) m Fuel for wate Space cooling (233) m Electricity g (233a) m Electricity g (234a) m	requirement per m2 quirements	t after sol	ar contribu 1 heating s ry/suppleme stem 1 (in stem 2 (in ry heating Mar 387.2727 ing system 0.0000 0.0000 231.8492 188.7089 122.8608 0.0000 0.0000 dix M) (neg -49.3127 nes (Append	ystems, inci ntary system %) %) %) %ysystem, % Apr 173.4455 1) 247.6858 70.0264 2) 0.0000 0.0000 209.1766 188.7089 110.8462 0.0000 0.0000 10.64625 616.4625 ative quant: -58.7771 ix M) (negative of the company of the	May 41.3438 247.6858 16.6920 0.0000 0.0000 203.5869 188.7089 107.8841 0.0000 0.0000 12.7161 ity) -65.5787 ive quantive 0.0000	Jun 0.0000 0.0000 0.0000 0.0000 0.0000 180.7208 188.7089 95.7670 0.0000 0.0000 10.3892 -61.7595 by) 0.0000	Jul 0.0000 0.0000 0.0000 0.0000 0.0000 173.7989 188.7089 92.0989 0.0000 0.0000 11.6001 -60.8548 0.0000	Aug 0.0000 0.0000 0.0000 0.0000 0.0000 187.1869 188.7089 99.1935 0.0000 0.0000 15.0782	Sep 0.0000 0.0000 0.0000 0.0000 0.0000 187.2189 188.7089 99.2104 0.0000 0.0000 19.5851	Oct 190.8551 247.6858 77.0553 0.0000 0.0000 210.3436 188.7089 111.4646 0.0000 0.0000 25.6967	Nov 426.4398 247.6858 172.1697 0.0000 0.0000 223.1619 188.7089 118.2572 0.0000 0.0000 29.0244	3031.5275 32.9693 0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409 0.0000 0.0000 245.7912 188.7089 188.7089 130.2489 0.0000 0.0000 31.9725	(99) (201) (202) (206) (207) (208) (98) (210) (211) (212) (213) (215) (64) (216) (217) (219) (221) (231) (232) (233a)
Space heating 9a. Energy re Fraction of s Fraction of s Fraction of s Efficiency of Efficiency of Efficiency of Space heating Frace heating Space heating Space heating Space heating Space heating Efficiency of (21)m Fuel for wate Space cooling (221)m Pumps and Fa Lighting Electricity g (233a)m Electricity g Electricity g	quirements quirement quirem	t after sol	ar contribu 1 heating s	ystems, inci- ntary system %) %) %) %ystem, % Apr 173.4455 1) 247.6858 70.0264 2) 0.0000 0.0000 209.1766 188.7089 110.8462 0.0000 16.4625 ative quant: -58.7771 ix M) (negat 0.0000 tors (Appen: 0.0000 tors (Appen: 0.0000	May 41.3438 247.6858 16.6920 0.0000 0.0000 203.5869 188.7089 107.8841 0.0000 0.27161 ity) -65.5787 cive quantif 0.0000 ix M) (negg	Jun 0.0000 0.0000 0.0000 0.0000 0.0000 180.7208 188.7089 95.7670 0.0000 10.3892 -61.7595 ty) 0.0000 attive quant. 0.0000	Jul 0.0000 0.0000 0.0000 0.0000 173.7989 188.7089 92.0989 0.0000 11.6001 -60.8548 0.0000 ity) 0.0000 ye if net gr	Aug 0.0000 0.0000 0.0000 0.0000 0.0000 187.1869 188.7089 99.1935 0.0000 0.0000 15.0782 -55.9010 0.0000	Sep 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 187.2189 188.7089 99.2104 0.0000 0.0000 19.5851 -47.1454	Oct 190.8551 247.6858 77.0553 0.0000 0.0000 210.3436 188.7089 111.4646 0.0000 25.6967 -37.3828 0.0000 0.0000	Nov 426.4398 247.6858 172.1697 0.0000 0.0000 223.1619 188.7089 118.2572 0.0000 29.0244 -23.4887	3031.5275 32.9693 0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409 0.0000 0.0000 245.7912 188.7089 188.7089 130.2489 0.0000 0.0000 31.9725 -17.5738	(99) (201) (202) (206) (207) (208) (98) (210) (211) (212) (213) (215) (64) (217) (219) (221) (231) (232) (233a) (234a)
Space heating	requirement per m2 quirements quirements pace heat fi deficiency 247.6858 fuel (main 217.7334 efficiency 0.0000 fuel (secon 0.0000 requirement 246.3650 requirement 188.7089 1 heating, l 13.1079 enerated by -20.6886 enerated by 0.0000 enerated by 0.0000 enerated by 0.0000 sed or net e 0.0000 enerated by 0.0000	t after sol	ar contribu 1 heating s stem(s) stem(s) stem(s) stem 1 (in stem 2 (in ry heating Mar 387.2727 ing system 0.0000 co.0000 231.8492 188.7089 122.8608 0.0000 0.0000 22.4700 dix M) (neg -49.3127 nes (Append 0.0000 generated 1 0.0000 generated 3 0.00000 generated 3 0.0000 generated	ystems, inci ntary system %) %) %) %ystems, % Apr 173.4455 1) 247.6858 70.0264 2) 0.0000 0.0000 0.0000 209.1766 188.7089 110.8462 0.0000 16.4625 ative quant: -58.7771 ix M) (negat 0.0000 tors (Appencount) tors	May 41.3438 247.6858 16.6920 0.0000 0.0000 203.5869 188.7089 107.8841 0.0000 0.0000 ity) -65.5787 cive quanti 0.0000 ix M) (neg quanti 0.0000 (Appendix 0.0000)	Jun 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 180.7208 188.7089 95.7670 0.0000 0.0000 10.3892 -61.7595 ty) 0.0000 ative quant. 0.0000 N) (negation 0.0000 N) (negation 0.0000)	Jul 0.0000 0.0000 0.0000 0.0000 0.0000 173.7989 188.7089 92.0989 0.0000 0.0000 11.6001 -60.8548 0.0000 ity) 0.0000 ve if net go	Aug 0.0000 0.0000 0.0000 0.0000 0.0000 187.1869 188.7089 99.1935 0.0000 0.0000 15.0782 -55.9010 0.0000 0.0000 eneration) 0.0000	Sep 0.0000 0.0000 0.0000 0.0000 0.0000 187.2189 188.7089 99.2104 0.0000 0.0000 19.5851 -47.1454 0.0000 0.0000 0.0000	Oct 190.8551 247.6858 77.0553 0.0000 0.0000 210.3436 188.7089 111.4646 0.0000 25.6967 -37.3828 0.0000 0.0000	Nov 426.4398 247.6858 172.1697 0.0000 0.0000 223.1619 188.7089 118.2572 0.0000 29.0244 -23.4887 0.0000 0.0000 0.0000	3031.5275 32.9693 0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409 0.0000 0.0000 245.7912 188.7089 188.7089 130.2489 0.0000 0.0000 31.9725 -17.5738 0.0000 0.0000	(99) (201) (202) (206) (207) (208) (98) (210) (211) (212) (213) (215) (64) (216) (217) (219) (221) (231) (232) (233a) (234a) (235a) (235c)
Space heating	requirements quirements quirements quirements pace heat fi main space main space main space secondary/s Jan requirement 673.0450 efficiency 247.6858 fuel (main 0.0000 fuel (main 0.0000 fuel (secon 0.0000 fuel (secon 188.7089 requirement 246.3650 water heat 188.7089 requirement 246.3650 water heat 188.7089 colono 0.0000 guel requirement 0.0000 onerated by -20.6886 enerated by 0.0000 enerated by	t after sol	ar contribu l heating s l heating s ry/suppleme stem 1 (in stem 2 (in ry heating Mar 387.2727 ing system 247.6858 stem) 156.3565 ing system 0.0000 0.0000 231.8492 188.7089 122.8608 0.0000 022.4700 dix M) (neg -49.3127 nes (Append 0.0000 tric genera 0.0000 dix M) (neg -20.4190 mes (Append 0.0000 dix M) (neg -20.4190 nes (Append nes	ystems, inci- ntary system %) %) %) %ystem, % Apr 173.4455 1) 247.6858 70.0264 2) 0.0000 0.0000 0.0000 209.1766 188.7089 110.8462 0.0000 16.4625 ative quant: -58.7771 ix M) (negative quant: -38.9052 0.0000 ative quant: -33.8052 ix M) (negative quant:	May 41.3438 247.6858 16.6920 0.0000 0.0000 0.0000 203.5869 188.7089 107.8841 0.0000 0.27161 ity) -65.5787 cive quanti 0.0000 ity) -48.0148 cive quanti 0.0000 ity) -48.0148	Jun 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 180.7208 188.7089 95.7670 0.0000 0.03892 -61.7595 ty) 0.0000 ative quant 0.0000 N) (negati 0.0000 -49.5922	Jul 0.0000 0.0000 0.0000 0.0000 0.0000 173.7989 188.7089 92.0989 0.0000 0.0000 11.6001 -60.8548 0.0000 ity) 0.0000 ve if net gr 0.00000 -49.1648	Aug 0.0000 0.0000 0.0000 0.0000 0.0000 187.1869 188.7089 99.1935 0.0000 0.0000 15.0782 -55.9010 0.0000 0.0000 eneration) 0.0000	Sep 0.0000 0.0000 0.0000 0.0000 0.0000 187.2189 188.7089 99.2104 0.0000 0.0000 19.5851 -47.1454 0.0000 0.0000 0.0000 0.0000 -29.2122	Oct 190.8551 247.6858 77.0553 0.0000 0.0000 210.3436 188.7089 111.4646 0.0000 25.6967 -37.3828 0.0000 0.0000 0.0000 -15.2366	Nov 426.4398 247.6858 172.1697 0.0000 0.0000 223.1619 188.7089 118.2572 0.0000 29.0244 -23.4887 0.0000 0.0000 0.0000 -5.9628	3031.5275 32.9693 0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409 0.0000 0.0000 245.7912 188.7089 188.7089 130.2489 0.0000 0.0000 31.9725 -17.5738 0.0000 0.0000 -3.2602	(99) (201) (202) (206) (207) (208) (98) (210) (211) (212) (213) (215) (64) (216) (217) (219) (221) (2331) (233a) (234a) (235a) (235c) (233b)
Space heating	quirements quirements quirements quirements quirements quirements quirements quirements quirement quiremen	t after sol	ar contribu 1 heating s 1	ystems, inci	May 41.3438 247.6858 16.6920 0.0000 0.0000 0.0000 203.5869 188.7089 107.8841 0.0000 12.7161 ity) -65.5787 tive quanti 0.0000 ity) -48.0148 tive quanti 0.0000 ity) -48.0148	Jun 0.0000 0.0000 0.0000 0.0000 0.0000 180.7208 188.7089 95.7670 0.0000 0.0000 10.3892 -61.7595 ty) 0.0000 ative quant 0.0000 N) (negati: 0.0000 -49.5922 ty) 0.0000 ative quant	Jul 0.0000 0.0000 0.0000 0.0000 173.7989 188.7089 92.0989 0.0000 0.0000 11.6001 -60.8548 0.0000 ve if net gr 0.0000 -49.1648 0.0000	Aug 0.0000 0.0000 0.0000 0.0000 0.0000 187.1869 188.7089 99.1935 0.0000 0.0000 15.0782 -55.9010 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 0.0000 0.0000 0.0000 0.0000 0.0000	Sep 0.0000 0.0000 0.0000 0.0000 0.0000 187.2189 188.7089 99.2104 0.0000 0.0000 1.5851 -47.1454 0.0000 0.0000 0.0000 -29.2122 0.0000	Oct 190.8551 247.6858 77.0553 0.0000 0.0000 210.3436 188.7089 111.4646 0.0000 0.0000 25.6967 -37.3828 0.0000 0.0000 -15.2366 0.0000	Nov 426.4398 247.6858 172.1697 0.0000 0.0000 223.1619 188.7089 118.2572 0.0000 0.0000 29.0244 -23.4887 0.0000 0.0000 -5.9628 0.0000	3031.5275 32.9693 0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409 0.0000 0.0000 245.7912 188.7089 188.7089 130.2489 0.0000 0.0000 31.9725 -17.5738 0.0000 0.0000 0.0000 -3.2602 0.0000	(99) (201) (202) (206) (207) (208) (98) (210) (211) (212) (213) (215) (64) (216) (217) (219) (221) (231) (232) (233a) (234a) (235a) (235c) (233b) (234b)
Space heating	requirement per m2 quirements	t after sol	ar contribu l heating s l heating s ry/suppleme stem 1 (in stem 2 (in ry heating Mar 387.2727 ing system 247.6858 stem) 156.3565 ing system 0.0000 0.0000 231.8492 188.7089 122.8608 0.0000 02.4700 dix M) (neg -49.3127 nes (Append 0.0000 dix M) (neg -20.4190 nes (Append 0.0000 dix M) (neg -20.0000 dix M) (neg -20.00000 dix M) (neg -20.0000 dix M) (neg -20.0000 dix M) (neg -20.00000 dix M) (neg -20.00000 dix M) (neg -20.00000 dix M) (neg -20.00000	ystems, inci- ntary system %) %) %) %ystem, % Apr 173.4455 1) 247.6858 70.0264 2) 0.0000 0.0000 0.0000 209.1766 188.7089 110.8462 0.0000 16.4625 ative quant: -58.7771 ix M) (negat 0.0000 tors (Appens 0.0000 ative quant: -33.8052 ix M) (negat 0.0000 ative quant: -33.8052 ix M) (negat 0.0000 tors (Appens	May 41.3438 247.6858 16.6920 0.0000 0.0000 0.0000 203.5869 188.7089 107.8841 0.0000 12.7161 ity) -65.5787 cive quanti 0.0000 ity) -48.0148 cive quanti 0.0000 ity) -48.0148 ive quanti 0.0000 ity) 1.0000	Jun 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 180.7208 188.7089 95.7670 0.0000 10.3892 -61.7595 ty) 0.0000 ative quant. 0.0000 -49.5922 ty) 0.0000 ative quant. 0.0000 colour quant. 0.0000 10.0000 colour quant. 0.0000 colour quant. 0.0000 colour quant. 0.0000 colour quant. 0.0000	Jul 0.0000 0.0000 0.0000 0.0000 0.0000 173.7989 188.7089 92.0989 0.0000 0.0000 11.6001 -60.8548 0.0000 ity) 0.0000 ve if net gr 0.0000 -49.1648 0.0000 ity) 0.0000	Aug 0.0000 0.0000 0.0000 0.0000 0.0000 187.1869 188.7089 99.1935 0.0000 0.0000 15.0782 -55.9010 0.0000 0.0000 eneration) 0.0000 -40.7525 0.0000 0.0000	Sep 0.0000 0.0000 0.0000 0.0000 0.0000 187.2189 188.7089 99.2104 0.0000 0.0000 19.5851 -47.1454 0.0000 0.0000 0.0000 0.0000 -29.2122	Oct 190.8551 247.6858 77.0553 0.0000 0.0000 210.3436 188.7089 111.4646 0.0000 25.6967 -37.3828 0.0000 0.0000 0.0000 -15.2366	Nov 426.4398 247.6858 172.1697 0.0000 0.0000 223.1619 188.7089 118.2572 0.0000 29.0244 -23.4887 0.0000 0.0000 0.0000 -5.9628	3031.5275 32.9693 0.0000 1.0000 247.6858 0.0000 Dec 655.7256 247.6858 264.7409 0.0000 0.0000 245.7912 188.7089 188.7089 130.2489 0.0000 0.0000 31.9725 -17.5738 0.0000 0.0000 -3.2602	(201) (202) (206) (207) (208) (98) (210) (211) (212) (213) (215) (64) (216) (217) (221) (231) (232) (233a) (235a) (235a) (235b)

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Space heating fuel - main system 1 Space heating fuel - main system 2 Space heating fuel - secondary Efficiency of water heater Water heating fuel used Space cooling fuel Electricity for pumps and fans: Total electricity for the above, kWh/year Electricity for lighting (calculated in Appendix L) Energy saving/generation technologies (Appendices M ,N and Q) PV generation Wind generation Hydro-electric generation (Appendix N) Electricity generated - Micro CHP (Appendix N) Appendix Q - special features Energy saved or generated Energy used Total delivered energy for all uses				1223.9409 0.0000 0.0000 188.7089 1333.8746 0.0000 251.0584 -839.3408 0.0000 0.0000 0.0000 -0.0000 0.0000 1969.5330	(213) (215) (219) (221) (231) (232) (233) (234) (235a) (235a) (235) (236) (237)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies	Energy kWh/year 1223.9409 1333.8746 0.0000 251.0584	kg CO2/kWh 0.1563 0.1408 0.0000 0.1443	kg	Emissions CO2/year 191.2888 0.0000 187.8229 379.1117 0.0000 36.2355	(373) (264) (265) (267)
PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Dwelling Carbon Dioxide Emission Rate (DER)	-530.2265 -309.1143			-70.7348 -38.1022 -108.8370 306.5101 3.3300	(272)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies	Energy	1.5207 0.0000	:	ry energy kWh/year 1932.1217 0.0000 0228.3682 3960.4899 0.0000 385.0818	(473) (278) (279) (281)
PV Unit electricity used in dwelling PV Unit electricity exported Total Total Primary energy kWh/year Dwelling Primary energy Rate (DPER)	-530.2265 -309.1143			-791.6190 -139.8203 -931.4394 3414.1323 37.1300	(286)
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS					
1. Overall dwelling characteristics Ground floor First floor Second floor Total floor area TFA = (la)+(lb)+(lc)+(ld)+(le)(ln) Dwelling volume 91.9500	59.8100 27.2800		(2b) = (2c) = (2d) =	161.4870 66.0176	(1c) - (3c) (1d) - (3d) (4)
2. Ventilation rate			-2	}	
Number of open chimneys Number of open flues Number of chimneys / flues attached to closed fire Number of flues attached to solid fuel boiler Number of flues attached to other heater Number of blocked chimneys Number of intermittent extract fans Number of passive vents Number of flueless gas fires			0 * 80 = 0 * 20 = 0 * 10 =	0.0000 30.0000 0.0000	(6b) (6c) (6d) (6e) (6f) (7a) (7b)
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+$ Pressure test Pressure Test Method Measured/design AP50 Infiltration rate	(7b)+(7c) =	30.0000	Air changes) / (5) = Blo	per hour 0.1252 Yes ower Door 5.0000 0.3752	(17)

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Number of sides	sheltered												(19)
Shelter factor Infiltration rat	e adjusted	to includ	de shelter i	factor					(20) = 1 -	[0.075 x 1) = (18)		0.7750 0.2908	
Wind speed Wind factor	Jan 5.1000 1.2750	Feb 5.0000 1.2500	Mar 4.9000 1.2250	Apr 4.4000 1.1000	May 4.3000 1.0750	Jun 3.8000 0.9500	Jul 3.8000 0.9500	Aug 3.7000 0.9250	Sep 4.0000 1.0000	Oct 4.3000 1.0750	Nov 4.5000 1.1250	Dec 4.7000 1.1750	
Adj infilt rate Effective ac	0.3707 0.5687	0.3635 0.5661	0.3562 0.5634	0.3198 0.5511	0.3126 0.5489	0.2762 0.5382	0.2762 0.5382			0.3126 0.5489			
3. Heat losses a	nd heat lo	ss paramet	er										
Element				Gross m2	Openings m2	2	tArea m2	U-value W/m2K	A x W/	K	-value kJ/m2K	A x K kJ/K	
TER Opening Type Exposed Floor Cavity Wall Sloping Wall External Roof 1 Total net area o Fabric heat loss Party Wall 1	f external	elements	Aum(A, m2)	86.3300 13.0400 53.9800	14.9900	71 13 53 160	.9900 .2200 .3400 .0400 .9800 .5700 (26)(5	1.1450 0.1300 0.1800 0.1800 0.1100 30) + (32)		6 2 2 8 9			(27) (28b) (29a) (29a) (30) (31) (33) (32)
Thermal mass par		IP = Cm / T	TFA) in kJ/r	n2K								362.4428	(35)
E3 Sill E4 Jamb E20 Expo E7 Party P7 Party P3 Party E16 Corn E25 Stag E18 Part E21 Expo P4 Party P8 Party E14 Flat R8 Roof	nt sed floor floor bet Wall - Ex wall - In Intels (wall - Intel floor bet wall - Intel floor bet wall bet wall bet wall - Ro wall - Ro floor wall - Ex roof to wall (r	(normal) ween dwell posed floo termediate) y wall bet ween dwell (inverted) of (insule posed floo after)	or (normal) e floor betw tween dwell: lings	locks of fla ween dwellir ings iling level)	gs (in bloo	cks of flat	s)	8 8 23 3 31 4 14 16 26 5 1 14 4 24	.2500 .2000 .2000 .1200 .4640 .4500 .4500 .6400 .8000 .2000 .5960 .4700 .3200	si-value 0.0500 0.0500 0.0500 0.3200 0.1600 0.0900 0.0600 0.0600 0.1200 0.1200 0.1200 0.2400 0.0800 0.0600 0.0600 0.0600 0.0600 0.0600 0.0600 0.0600	Tot 0.41 0.41 1.18 0.99 2.20 0.74 0.00 1.49 1.60 0.31 0.48 1.73 1.10	00 00 35 84 27 27 00 80 20 00 88 80 30 76 89	
Thermal bridges Point Thermal br Total fabric hea	(Sum(L x P idges										(36a) = + (36a) =	14.9078 0.0000	
Ventilation heat	loss calc	ulated mor	nthly (38)m Mar	= 0.33 x (2	25)m x (5) Mav	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer co	44.9777 eff 99.1144	44.7666 98.9034	44.5598 98.6965	43.5882 97.7249	43.4064 97.5432	42.5602 96.6969	42.5602 96.6969	42.4035 96.5402	42.8861 97.0229	43.4064 97.5432	43.7742 97.9109	44.1586 98.2954	
Average = Sum(39)m / 12 =	Feb	Mar			Jun	Jul			Oct	Nov	97.7241	
HLP HLP (average)	1.0779	1.0756	1.0734	Apr 1.0628	May 1.0608	1.0516	1.0516	Aug 1.0499	Sep 1.0552	1.0608	1.0648	Dec 1.0690 1.0628	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
4. Water heating	energy re)									
Assumed occupanc Hot water usage	for mixer		04.0505	01 0710	50 5400	DE 5016	B0 BB00	TF 6000	77 7016	01 0501	04 0040	2.6515	
Hot water usage	88.2264 for baths 0.0000		84.9685 0.0000	0.0000	78.5438 0.0000	75.5016	73.7723	75.6898	77.7916 0.0000	0.0000	84.8342 0.0000	0.0000	
	for other 41.7838	uses 40.2644	38.7450	37.2256		34.1868	34.1868		37.2256	38.7450	40.2644	41.7838	(42c)
Average daily ho	t water us Jan	e (litres/ Feb	day) Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	119.3271 Dec	(43)
	use 30.0103	127.1650	123.7135	118.4975	114.2500	109.6883	107.9591	111.3959	115.0172	119.8031	125.0986	129.6722	
Energy conte 2 Energy content (Distribution los	annual)			162.2171	153.8025	134.8746	130.5672	137.9315	141.8277		178.2258 um(45)m =		
Water storage lo	30.8857	27.1622	28.5215	24.3326	23.0704	20.2312	19.5851	20.6897	21.2742	24.3858	26.7339	30.4553	(46)
Store volume a) If manufactu Temperature fa Enter (49) or (5 Total storage lo	ctor from 4) in (55)		actor is kno	own (kWh/da	чу):							150.0000 1.3938 0.5400 0.7527	(48) (49)
	23.3325	21.0745 ated solar	23.3325 storage	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
Primary loss Combi loss	23.3325 23.2624 0.0000	21.0745 21.0112 0.0000	23.3325 23.2624 0.0000	22.5798 22.5120 0.0000	23.3325 23.2624 0.0000	22.5798 22.5120 0.0000	23.3325 23.2624 0.0000	23.3325 23.2624 0.0000	22.5798 22.5120 0.0000	23.3325 23.2624 0.0000	22.5798 22.5120 0.0000	23.3325 23.2624 0.0000	(59)
WWHRS - PV diverter Solar input FGHRS	52.4994 40.3334	223.1669 -35.6712 -0.0000 0.0000	236.7379 -37.3529	ed for each 207.3089 -30.9296 -0.0000 0.0000	200.3974 -28.8253				186.9196 -25.5204 -0.0000 0.0000 0.0000	-30.0858		249.6303 -39.5865 -0.0000 0.0000 0.0000	(63a) (63b) (63c)
			199.3851	176.3793	171.5721	155.3004	154.0416		161.3992 er year (kWh			2156.0381	(64)
12Total per year Electric shower(0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	2156 0.0000	(64)
Heat gains from									wer(s) (kWh/			0.0000	

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	105.7392	93.8781	100.4985	90.0107	88.4152	80.9193	80.6895	83.1381	83.2312	91.3310	95.3336	104.7852	(65)
5. Internal ga													
Metabolic gair		, Watts							C	0-4	V	D	
(66)m Lighting gains	132.5741	132.5741	132.5741	132.5741					Sep 132.5741	Oct 132.5741	Nov 132.5741		(66)
Appliances gai	127.2048	140.8339	127.2048	131.4450	127.2048	131.4450	127.2048	127.2048	131.4450	127.2048	131.4450	127.2048	(67)
Cooking gains	242.6198 (calculated	245.1374 d in Append	238.7931 lix L, equat:	225.2867 ion L15 or 1	208.2373 L15a), also	192.2133 see Table 5	181.5083 5			198.8414		231.9148	
Pumps, fans	36.2574 3.0000	36.2574 3.0000	36.2574 3.0000	36.2574 3.0000	36.2574 3.0000	36.2574 0.0000	36.2574 0.0000	36.2574 0.0000	36.2574 0.0000	36.2574 3.0000	36.2574 3.0000	36.2574 3.0000	
Losses e.g. ev Water heating	-106.0593	-106.0593			-106.0593	-106.0593	-106.0593	-106.0593	-106.0593	-106.0593	-106.0593	-106.0593	(71)
Total internal	142.1225	139.6995	135.0786	125.0148	118.8377	112.3879	108.4536	111.7448	115.5989	122.7567	132.4077	140.8403	(72)
		591.4431	566.8487	547.5187	520.0521	498.8184	479.9390	480.7125	495.1511	514.5751	545.5157	565.7321	(73)
6. Solar gains	3												
[Jan]			A	rea m2	Solar flux Table 6a W/m2	Specif or 1	g fic data Table 6b	Specific or Tab	FF data le 6c	Acces facto Table 6	ss or id	Gains W	
Northeast													
Southeast Southwest			2.30 1.00	800 600 	36.7938 36.7938		0.6300 0.6300	0: 0:	.7000 .7000	0.770 0.770 0.770	10 10	26.7623 11.9194	(77) (79)
Solar gains Total gains													
7. Mean intern													
Temperature du Utilisation fa	actor for ga	ains for li	ving area, n	nil,m (see '	Table 9a)							21.0000	(85)
tau alpha	Jan 93.4011	Feb 93.6004	Mar 93.7966	Apr 94.7291	May 94.9056	Jun 95.7362	Jul 95.7362	Aug 95.8916	Sep 95.4146	Oct 94.9056	Nov 94.5492	Dec 94.1794	
util living ar	rea		0.9933	0.9640	0.8497	0.6314	0.4610		0.8101	0.9808	0.9978		
MIT		20.2569	20.4496	20.7252	20.9260	20.9926	20.9993		20.9607	20.7030			
Th 2 util rest of h			20.0226	20.0313	20.0330	20.0405	20.0405	20.0419		20.0330			
MIT 2 Living area fr	19.0132	0.9969 19.1743	0.9898 19.4208	0.9458 19.7662	0.7911 19.9801	0.5414 20.0375	0.3610 20.0404	0.4148 20.0416		0.9675 19.7470 Living area		18.9944	(90)
MIT Temperature ad	19.3451	19.4955	19.7260	20.0508	20.2607	20.3209	20.3249	20.3255		20.0307			(92)
adjusted MIT	19.3451	19.4955	19.7260	20.0508	20.2607	20.3209	20.3249	20.3255	20.2968	20.0307	19.6399	19.3262	(93)
8. Space heati	ing require	nent											
Utilisation	Jan 0.9985	Feb 0.9962	Mar 0.9884	Apr 0.9463	May 0.8062	Jun 0.5682	Jul 0.3907	Aug 0.4469	Sep 0.7485	Oct 0.9674	Nov 0.9958	Dec 0.9989	(94)
Useful gains Ext temp.	655.2518	735.5760	793.7790	850.8043		549.3161 14.6000				664.1153 10.6000		630.6473	(95)
	1491.1909	1443.5434	1305.3629	1089.7065	835.0394	553.1912	360.1867	378.9659	601.2294	919.8963	1227.7950	1486.8361	(97)
Space heating Space heating	621.9387		380.6185 er year (kW)		40.9112	0.0000	0.0000	0.0000	0.0000	190.3010	423.7455	637.0045 2942.2832	
Solar heating	0.0000 contribution	0.0000 on - total		0.0000 Wh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Space heating Space heating Space heating	621.9387 requirement	475.7541 after sol	380.6185 ar contribu	172.0096 tion - tota	40.9112 1 per year	0.0000 (kWh/year)	0.0000	0.0000	0.0000	190.3010 (98c)	423.7455 / (4) =	2942.2832	
9a. Energy req													
Fraction of sp	ace heat fi	rom seconda	ry/supplemen									0.0000	
Fraction of sp Efficiency of Efficiency of Efficiency of	main space main space	heating sy heating sy	stem 1 (in stem 2 (in	%)								1.0000 92.3000 0.0000 0.0000	(206) (207)
Space hostin-	Jan remuirement	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating Space heating	621.9387	475.7541	380.6185		40.9112	0.0000	0.0000	0.0000	0.0000	190.3010	423.7455	637.0045	(98)
Space heating	92.3000 fuel (main	92.3000 heating sy	92.3000 stem)	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating	673.8231 efficiency	515.4432 (main heat	412.3710 ing system 2	2)	44.3241	0.0000	0.0000	0.0000	0.0000	206.1766		690.1457	
Space heating		heating sy			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Space heating	fuel (secon	ndary)	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	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	0.0000	(213)

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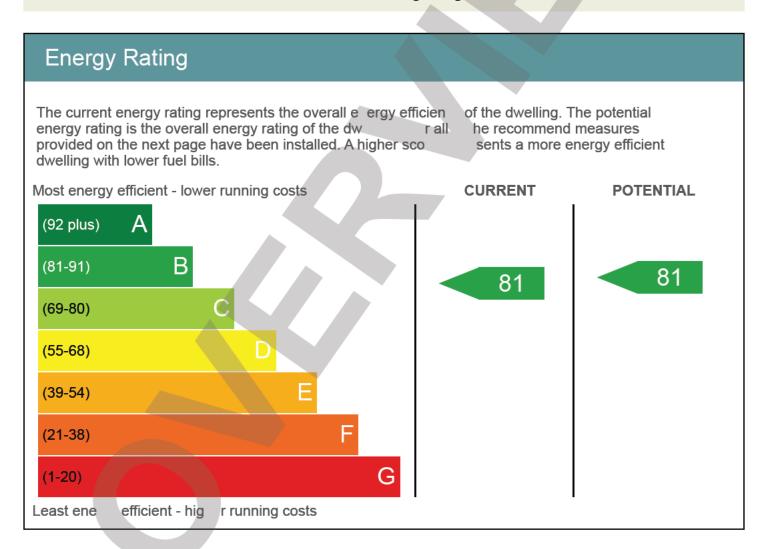
Water heating						
Water heating requirement 212.1659 187.4957 199.3851 176.3793 171.5721 155.3004 154.	0416 159.9401	161.3992	179.0808	189.2342		
Efficiency of water heater (217)m 86.3236 86.0563 85.4857 84.0035 81.3882 79.8000 79.	8000 79.8000	79.8000	84.1963	85.8123	79.8000 86.3841	
Fuel for water heating, kWh/month 245.7798 217.8756 233.2380 209.9665 210.8070 194.6121 193.	0346 200.4261	202.2546	212.6944	220.5211	243.1509	(219)
Space cooling fuel requirement (221)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	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 7.5 Lighting 26.4306 21.2036 19.0915 13.9873 10.8042 8.8271 9.5	3041 7.3041 8559 12.8111		7.3041 21.8331		7.3041 27.1652	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m -30.8211 -44.6104 -65.8046 -75.9780 -83.6196 -78.6382 -77.					-26.5114	
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	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0000 0.0000	0.0000	0.0000	0.0000	0.0000	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if		0.0000	0.0000	0.0000	0.0000	
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m -14.0566 -29.9011 -60.0562 -91.1267 -121.4089 -122.3440 -120.					-11.0925	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0000 0.0000	0.0000	0.0000	0.0000	0.0000	
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	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if 1 (235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	net generation)		0.0000	0.0000		
Annual totals kWh/year	0.0000	0.0000	0.0000	0.0000	0.0000	
Space heating fuel - main system 1 Space heating fuel - main system 2					3187.7391	(213)
Space heating fuel - secondary Efficiency of water heater					0.0000 79.8000	
Water heating fuel used Space cooling fuel					2584.3607 0.0000	
Electricity for pumps and fans:						
Total electricity for the above, kWh/year Electricity for lighting (calculated in Appendix L)					86.0000 213.3105	
Energy saving/generation technologies (Appendices M ,N and Q)						
PV generation Wind generation					-1514.9530 0.0000	
Hydro-electric generation (Appendix N) Electricity generated - Micro CHP (Appendix N)					0.0000	
Appendix Q - special features Energy saved or generated					-0.0000	(236)
Energy saved or generated Energy used					0.0000	(237)
Energy saved or generated						(237)
Energy saved or generated Energy used					0.0000	(237)
Energy saved or generated Energy used Total delivered energy for all uses					0.0000 4556.4572	(237)
Energy saved or generated Energy used Total delivered energy for all uses	Energy kWh/year		ion factor kg CO2/kWh		0.0000	(237)
Energy saved or generated Energy used Total delivered energy for all uses	 Energy		kg CO2/kWh 0.2100	k	0.0000 4556.4572 Emissions	(237) (238)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1	Energy kWh/year	1	0.2100	k	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158	(237) (238) (261) (373) (264)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot	Energy kWh/year 3187.7391	1	0.2100	k	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293	(237) (238) (261) (373) (264) (265) (267)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting	Energy kWh/year 3187.7391 2584.3607 86.0000	1	kg CO2/kWh 0.2100	k	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410	(237) (238) (261) (373) (264) (265) (267)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105	1	0.2100 0.2100 0.2100 0.1387 0.1443	k	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873	(237) (238) (261) (373) (264) (265) (267)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105	1	0.2100 0.2100 0.2100 0.1387 0.1443	k	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326	(261) (373) (264) (267) (268)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system l Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105	1	0.2100 0.2100 0.2100 0.1387 0.1443	k	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873	(261) (373) (264) (265) (267) (268) (269) (272)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105	1	0.2100 0.2100 0.2100 0.1387 0.1443	k	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326 1058.6249	(261) (373) (264) (265) (267) (268) (269) (272)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER)	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105	1	0.2100 0.2100 0.2100 0.1387 0.1443	k	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326 1058.6249	(261) (373) (264) (265) (267) (268) (269) (272)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105 -705.8886 -809.0645	1	CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1340 0.1256	k	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326 1058.6249 11.5100	(261) (373) (264) (265) (267) (268) (269) (272)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER)	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105 -705.8886 -809.0645	Primary enem	0.2100 0.2100 0.2100 0.1387 0.1443	k	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326 1058.6249	(261) (373) (264) (264) (267) (268) (269) (272) (273)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105 -705.8886 -809.0645 Energy kWh/year 3187.7391	Primary ene	CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1340 0.1256 crgy factor kg CO2/kWh 1.1300	k	Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.923 30.7873 -94.6205 -101.6121 -196.2326 1058.6249 11.5100 ary energy kWh/year 3602.1451 0.0000	(261) (373) (264) (265) (268) (269) (272) (273)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating (other fuel) Space and water heating	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105 -705.8886 -809.0645 Energy kWh/year 3187.7391 2584.3607	Primary ene:	cg CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1340 0.1256 cgg factor kg CO2/kWh 1.1300 1.1300	k Prim	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326 1058.6249 11.5100 ary energy kWh/year 3602.1451 0.0000 2920.3276 6522.4728	(261) (373) (264) (265) (267) (268) (272) (273) (273) (275) (473) (279)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel)	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105 -705.8886 -809.0645 Energy kWh/year 3187.7391	Primary ene:	CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1340 0.1256 crgy factor kg CO2/kWh 1.1300	k	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326 1058.6249 11.5100 ary energy kWh/year 3602.1451 0.0000 02920.3276	(261) (373) (261) (373) (264) (265) (267) (268) (272) (273) (273) (273)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105 -705.8886 -809.0645 Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105	Primary ener	cg CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1340 0.1256 cg CO2/kWh 1.1300 1.5128 1.5338	Prim	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326 1058.6249 11.5100 ary energy kWh/year 3602.1451 0.0000 2920.3276 6522.4728 130.10827	(261) (373) (261) (373) (264) (265) (267) (268) (272) (273) (273) (273)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105 -705.8886 -809.0645 Energy kWh/year 3187.7391 2584.3607 86.0000	Primary ene)	CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1340 0.1256 crgy factor kg CO2/kWh 1.1300 1.5128	Prim	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326 1058.6249 11.5100 ary energy kWh/year 3602.1451 0.0000 2920.3276 6522.4728 130.1008 327.1827	(261) (373) (261) (373) (264) (265) (267) (268) (272) (273) (273) (273) (278) (278) (278) (278) (281) (282)
Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP 13a. Carbon dioxide emissions - Individual heating systems including micro-CHP 15pace heating - main system 1 Total CO2 associated with community systems Water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling	Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105 -705.8886 -809.0645 Energy kWh/year 3187.7391 2584.3607 86.0000 213.3105 -705.8886	Primary ene)	rgy factor rgy factor 1.1300 1.1300 1.1300 1.1300 1.1300 1.1300 1.14954	Prim	0.0000 4556.4572 Emissions g CO2/year 669.4252 0.0000 542.7158 1212.1410 11.9293 30.7873 -94.6205 -101.6121 -196.2326 1058.6249 11.5100 ary energy kWh/year 3602.1451 0.0000 2920.3276 6522.4728 130.1008 327.1827	(261) (373) (264) (265) (267) (268) (272) (273) (273) (273) (273) (273) (279) (281) (282)

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Dwelling Address	Unit 1, Highland Square , Bristol
Report Date	05/03/2024
Property Type	Maisonette, Mid-Terrace
Floor Area [m ²]	92

This document is not an Energy Performance Certificat EPC) s required by the Energy Performance of Buildings Reg io



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Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good			
Feature	Description			gy Performance			
Walls	Average thermal transmi	ttance 0.18 W/m²K	5///	Very Good			
Roof	Average thermal transmi	ttance 0.11 W/m²K		Very Good			
Floor	Average thermal transmi	Very Good					
Windows	High performance glazin	High performance glazing					
Main heating	Air source heat pump, ra	diators, electric		Good			
Main heating controls	Time and temperature z	contro		Very Good			
Secondary heating	None						
Hot water	From main sys m	From main sys m					
Lighting	Good ligh g efficien			Good			
Air tightness	Air perme 50] =	4.5 h.m² (assumed)		Good			

Primary Energy use

The primary energy use for this property per year is 33 kilowatt hour (kWh) per square metre

Estim ted CO₂ missions of the dwelling

The estimated ing provides an indication of the dwelling's impact on the environment in terms of carbon dioxide emissions; the higher the rating the less impact it has on the environment.

The estimated CO emissions for this dwellings is: 0.3 per year

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With the recommended measures the potential CO emissions could be:

(

per year

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelli

To reach the dwelling's potential energy rating all of the recommended measures shown would d to be installed.

Having these measures installed individually or in any other order may give a different result omp d with the cumulative potential rating.

Recommended measure	Typical	Potential Rati	C ulative	Cumulative
	Yearly	after	avings	Potential
	Saving	measure insta	(per year)	Rating

Estimated energy use and potential aving

Estimated energy cost for this property over a year

£654

Over a year you could save

£0

The estimated cost and saving how how much the average hou ld would spend in this property heating, lighting and hot water. It not based on how e is used by the people living at the pr

Containg the ssessor and the accreditation scheme

As	sessor contact details
Assessor name	
Assessor's accreditation number	
Email Address	

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Accreditation scheme contact details							
Accreditation scheme	Elmhurst Energy Systems Ltd						
Telephone							
Email Address							

Assessment details							
Related party disclosure	No related pa						
Date of assessment	05/03/202						
Date of certificate	05/03/202						
Type of assessment	SAP w dwellin						



Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Tue 05 Mar 2024 08:41:59

Project Information							
Assessed By		Building Type	Maisonette, Semi-detached				
OCDEA Registration	EES/025661	Assessment Date	2024-03-05				

Dwelling Details			
Assessment Type	As designed	Total Floor Area	100 m ²
Site Reference	Unit 6 (HMO)	Plot Reference	Residual
Address	Unit 1 Highland Square, Bristo	l	

Client Details	
Name	Tebby & Son
Company	SF Tebby & Son
Address	Unit 11 Avon Gorge Industrial Estate , Bristol, BS2 9XX

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission	rate					
Fuel for main heating system	Electricity					
Target carbon dioxide emission rate	10.1 kgCO ₂ /m ²					
Dwelling carbon dioxide emission rate	3.97 kgCO ₂ /m ²	ОК				
1b Target primary energy rate and dwelling primary energy						
Target primary energy	52.7 kWh _{PE} /m ²					
Dwelling primary energy	41.55 kWh _{PE} /m ²	ОК				
1c Target fabric energy efficiency and dwelling	fabric energy efficiency					
Target fabric energy efficiency	33.7 kWh/m ²					
Dwelling fabric energy efficiency	32.4 kWh/m ²	ОК				

2a Fabric U-values	•			
Element	Maximum permitted average U-Value [W/m²K]	Dwelling average U-Value [W/m²K]	Element with highest individual U-Value	
External walls	0.26	0.18	Walls (1) (0.18)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	0.14	Exposed Floor (0.18)	OK
Roofs	0.16	0.11	Roof (1) (0.11)	OK
Windows, doors, and roof windows	1.6	1.31	W01 (1.31)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))								
Name	Net area [m ²]	U-Value [W/m ² K]						
Exposed wall: Walls (1)	55.27	0.18						
Exposed wall: Walls (2)	4.11	0.18						
Party wall: Party Wall (1)	133.64	0 (!)						
Ground floor: Heatloss Floor 1, Heatloss Floor 1	52.33	0.13						
Upper floor: Exposed Floor, Exposed Floor	9.59	0.18						
Exposed roof: Roof (1)	18.06	0.11						

2c Openings (better than typically expected values are flagged with a subsequent (!))								
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]				
W01, Windows	3.48	South West	0.7	1.31				
W02, Windows	3.48	North West	0.7	1.31				
W03, Windows	3.48	North West	0.7	1.31				
W04, Windows	3.48	South West	0.7	1.31				
W05, Windows	3.49	South West	0.7	1.31				
W06, Windows	1.26	South West	0.7	1.31				

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))
Building part 1 - Main Dwelling: Thermal bridging calculated from linear thermal transmittances for each junction

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference	
External wall	E2: Other lintels (including other steel lintels)	Not government-approved scheme	0.023 (!)		
External wall	E3: Sill	Calculated by person with suitable expertise			
External wall	E4: Jamb	Calculated by person with suitable expertise	0.016 (!)		
External wall	E24: Eaves (insulation at ceiling level - inverted)	SAP table default	0.15		
Party wall	P3: Intermediate floor between dwellings (in blocks of flats)	SAP table default	0 (!)		
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.043		
External wall	E25: Staggered party wall between dwellings	Calculated by person with suitable expertise	0.036 (!)		
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.046		
External wall	E14: Flat roof	SAP table default	0.16		
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.073		
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.093		
Party wall	P5: Roof (insulation at rafter level)	Calculated by person with suitable expertise	0.101		
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.047	Marmox Spec	
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.116		
External wall	E21: Exposed floor (inverted)	SAP table default	0.32		
External wall	E22: Basement floor	Calculated by person with suitable expertise	-0.08		
External wall	E19: Ground floor (inverted)	SAP table default	0.1		
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.001 (!)		
Party wall	P7: Exposed floor (normal)	Calculated by person with suitable expertise	0.185		
Party wall	P8: Exposed floor (inverted)	Calculated by person with suitable expertise	0.185		

3 Air permeability (better than typically expected values are flagged with a subsequent (!))						
Maximum permitted air permeability at 50Pa 8 m³/hm²						
Dwelling air permeability at 50Pa	4.5 m ³ /hm ² , Design value	OK				
Air permeability test certificate reference						

4 Space heating							
Main heating system 1: Heat pump with	Main heating system 1: Heat pump with radiators or underfloor heating - Electricity						
Efficiency	248.6%						
Emitter type	Radiators						
Flow temperature	55°C						
System type	Heat Pump						
Manufacturer	Atlantic						
Model	Logic Air 8kW						
Commissioning							
Secondary heating system: N/A							
Fuel	N/A						
Efficiency	N/A						
Commissioning							

5 Hot water			
Cylinder/store - type: Cylinder			
Capacity	150 litres		
Declared heat loss	2.09 kWh/day		
Primary pipework insulated	Yes		
Manufacturer			
Model			
Commissioning			
Waste water heat recovery system 1 -	type: N/A		
Efficiency			
Manufacturer			
Model			
6 Controls			
	ature zone control by	arrangement of plumbing and electrical s	ervices
Function	ataro zono controi by	arrangement of planteing and electrical e	01 11000
Ecodesign class			
Manufacturer			
Model			
Water heating - type: Cylinder thermosta	t and HW separately	timed	
Manufacturer	at and rive separately	umeu	
Model			
Model			
7 Lighting			
Minimum permitted light source efficacy	75 lm/W		
Lowest light source efficacy	80 lm/W		OK
External lights control	N/A		
O Machanical vandilation			
8 Mechanical ventilation			
System type: N/A	A / / A		
Maximum permitted specific fan power	N/A		N1/A
Specific fan power	N/A		N/A
Minimum permitted heat recovery	N/A		
efficiency	21/2		1
Heat recovery efficiency	N/A		N/A
Manufacturer/Model			
Commissioning			
9 Local generation			
N/A			
10 Heat networks			
N/A			
11 Supporting documentary evidence			
N/A			
12 Declarations			
a. Assessor Declaration			
		intents of this BREL Compliance Report	
		nformation submitted for this dwelling for	
		and that the supporting documentary	
evidence (SAP Conventions, Appendi	x 1 (documentary evi	dence) schedules the minimum	
documentary evidence required) has	been reviewed in the	course of preparing this BREL	
Compliance Report.			
Signed:		Assessor ID:	
Name:		Date:	
b. Client Declaration			
N/A			



Post Defense											- d D-4-			
Property Reference		6 (HMO)						_	D (ed on Date	00.	03/2024	
Assessment Reference		idual					Pro	р Туре	Ref	Tebby	and Son G	arage		
Property	Unit	1, Highla	nd Square	, Bristol										
SAP Rating				83 B		DER		3.9	7		TER	•	10.10	
Environmental				96 A		% DER	< TER					(60.69	
CO ₂ Emissions (t/year)				0.37		DFEE		32.3	38		TFEE	;	33.69	
Compliance Check				See BR	REL	% DFE	E < TFEI	E					3.91	
% DPER < TPER				21.16		DPER		41.	55		TPER		52.70	
Assessor Details											Assesso	r ID	J367-00	001
Client														
SUMMARY FOR INPU	T DATA FO	DR: Nev	v Build (A	As Desi	gned)									
Orientation			•	Northea										
Property Tenture				1	151									
Transaction Type				6										
Terrain Type				Urban										
1.0 Property Type					ette, Semi-De	tached								
Position of Flat					-floor flat									
Which Floor				1										
2.0 Number of Storeys				2										
3.0 Date Built				2024										
3.0 Property Age Band				L										
4.0 Sheltered Sides				3										
5.0 Sunlight/Shade				Average or unknown										
6.0 Thermal Mass Parame	ter			Precise	calculation									
Thermal Mass				N/A							kJ/m²K			
7.0 Electricity Tariff				Standar	rd									
Smart electricity meter fi	itted			No										
Smart gas meter fitted				No										
7.0 Measurements														
					Basemer Ground floo 1st Store 2nd Store 3rd Store 4th Store 5th Store 6th Store 7th Store	nt: vr: y: y: y: y: y: y:	1 Loss Pe 0.00 n 19.20 r 13.06 r 18.05 r 0.00 n 0.00 n 0.00 n	n m m m n n	er In	0.00 52.3 47.7 27.2 0.00 0.00 0.00	loor Area) m² 3 m² 8 m² 8 m² 0 m²	Avera	9e Store 0.00 r 2.50 r 2.70 r 2.42 r 0.00 r 0.00 r 0.00 r 0.00 r	n n n n n n
8.0 Living Area				17.50							m²			
9.0 External Walls Description	Туре	Constr	uction				Kappa (kJ/m²K)		Nett Area) (m²)	Shelter Res	Shelter	Openii	ngs Area	Calculation Type
	Cavity Wall	filled ca	wity, any outs	ide structure		0.18	150.00	73.94	55.27	0.00	None	18.6		r Gross Area
Basement Wall	Cavity Wall		wall : plasterb wity, any outs		os, dense block, e	0.18	150.00	4.11	4.11	0.00	None	0.00	Ente	r Gross Area
9.1 Party Walls														
Description Party Wall 1	Type Filled Ca Edge Se	avity with	Single pla		d on both side	es, dense	cellular t	olocks,	U-Value (W/m²K) 0.00		K) (m²)	Shelter Res 0.00		helter None
9.2 Internal Walls Description	2490 00		Construct	ion									арра	Area (m²
Internal Wall 1			Dense bloo	ck, dense	plaster								/m²K) 00.00	135.60

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10.0 External Roofs Description	Туре	Construc	tion			Kappa kJ/m²K)A		Nett Area		Shelte Factor		onOpening
External Roof 1	External Flat Roof	Plasterbo	ard, in	sulated flat roof	0.11	9.00	18.06	(m²) 18.06	None	0.00	Enter Gro	ss 0.00
10.1 Party Ceilings Description		Const	ructio	n							Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1		Precas	st cond	crete planks floor, screed,	carpeted						30.00	43.86
10.2 Internal Ceilings Description Internal Ceiling 1		Storey Lowest occu	ıpied	Construction Other								ea (m²) 38.19
11.0 Heat Loss Floors Description	Туре	Storey Index	ĸ	Construction			/alue	Sh	elter Code			pa Area(m
Heatloss Floor 1 Exposed Floor	Ground Floor - Soli Exposed Floor - Solid	d Lowest occu +1	pied	Suspended concrete floor, carp Other	peted	0	m²K) .13 .18		None None	'	Factor (kJ/n 0.00 75. 0.00 40.	00 52.33
11.2 Internal Floors Description Internal Floor 1		Storey Index	Cons	struction r							Kappa (kJ/m²K 40.00	Area (m²) 38.19
12.0 Opening Types												
Description Windows	Data Source Manufacturer	Type Window		Glazing Double Low-F Soft	0.05	Glazing Gap	Filli ı Typ Air Fi	e	G-value 0.63	Frame Type Wood	Frame Factor 0.70	U Value (W/m²K) 1.31
SOlid dooor	Manufacturer	Solid Doo	Г	Bodbic Low-L Cont	0.00		Air Fi		0.00	Wood	0.70	1.31
13.0 Openings Name W01 W02 W03 W04 W05 W06	Opening Ty Windows Windows Windows Windows Windows	ype		Location Cavity Wall Cavity Wall Cavity Wall Cavity Wall Cavity Wall Cavity Wall		Souti North North Souti Souti	ntation h West h West h West h West h West		Area (3.48 3.48 3.48 3.48 1.26	3 ° 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	Р	itch 0 0 0 0 0
7700	Willdows			Cavity Wall		Souti	i west		1.20	•		U
14.0 Conservatory				None								
15.0 Draught Proofing			Ĺ	100					%			
16.0 Draught Lobby				No								
17.0 Thermal Bridging				Calculate Bridges								
17.1 List of Bridges									•			
Bridge Type E2 Other lintels (includi E3 Sill E4 Jamb E24 Eaves (insulation a P3 Party wall - Intermed	at ceiling level - inv	verted)	Non Inder Inder Table	rce Type Gov Approved Schemes bendently assessed bendently assessed to EK1 - Default to K1 - Default	Length 9.19 9.19 25.20 7.26 40.59	Psi 0.02 0.02 0.02 0.15 0.00	Adjus 0.0 0.0 0.0 0.1 0.0	2 2 2 5	eference:			Imported No No No No No
(in blocks of flats) E16 Corner (normal) E25 Staggered party w E18 Party wall between E14 Flat roof E17 Corner (inverted –	dwellings		Inde Inde Table	pendently assessed pendently assessed pendently assessed e K1 - Default pendently assessed	11.40 6.40 13.90 6.90 7.70	0.04 0.04 0.05 0.16 -0.07	0.0 0.0 0.0 0.1 -0.0	4 5 6				No No No No No
external area) P1 Party wall - Ground P5 Party wall - Roof (in: E5 Ground floor (norma E20 Exposed floor (norma E21 Exposed floor (inve E22 Basement floor E19 Ground floor (inve E6 Intermediate floor w P7 Party Wall - Expose P8 Party Wall - Expose	sulation at rafter le al) mal) erted) ted) ithin a dwelling d floor (normal)	evel)	Inde Inde Inde Table Inde Inde Inde	pendently assessed pendently assessed pendently assessed pendently assessed e K1 - Default pendently assessed e K1 - Default pendently assessed pendently assessed pendently assessed pendently assessed	27.54 6.50 13.88 2.16 5.04 4.11 4.11 10.91 4.34 0.93	0.09 0.10 0.05 0.12 0.32 -0.08 0.10 0.00 0.18 0.18	0.0 0.1 0.0 0.1 0.3 -0.0 0.1 0.0 0.1	0 5 M 2 2 8 0 0 8	larmox Sp	ec		No No No No No No No No
Y-value				0.07					W/m²K			
18.0 Pressure Testing				Yes]			
Designed AP ₅₀				4.50] m³/(h.m²	2) ക 50	Pa	
Property Tested?				Yes]	, w 50	. ч	
Test Method				Blower Door]			
			L						J			

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Mechanical Ventilation Mechanical Ventilation System Present	No						
	140						
20.0 Fans, Open Fireplaces, Flues							
21.0 Fixed Cooling System	No						
22.0 Lighting					_		
No Fixed Lighting	No Name	Efficacy	Por	wer		pacity	Count
	Lighting 1	80.00		5	0	1200	5
24.0 Main Heating 1	Database						
Percentage of Heat	100.00				%		
Database Ref. No.	106764						
Fuel Type	Electricity						
SAP Code	0						
In Winter	248.59						
In Summer	188.24						
Model Name	Logic Air 8kW						
Manufacturer	Atlantic						
System Type	Heat Pump						
Controls SAP Code	2207						
Delayed Start Stat	No						
HETAS approved System	No						
Oil Pump Inside	No						
FI Case	0.00						
Flue Type	None or Unknown	1					
Fan Assisted Flue	No						
Is MHS Pumped	Pump in heated s	pace					
Heating Pump Age	2013 or later	•					
Heat Emitter	Radiators						
Flow Temperature	Enter value						
Flow Temperature Value	55.00						
Boiler Interlock	No						
25.0 Main Heating 2	None						
26.0 Heat Networks	None						
Heat Source Fuel Type Heating U	Jse Efficiency	Percentage Of Heat	P	leat El ower Ratio	lectrical	Fuel Factor	Efficiency type
Heat source 1 None Heat source 2 None							
Heat source 3 None							
Heat source 4 None Heat source 5 None							
28.0 Water Heating							
Water Heating	Main Heating 1						
SAP Code	901						
Flue Gas Heat Recovery System	No						
Waste Water Heat Recovery Instantaneous System 1	No						
Waste Water Heat Recovery Instantaneous System 2	No						
Waste Water Heat Recovery Storage System	No						
Solar Panel	No						
Solar Panel Water use <= 125 litres/person/day	No Yes						

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Cold Water Source From header tank **Bath Count** Supplementary Immersion No No Immersion Only Heating Hot Water 28.1 Showers **Shower Type** Description Flow Rate Rated Power Connected Connected To [l/min] [kW] Combi boiler or unvented hot water system Combi boiler or unvented hot water system Combi boiler or unvented hot water system 7.00 7.00 1 2 3 No No 7.00 28.3 Waste Water Heat Recovery System 29.0 Hot Water Cylinder Hot Water Cylinder Cylinder Stat Yes Yes Cylinder In Heated Space Independent Time Control Yes Insulation Type Measured Loss Cylinder Volume 150.00 Loss kWh/day Pipes insulation Fully insulated primary pipework In Airing Cupboard 31.0 Thermal Store None 34.0 Small-scale Hydro None **Electricity Generated** 0.00 0.00 Apportioned kWh/Year Connected to dwelling's electricity meter Yes **Electricity Generation Annual** Mar Apr May Jun Aug Oct Nov Dec Recommendations Lower cost measures None Further measures to achieve even higher standards

	Timinal Cont	Torrigal and the second	Ratings af	ter improvement
	Typical Cost	Typical savings per year	SAP rating	Environmental Impact
Solar water heating			0	0
_			0	0
			0	0

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Property Reference			Jnit 6 (HMO)							Issued on Da		05/03/2024	
Assessment Refer	rence		Residual					Prop Type R	lef Te	ebby and Son	Garage		
Property			Jnit 1, Highland	Square , Bristol									
SAP Rating					83 B		DER	3.9	97	TER		10.10	
Environmental					96 A		% DER < TER	₹				60.69	
CO ₂ Emissions (t/)	year)				0.37		DFEE	32	.38	TFEE		33.69	
Compliance Chec	k				See BREL		% DFEE < TF	EE				3.91	
% DPER < TPER					21.16		DPER	41	.55	TPER	1	52.70	
Assessor Details										Asse	ssor ID	U367-000)1
SAP 10 WORKSHEET	FOR New R	build /Ac	Designed)	(Version 10	2 February	7 2022)							
CALCULATION OF D						, 2022) 							
1. Overall dwell	ing charac	teristic	 3										
Ground floor First floor Total floor area Dwelling volume	TFA = (la	i)+(1b)+(lc)+(ld)+(le)(ln)	10	00.1100		47.7800		2.7000	(2b) = (2c) =	Volume (m3) 130.8250 129.0060 259.8310	(lb) - (3 (lc) - (3 (4)
2. Ventilation r	ate										I	n3 per hour	
Number of open of Number of open f Number of filmes Number of flues Number of blocke Number of interm Number of passiv Number of fluele	lues ys / flues attached t attached t d chimneys ittent ext e vents	o solid : o other ! ract fan:	fuel boiler neater	fire							0 * 35 = 0 * 20 = 4 * 10 =	0.0000 0.0000 0.0000 0.0000 40.0000 0.0000	(6b) (6c) (6d) (6e) (6f) (7a) (7b)
Infiltration due Pressure test Pressure Test Me Measured/design Infiltration rat Number of sides	thod AP50	ys, flue:	s and fans	= (6a)+(6b)	+(6c)+(6d)+((6e) + (6f) + ((6g)+(7a)+(7b)+(7c) =			/ (5) =	0.1539 Yes 310wer Door 4.5000 0.3789	(8)
Shelter factor Infiltration rat	e adjusted	l to incl	ude shelter	factor					(20) = 1 - (2)	[0.075 x 1) = (18)	(19)] = x (20) =	0.7750 0.2937	
Wind speed Wind factor Adj infilt rate			Mar 4.9000 1.2250			Jun 3.8000 0.9500	Jul 3.8000 0.9500		Sep 4.0000 1.0000	Oct 4.3000 1.0750			
	0.3744		0.3598 0.5647			0.2790 0.5389	0.2790 0.5389		0.2937 0.5431				
3. Heat losses a	nd heat lo	ss parame	eter										
Windows (Uw = 1. Heatloss Floor 1 Exposed Floor Cavity Wall Basement Wall External Roof 1 Total net area of Fabric heat loss Party Wall 1 Party Ceiling 1 Internal Wall 1 Internal Floor 1 Internal Ceiling	f external, W/K = Su	element: m (A x U	s Aum(A, m2)	Gross m2 73.9400 4.1100 18.0600	Openings m2 18.6700	18. 52. 9. 55. 4. 18. 158. 133. 43. 135. 38.	1100 0600 0300	W/m2K 1.2448 0.1300 0.1800 0.1800 0.1800 0.1100 (30) + (32) 0.0000	W/1/ 23.239 6.802: 1.726: 9.948: 0.739: 1.986: = 44.444: 0.000:	K 1 9 9 9 9 7 1 1 2 2 4 1 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5	0.0000 0.0000 9.0000 0.0000 0.0000 0.0000 0.0000	383.6000 8290.5000 616.5000 162.5400 9354.8000 1315.8000 13560.0000 1527.6000	(27) (28a) (28b) (29a) (29a) (30) (31) (33) (32) (32b) (32c) (32d) (32e)
Heat capacity Cm Thermal mass par List of Thermal K1 Eleme E2 Other	ameter (TM Bridges nt	IP = Cm /	TFA) in kJ/						(30) + (32) Length P: 9.1850) + (32a). si-value 0.0230	(32e) = Tot 0.21	406.1901	

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P3 Party E16 Corr E25 Stag E18 Part E14 Flat E17 Corr P1 Party P5 Party E5 Grour E20 Expc E21 Expc E22 Base E19 Grour E6 Inter P7 Party Prarty P8 Party Thermal bridges	E4 Jamb E24 Laves (insulation at ceiling level - inverted) E24 Eaves (insulation at ceiling level - inverted) F3 Party wall - Intermediate floor between dwellings (in blocks of flats) E16 Corner (normal) E25 Staggered party wall between dwellings E25 Staggered party wall between dwellings E18 Party wall between dwellings E18 Party wall between dwellings E19 Farty wall between dwellings E10 Corner (inverted - internal area greater than external area) E17 Corner (inverted - internal area greater than external area) E18 Farty wall - Ground floor E19 Farty wall - Roof (insulation at rafter level) E59 Ground floor (normal) E20 Exposed floor (normal) E21 Exposed floor (inverted) E22 Exposed floor (inverted) E23 Basement floor E40 Ground floor (inverted) E51 Ground floor (inverted) E62 Intermediate floor within a dwelling E70 Farty Wall - Exposed floor (normal) E61 Intermediate floor within a dwelling E70 Farty Wall - Exposed floor (normal) E70 Farty Wall - Exposed floor (normal) E71 Farty Wall - Exposed floor (normal) E72 Farty Wall - Exposed floor (normal) E73 Farty Wall - Exposed floor (normal) E74 Farty Wall - Exposed floor (normal) E75 Farty Wall - Exposed floor (normal) E77 Farty Wall - Exposed floor (normal) E78 Farty Wall - Exposed floor (normal) E79 Farty Wall - Exposed floor (normal) E70 Farty Wall - Exposed floor (normal) E71 Farty Wall - Exposed floor (normal) E72 Farty Wall - Exposed floor (normal) E73 Farty Wall - Exposed floor (normal)										0.19 0.40 1.08 0.00 0.49 0.23 0.63 1.10 -0.56 2.56 0.65 0.65 0.25 1.61 -0.32 0.41 0.01	32 90 00 02 04 94 40 21 12 22 65 24 06 28 88 10 09	(36)
									(33) + (36)		55.0438	(37)
Ventilation heat (38)m Heat transfer co	Jan 48.8832 eff	Feb 48.6498	Mar 48.4210	Apr 47.3464	May 47.1453	Jun 46.2093	Jul 46.2093	Aug 46.0360	Sep 46.5698	Oct 47.1453	Nov 47.5520	Dec 47.9773	
Average = Sum(39		103.6936	103.4648	102.3901	102.1891	101.2531	101.2531	101.0797	101.6136	102.1891	102.5958	103.0210 102.3892	(39)
HLP HLP (average) Days in mont	Jan 1.0381 31	Feb 1.0358 28	Mar 1.0335 31	Apr 1.0228	May 1.0208	Jun 1.0114 30	Jul 1.0114 31	Aug 1.0097 31	Sep 1.0150 30	Oct 1.0208 31	Nov 1.0248 30	Dec 1.0291 1.0228 31	(40)
4. Water heating													
Assumed occupance Hot water usage	for mixer	showers	04 5455	03 4054	70 7607	74 0205	71 0150	75 4500	77 2200	01 0154	04.0500	2.7405	
Hot water usage	87.8734 for baths 0.0000		0.0000	0.0000	78.7627 0.0000	74.9396 0.0000	71.9158	75.4508 0.0000	77.2288	0.0000	0.0000	87.7942 0.0000	
Hot water usage			39.5907	38.0382	36.4856	34.9330	34.9330	36.4856	38.0382	39.5907	41.1433	42.6959	
Average daily ho				0010002	0011000	0113000	0113000	0011000	0010002	03.0307	1111100	119.8269	
Daily hot water	Jan use	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte 1 Energy content (192.2206 (annual)	127.6714 168.9351	177.3881	119.5336 156.1408	115.2483 148.5091	109.8726 127.0641	106.8488 118.0711	111.9364 131.7512	115.2670 133.7039	120.6061 155.4132 Total = S	126.1021 170.4312 Sum(45)m =	130.4901 191.6343 1871.2626	(45)
	28.8331		26.6082	23.4211	22.2764	19.0596	17.7107	19.7627	20.0556	23.3120	25.5647	28.7451	(46)
Water storage lo Store volume a) If manufactu Temperature fa Enter (49) or (5	urer decla actor from 54) in (55	Table 2b	actor is kno	own (kWh/d	ay):							150.0000 2.0900 0.5400 1.1286	(48) (49)
Total storage lo	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(56)
_	34.9866 23.2624	31.6008 21.0112	34.9866 23.2624	33.8580 22.5120	34.9866 23.2624	33.8580 22.5120	34.9866 23.2624	34.9866 23.2624	33.8580 22.5120	34.9866 23.2624	33.8580 22.5120	34.9866 23.2624	
	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	221.5471 0.0000	235.6371 0.0000	212.5108 0.0000	206.7581 0.0000	183.4341	176.3201 0.0000	190.0002 0.0000	190.0739	213.6622 0.0000	226.8012 0.0000	249.8833 0.0000	
Solar input		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Output from w/h		0.0000	0.0000		0.0000	0.0000				0.0000			
12Total per year	r (kWh/yea		235.6371	212.5108	206.7581	183.4341	176.3201				226.8012 Sum(64)m =		(64)
Electric shower	0.0000	0.0000	0.0000			0.0000 sed by inst		0.0000			0.0000 m(64a)m =	0.0000	
Heat gains from 1	water hea 110.5126	ting, kWh/m 98.2605	nonth 105.5807								101.7644		
5. Internal gain	ns (see Ta	ble 5 and 5	āa)										
Metabolic gains	(Table 5)	Watte	Mar		May		Jul	Aug	Sep	Oct	Nov	Dec	
(66)m l	137.0271	137.0271	137.0271	137.0271	137.0271	137.0271	137.0271	137.0271	137.0271		137.0271		(66)
Appliances gains	31.4313 (calcula	145.5132 ted in Appe	131.4313 endix L, eq	135.8123 uation L13	131.4313 or L13a), a	135.8123 lso see Tab	131.4313 le 5					131.4313	(67)
Cooking gains (c	256.5055	259.1672	252.4597	238.1804	220.1552	203.2141	191.8964	189.2347	195.9421	210.2215	228.2467	245.1878	(68)
Pumps, fans	36.7027 0.0000	36.7027 0.0000	36.7027 0.0000	36.7027 0.0000	36.7027 0.0000			36.7027 0.0000	36.7027 0.0000	36.7027 0.0000		36.7027 0.0000	
	109.6217	-109.6217			-109.6217	-109.6217	-109.6217	-109.6217	-109.6217	-109.6217	-109.6217	-109.6217	(71)
	148.5384		141.9096	134.7400	129.0033	121.3122	115.4003	121.5141	124.3785	132.0888	141.3394	148.2763	(72)
Total internal o	gains 500.5832	615.0095	589.9087	572.8408	544.6979	524.4467	502.8361	506.2881	520.2411	537.8497	569.5065	589.0035	(73)
6. Solar gains													

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[Jan]				rea m2	Solar flux Table 6a W/m2	Speci or	g fic data Table 6b	Specific or Tab	FF data le 6c	Acce fact Table	or	Gains W	
Southwest Northwest			11.7 6.9	100			0.6300 0.6300	0	.7000 .7000	0.77 0.77		131.6751 23.9996	
Solar gains Total gains													
7. Mean inter			ing season)										
Temperature of						Thl (C)						21.0000	(85)
tau	Jan 108.6866	Feb 108.9313	Mar 109.1721	Apr 110.3180	May 110.5350	111.5568						Dec 109.6424	
alpha util living a	8.2458 area	8.2621 0.9974		8.3545 0.9388	8.3690 0.7837	8.4371 0.5594	8.4371 0.4033		8.4107 0.7157	8.3690 0.9659	8.3398 0.9976	8.3095 0.9996	(86)
Living Non living 24 / 16				20.8482	20.9727	20.9984	20.9999	20.9998	20.9896	20.8207	20.5120	20.2654	
Non living 24 / 16 24 / 9				19.9299 0 0	0	20.0733 0 0	20.0738 0 0	0	0	0	0	19.2069 0 0	
16 / 9 MIT	28 20.6358	0 20.4304	20.6175	0 20.8482	20.9727	0 20.9984	0 20.9999	0 20.9998	0 20.9896	0 20.8207	0 20.5120	10 20.3682	(87)
Th 2 util rest of		20.0536 0.9961		20.0644 0.9103	20.0661 0.7184	20.0738	20.0738	20.0753 0.3591	20.0708 0.6272	20.0661 0.9431		20.0592 0.9994	
MIT 2 Living area f	19.7240 fraction	19.4131	19.6505	19.9299		20.0733	20.0738	20.0752	20.0664	19.9072 Living are	19.5252 a / (4) =	19.3605 0.1748	(90) (91)
MIT Temperature a adjusted MIT	adjustment			20.0905	20.2106	20.2350	20.2357	20.2368	20.2278		19.6977	19.5366 0.0000 19.5366	
aajastea mii	15.0054	13.3310	15.0150	20.0303	20.2100	20.2550	20.2557	20.2300	20.2270	20.0003	15.0577	13.3300	(55)
8. Space heat	ting require	ment											
										0			
Utilisation Useful gains Ext temp.	755.5015		966.5951		May 0.7291 849.2738 11.7000	Jun 0.4936 569.8046 14.6000	Jul 0.3333 368.1029 16.6000		Sep 0.6427 616.8190 14.1000	Oct 0.9431 797.3193 10.6000	Nov 0.9952 753.7583 7.1000	Dec 0.9992 720.7087 4.2000	(95)
Heat loss rat	te W 1619.5341		1378.1075			570.5607	368.1261	387.8277	622.6641		1292.4684		
Space heating Space heating	642.8402		306.1652 per vear (kW		15.1913	0.0000	0.0000	0.0000	0.0000	126.5476	387.8712	639.3081 2652.5029	(98a)
Solar heating	g 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	
Solar heating Space heating	g kWh		306.1652	-	15.1913	0.0000	0.0000	0.0000	0.0000	126.5476	387.8712		
Space heating Space heating		t after sol	lar contribu	tion - tota	l per year	(kWh/year)				(98c) / (4) =	2652.5029 26.4959	
9a. Energy re	equirements	- Individua	al heating s	ystems, inc	luding micr	o-CHP							
Fraction of s Fraction of s Efficiency of Efficiency of Efficiency of	space heat f f main space f main space	rom main sy heating sy heating sy	ystem(s) ystem 1 (in ystem 2 (in	용) 용)	m (Table 11)						0.0000 1.0000 248.5876 0.0000 0.0000	(202) (206) (207)
Space heating	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating	642.8402	429.7618	306.1652 ting system		15.1913	0.0000	0.0000	0.0000	0.0000	126.5476	387.8712	639.3081	(98)
Space heating	248.5876 g fuel (main	248.5876 heating sy	248.5876 ystem)	248.5876	248.5876	0.0000	0.0000	0.0000	0.0000	248.5876	248.5876	248.5876	
Space heating				42.1652 2) 0.0000	6.1111 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Space heating			ystem 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Space heating	g fuel (seco 0.0000	ndary) 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	g requiremen												
Efficiency of	f water heat	221.5471 er 188.2367		212.5108 188.2367	206.7581 188.2367	183.4341 188.2367	176.3201 188.2367	190.0002 188.2367	190.0739 188.2367	213.6622 188.2367	226.8012 188.2367	249.8833 188.2367 188.2367	(216)
Fuel for wate	er heating,	kWh/month		112.8955		97.4486	93.6693	100.9368	100.2367	113.5072	120.4872	132.7495	
Space cooling (221)m	g fuel requi 0.0000	rement 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 Lighting Electricity	32.7159	0.0000 26.2459 PVs (Apper	23.6315	0.0000 17.3135 ative quant	0.0000 13.3734 ity)	0.0000 10.9262	0.0000 12.1997	0.0000 15.8576	0.0000 20.5975	0.0000 27.0250	0.0000 30.5246	0.0000 33.6251	
(233a)m Electricity	0.0000 generated by	0.0000 wind turb	0.0000 ines (Append	0.0000 lix M) (nega	0.0000 tive quanti		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
(234a)m Electricity ((235a)m	0.0000 generated by 0.0000	0.0000 hydro-elec 0.0000	ctric genera	0.0000 tors (Apper 0.0000	0.0000 dix M) (neg 0.0000	0.0000 ative quant 0.0000	0.0000 (ity) 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Electricity ((235c)m	used or net 0.0000	electricity 0.0000	y generated 0.0000	by micro-CH 0.0000	P (Appendix 0.0000				0.0000	0.0000	0.0000	0.0000	
Electricity (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 ((234b)m Electricity (0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 itv)	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
(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)

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Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if (235d)m 0.00000 0.000000	f net generation)	0.0000 0.000(188.236 1358.447 0.000 0.000 264.035 0.000 0.000 0.000	3 (211) 0 (213) 0 (215) 7 (219) 0 (221) 0 (221) 0 (231) 8 (232) 0 (234) 0 (235a) 0 (235a) 0 (235) 0 (236) 0 (237)
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Total CO2, kg/year EPC Dwelling Carbon Dioxide Emission Rate (DER)	Energy kWh/year 1067.0293 1358.4477 0.0000 264.0358	0.157; 0.1400 0.0000	h kg CO2/yea 3 167.895 0.000 8 191.299 359.195 0 0.000 3 38.108 397.304	r 9 (261) 0 (373) 7 (264) 6 (265) 0 (267) 5 (268)
Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Total Primary energy kWh/year Dwelling Primary energy Rate (DPER)	Energy	kg CO2/kWl 1.582 1.520 0.000	5 1688.559 0.000 7 2065.798 3754.357	r 0 (275) 0 (473) 0 (278) 0 (279) 0 (281) 0 (282) 9 (286)
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS 1. Overall dwelling characteristics Ground floor First floor Total floor area TFA = (la)+(lb)+(lc)+(ld)+(le)(ln) 100.1100 Dwelling volume	Area (m2) 52,3300 47.7800) (m3 0 (2b) = 130.825 0 (2c) = 129.006) 0 (lb) - (3b 0 (lc) - (3c (4)
Number of open chimneys Number of open flues Number of open flues Number of chimneys / flues attached to closed fire Number of flues attached to solid fuel boiler Number of flues attached to other heater Number of blocked chimneys Number of intermittent extract fans Number of passive vents Number of flueless gas fires			m3 per hou 0 * 80 = 0.000 0 * 20 = 0.000 0 * 10 = 0.000 0 * 20 = 0.000 0 * 35 = 0.000 0 * 20 = 0.000 4 * 10 = 40.000 0 * 10 = 0.000 0 * 40 = 0.000	0 (6a) 0 (6b) 0 (6c) 0 (6d) 0 (6e) 0 (6f) 0 (7a) 0 (7b)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(6g)+(6g)+(6g)+(6g)+(6g)+(6g)+(6g		(20) = 1 - [0.075	0.403 x (19)] = 0.775	9 (8) s r 0 (17) 9 (18) 3 (19)
	Jul Aug 3.8000 3.7000	Sep Oct 4.0000 4.3000		0 (22)

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Wind factor Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Effective ac	0.3991 0.5797	0.3913 0.5766	0.3835 0.5735	0.3444 0.5593	0.3365 0.5566	0.2974 0.5442	0.2974 0.5442	0.2896 0.5419	0.3131 0.5490	0.3365 0.5566	0.3522 0.5620	0.3678 0.5677	
LIICCUIVE do	0.3737	0.5700	0.5755	0.5555	0.5500	0.5442	0.5442	0.5415	0.5450	0.5500	0.3020	0.3077	(23)
3. Heat losses													
Element				Gross	Openings	Net	tArea	U-value	Ах	יז ד	-value	AxK	
TER Opening Typ	ne (IIw = 1	20)		m2	m2	2	m2 .6700	W/m2K 1.1450	W/F 21.3779	K	kJ/m2K	kJ/K	
Heatloss Floor Exposed Floor		201				52	.3300 .5900	0.1300 0.1300	6.8029 1.2467	9			(28a) (28b)
Cavity Wall Basement Wall				73.9400 4.1100	18.6700	55	.2700 .1100	0.1800 0.1800	9.9486	6			(29a) (29a)
External Roof 1		1 -1		18.0600		18	.0600	0.1100	1.9866				(30)
Total net area Fabric heat los							(26) (3	30) + (32) =					(31)
Party Wall 1						133	.6400	0.0000	0.0000	J			(32)
Thermal mass pa List of Thermal	Bridges	MP = Cm / 1	[FA] in kJ/m	n2K								410.5713	(35)
K1 Elem E2 Othe		(including	other steel	l lintels)					ngth Pa 1850	0.0500	Tot 0.45		
E3 Sill E4 Jamb									1850 2000	0.0500 0.0500	0.45 1.26		
E24 Eav P3 Part	ves (insula v wall - I	tion at cei ntermediate	iling level e floor betw	- inverted) ween dwellin	ngs (in bloo	ks of flat:	3)		2600 5870	0.2400	1.74		
	rner (norma		tween dwelli	inas				11.	4000	0.0900 0.0600	1.02		
E18 Par E14 Fla	rty wall be	tween dwell	lings	90				13.	9000	0.0600	0.83 0.55	40	
E17 Cor				reater than	external an	rea)		7.	7000	-0.0900 0.0800	-0.69 2.20	30	
P5 Part		oof (insula	ation at rai	fter level)				6.	5000	0.0800	0.52 2.22	00	
E20 Exp	oosed floor oosed floor	(normal)						2.	1600	0.3200	0.69	12	
E22 Bas	sement floo	r` ′)					4.		0.3200	1.61 0.28	77	
E6 Inte		loor withir	n a dwelling	J				10.	9100	0.0700 0.0000	0.28 0.00	00	
P8 Part	y Wall - E	xposed floo	or (normal) or (inverted						3400 9300	0.1600 0.2400	0.69 0.22	32	
Thermal bridges Point Thermal b	oridges	Psi) calcul	Lated using	Appendix K)							(36a) =	14.7649 0.0000	
Total fabric he									(33	3) + (36)	+ (36a) =	56.8674	(37)
Ventilation hea	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m Heat transfer c	49.7025 coeff	49.4373	49.1773	47.9562	47.7277	46.6642	46.6642	46.4672	47.0738	47.7277	48.1899	48.6731	(38)
Average = Sum(3			106.0447	104.8235	104.5951	103.5315	103.5315	103.3346	103.9412	104.5951	105.0573	105.5405 104.8224	(39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP HLP (average)	Jan 1.0645	Feb 1.0619	Mar 1.0593	Apr 1.0471	May 1.0448	Jun 1.0342	Jul 1.0342	Aug 1.0322	Sep 1.0383	Oct 1.0448	Nov 1.0494	Dec 1.0542 1.0471	(40)
		1.0619										1.0542	(40)
HLP (average)	1.0645	1.0619	1.0593	1.0471	1.0448	1.0342	1.0342	1.0322	1.0383	1.0448	1.0494	1.0542 1.0471	(40)
HLP (average)	1.0645	1.0619	1.0593	1.0471	1.0448	1.0342	1.0342	1.0322	1.0383	1.0448	1.0494	1.0542 1.0471	(40)
HLP (average)	1.0645 31 	1.0619 28 equirements	1.0593 31 31 3 (kWh/year)	1.0471 30	1.0448	1.0342	1.0342	1.0322	1.0383	1.0448	1.0494	1.0542 1.0471	(40)
HLP (average) Days in mont 4. Water heatin Assumed occupan	1.0645 31 ag energy r	1.0619 28 equirements	1.0593 31 31 3 (kWh/year)	1.0471 30	1.0448	1.0342	1.0342	1.0322	1.0383	1.0448	1.0494	1.0542 1.0471	
HLP (average) Days in mont 4. Water heatin Assumed occupan Hot water usage	1.0645 31 ag energy r acy e for mixer 90.1511	1.0619 28 equirements showers 88.7963	1.0593 31 31 3 (kWh/year)	1.0471 30	1.0448	1.0342	1.0342	1.0322	1.0383	1.0448	1.0494	1.0542 1.0471 31	(42)
HLP (average) Days in mont 4. Water heatin Assumed occupan Hot water usage	1.0645 31 ag energy r acy for mixer 90.1511 for baths 0.0000	1.0619 28 equirements showers 88.7963 0.0000	1.0593 31 3 (kWh/year)	1.0471 30	1.0448	1.0342	1.0342	1.0322 31	1.0383 30	1.0448	1.0494 30	1.0542 1.0471 31	(42) (42a)
HLP (average) Days in mont 4. Water heatin Assumed occupan Hot water usage Hot water usage	1.0645 31 ag energy r acy e for mixer 90.1511 0.0000 e for other 42.6959	1.0619 28 equirements showers 88.7963 0.0000 uses 41.1433	1.0593 31 3 (kWh/year) 86.8221 0.0000 39.5907	30	1.0448 31	1.0342 30 77.1486	1.0342 31 75.3817	1.0322	1.0383 30 79.4887	1.0448 31 82.8264	1.0494 30 86.6848	1.0542 1.0471 31 2.7405 89.8057 0.0000 42.6959	(42) (42a) (42b) (42c)
HLP (average) Days in mont 4. Water heatin Assumed occupan Hot water usage	1.0645 31 ag energy r ccy for mixer 90.1511 for baths 0.0000 for other 42.6959 not water u	1.0619 28	1.0593 31 3 (kWh/year) 86.8221 0.0000 39.5907 /day)	83.0448 0.0000 38.0382	80.2573 0.0000 36.4856	77.1486 0.0000 34.9330	75.3817 0.0000 34.9330	77.3410 0.0000 36.4856	1.0383 30 79.4887 0.0000 38.0382	82.8264 0.0000 39.5907	1.0494 30 86.6848 0.0000 41.1433	1.0542 1.0471 31 2.7405 89.8057 0.0000 42.6959 121.9307	(42) (42a) (42b) (42c)
HLP (average) Days in mont 4. Water heatin Assumed occupan Hot water usage Hot water usage Average daily h Daily hot water	1.0645 31 ag energy r ccy for mixer 90.1511 e for baths 0.0000 e for other 42.6959 not water u Jan use	1.0619 28 equirements showers 88.7963 0.0000 uses 41.1433 se (litres/	1.0593 31 3 (kWh/year) 86.8221 0.0000 39.5907 (day)	1.0471 30 83.0448 0.0000 38.0382 Apr	1.0448 31 80.2573 0.0000 36.4856	77.1486 0.0000 34.9330 Jun	75.3817 0.0000 34.9330 Jul	1.0322 31 77.3410 0.0000 36.4856	1.0383 30 79.4887 0.0000 38.0382 Sep	1.0448 31 82.8264 0.0000 39.5907 Oct	1.0494 30 86.6848 0.0000 41.1433	1.0542 1.0471 31 2.7405 89.8057 0.0000 42.6959 121.9307 Dec	(42) (42a) (42b) (42c) (43)
HLP (average) Days in mont 4. Water heatin Assumed occupan Hot water usage Hot water usage Average daily h Daily hot water Energy conte	1.0645 31 ag energy r coy e for mixer 90.1511 c 0.0000 e for other 42.6959 not water u Jan r use 132.8470 210.3972	1.0619 28 	1.0593 31 3 (kWh/year) 86.8221 0.0000 39.5907 /day)	83.0448 0.0000 38.0382	80.2573 0.0000 36.4856	77.1486 0.0000 34.9330	75.3817 0.0000 34.9330	77.3410 0.0000 36.4856	1.0383 30 79.4887 0.0000 38.0382 Sep 117.5268	1.0448 31 82.8264 0.0000 39.5907 Oct 122.4171 166.1189	1.0494 30 86.6848 0.0000 41.1433 Nov 127.8281 182.1146	1.0542 1.0471 31 2.7405 89.8057 0.0000 42.6959 121.9307 Dec 132.5016 207.4655	(42) (42a) (42b) (42c) (43)
HLP (average) Days in mont 4. Water heatin Assumed occupan Hot water usage Hot water usage Average daily h Daily hot water	ng energy r or y for mixer 90.1511 for other 42.6959 not water u Jan r use 132.8470 210.3972 (annual) 958 (46) m	1.0619 28 equirements 88.7963 0.0000 uses 41.1433 se (litres/ Feb 129.9396 185.0323 = 0.15 x (4	1.0593 31 3 (kWh/year) 86.8221 0.0000 39.5907 (day) Mar 126.4128 194.2918	1.0471 30 83.0448 0.0000 38.0382 Apr 121.0830 165.7565	1.0448 31 80.2573 0.0000 36.4856 May 116.7429 157.1583	1.0342 30 77.1486 0.0000 34.9330 Jun 112.0816 137.8175	75.3817 0.0000 34.9330 Jul 110.3147 133.4161	1.0322 31 31 77.3410 0.0000 36.4856 Aug 113.8265 140.9410	1.0383 30 79.4887 0.0000 38.0382 Sep 117.5268 144.9223	1.0448 31 82.8264 0.0000 39.5907 Oct 122.4171 166.1189 Total = St	1.0494 30 86.6848 0.0000 41.1433 Nov 127.8281 182.1146 um(45) m =	1.0542 1.0471 31 2.7405 89.8057 0.0000 42.6959 121.9307 Dec 132.5016 207.4655 2025.4320	(42) (42a) (42b) (42c) (43) (44) (45)
HLP (average) Days in mont 4. Water heatin Assumed occupan Hot water usage Hot water usage Average daily h Daily hot water Energy conte Energy content Distribution lo	1.0645 31 31 31 31 31 31 31 31 31 31 31 31 31	1.0619 28 equirements 88.7963 0.0000 uses 41.1433 se (litres/ Feb 129.9396 185.0323 = 0.15 x (4	1.0593 31 3 (kWh/year) 86.8221 0.0000 39.5907 (day) Mar 126.4128 194.2918	1.0471 30 83.0448 0.0000 38.0382 Apr 121.0830	1.0448 31 80.2573 0.0000 36.4856 May 116.7429	1.0342 30 77.1486 0.0000 34.9330 Jun 112.0816	1.0342 31 75.3817 0.0000 34.9330 Jul 110.3147	1.0322 31 	1.0383 30 79.4887 0.0000 38.0382 Sep 117.5268	1.0448 31 82.8264 0.0000 39.5907 Oct 122.4171 166.1189	1.0494 30 86.6848 0.0000 41.1433 Nov 127.8281 182.1146	1.0542 1.0471 31 2.7405 89.8057 0.0000 42.6959 121.9307 Dec 132.5016 207.4655 2025.4320 31.1198	(42) (42a) (42b) (42c) (43) (44) (45)
HLP (average) Days in mont 4. Water heatin Assumed occupan Hot water usage Hot water usage Average daily h Daily hot water Energy conte Energy content Distribution lo Water storage l Store volume a) If manufact	1.0645 31 ag energy r cy for mixer 90.1511 for baths 0.0000 for other 42.6959 for water u Jan 132.8470 210.3972 (annual) loss (46) m 31.5596 loss:	1.0619 28	1.0593 31 3 (kWh/year) 86.8221 0.0000 39.5907 (day) Mar 126.4128 194.2918	1.0471 30 83.0448 0.0000 38.0382 Apr 121.0830 165.7565 24.8635	1.0448 31 80.2573 0.0000 36.4856 May 116.7429 157.1583 23.5737	1.0342 30 77.1486 0.0000 34.9330 Jun 112.0816 137.8175	75.3817 0.0000 34.9330 Jul 110.3147 133.4161	1.0322 31 31 77.3410 0.0000 36.4856 Aug 113.8265 140.9410	1.0383 30 79.4887 0.0000 38.0382 Sep 117.5268 144.9223	1.0448 31 82.8264 0.0000 39.5907 Oct 122.4171 166.1189 Total = St	1.0494 30 86.6848 0.0000 41.1433 Nov 127.8281 182.1146 um(45) m =	1.0542 1.0471 31 2.7405 89.8057 0.0000 42.6959 121.9307 Dec 132.5016 207.4655 2025.4320 31.1198 150.0000 1.3938	(42) (42a) (42b) (42c) (43) (44) (45) (46) (47) (48)
HLP (average) Days in mont 4. Water heatin Assumed occupan Hot water usage Hot water usage Average daily h Daily hot water Energy conte Energy content Distribution lo Water storage 1 Store volume a) If manufact Temperature f Enter (49) or (1.0645 31 genergy r ncy for mixer 90.1511 for baths 0.0000 for other 42.6959 not water u Jan 132.8470 210.3972 (annual) SS (46)m 31.5596 loss: curer decla actor from	1.0619 28	1.0593 31 3 (kWh/year) 86.8221 0.0000 39.5907 (day) Mar 126.4128 194.2918	1.0471 30 83.0448 0.0000 38.0382 Apr 121.0830 165.7565 24.8635	1.0448 31 80.2573 0.0000 36.4856 May 116.7429 157.1583 23.5737	1.0342 30 77.1486 0.0000 34.9330 Jun 112.0816 137.8175	75.3817 0.0000 34.9330 Jul 110.3147 133.4161	1.0322 31 31 77.3410 0.0000 36.4856 Aug 113.8265 140.9410	1.0383 30 79.4887 0.0000 38.0382 Sep 117.5268 144.9223	1.0448 31 82.8264 0.0000 39.5907 Oct 122.4171 166.1189 Total = St	1.0494 30 86.6848 0.0000 41.1433 Nov 127.8281 182.1146 um(45) m =	1.0542 1.0471 31 2.7405 89.8057 0.0000 42.6959 121.9307 Dec 132.5016 207.4655 2025.4320 31.1198 150.0000	(42) (42a) (42b) (42c) (43) (44) (45) (46) (47) (48) (49)
HLP (average) Days in mont 4. Water heatin Assumed occupan Hot water usage Hot water usage Average daily h Daily hot water Energy contee Energy contee Energy contee Temperature for volume a) If manufact Temperature for Enter (49) or (Total storage 1	ng energy r ory for mixer 90.1511 for baths 0.0000 for other 42.6959 tot water u Jan r use 132.8470 210.3972 (annual) 305.596 toss: curer decla factor from (54) in (55) toss 23.3325	1.0619 28	1.0593 31 31 86.8221 0.0000 39.5907 (day) Mar 126.4128 194.2918 45)m 29.1438	1.0471 30 83.0448 0.0000 38.0382 Apr 121.0830 165.7565 24.8635	1.0448 31 80.2573 0.0000 36.4856 May 116.7429 157.1583 23.5737	1.0342 30 77.1486 0.0000 34.9330 Jun 112.0816 137.8175	75.3817 0.0000 34.9330 Jul 110.3147 133.4161	1.0322 31 31 77.3410 0.0000 36.4856 Aug 113.8265 140.9410	1.0383 30 79.4887 0.0000 38.0382 Sep 117.5268 144.9223	1.0448 31 82.8264 0.0000 39.5907 Oct 122.4171 166.1189 Total = St	1.0494 30 86.6848 0.0000 41.1433 Nov 127.8281 182.1146 um(45) m =	1.0542 1.0471 31 2.7405 89.8057 0.0000 42.6959 121.9307 Dec 132.5016 207.4655 2025.4320 31.1198 150.0000 1.3938 0.5400	(42) (42a) (42b) (42c) (43) (44) (45) (46) (47) (48) (49) (55)
HLP (average) Days in mont 4. Water heatin Assumed occupan Hot water usage Hot water usage Hot water usage Energy conte Energy content Distribution lo Water storage l Store volume a) If manufact Temperature f Enter (49) or (Total storage l If cylinder con	ng energy r cry for mixer 90.1511 for baths 0.0000 for other 42.6959 to water u Jan r use 132.8470 210.3972 (annual) bas (46)m 31.5596 loss 23.3325 tains dedi 23.3325 tains dedi 23.3325	1.0619 28	1.0593 31 31 3 (kWh/year) 86.8221 0.0000 39.5907 /day) Mar 126.4128 194.2918 45)m 29.1438 actor is known	1.0471 30 83.0448 0.0000 38.0382 Apr 121.0830 165.7565 24.8635 own (kWh/da	1.0448 31 80.2573 0.0000 36.4856 May 116.7429 157.1583 23.5737 ay):	1.0342 30 77.1486 0.0000 34.9330 Jun 112.0816 137.8175 20.6726	1.0342 31 75.3817 0.0000 34.9330 Jul 110.3147 133.4161 20.0124	1.0322 31 77.3410 0.0000 36.4856 Aug 113.8265 140.9410 21.1412	1.0383 30 79.4887 0.0000 38.0382 Sep 117.5268 144.9223 21.7383	1.0448 31 82.8264 0.0000 39.5907 Oct 122.4171 166.1189 Total = St 24.9178	1.0494 30 86.6848 0.0000 41.1433 Nov 127.8281 182.1146 cum(45) m = 27.3172	1.0542 1.0471 31 2.7405 89.8057 0.0000 42.6959 121.9307 Dec 132.5016 207.4655 2025.4320 31.1198 150.0000 1.3938 0.5400 0.7527 23.3325 23.3325	(42) (42a) (42b) (42c) (43) (44) (45) (46) (47) (48) (49) (55) (56) (57)
HLP (average) Days in mont 4. Water heatin Assumed occupan Hot water usage Hot water usage Hot water usage Energy conte Energy conte Energy content Distribution lo Water storage 1 Store volume a) If manufact Temperature f Enter (49) or (Total storage 1 If cylinder con Primary loss Combi loss	1.0645 31 31 31 31 31 31 31 32 40 40 40 40 40 40 40 40 40 4	1.0619 28	1.0593 31 31 3 (kWh/year) 86.8221 0.0000 Mar 126.4128 194.2918 45)m 29.1438 actor is kmo 23.3325 r storage 23.3325 23.325 23.2624 0.0000	1.0471 30 83.0448 0.0000 38.0382 Apr 121.0830 165.7565 24.8635 own (kWh/da 22.5798 22.5798 22.5798 22.5120 0.0000	1.0448 31 80.2573 0.0000 36.4856 May 116.7429 157.1583 23.5737 ay): 23.3325 23.3325 23.3252 40.0000	77.1486 0.0000 34.9330 Jun 112.0816 137.8175 20.6726	75.3817 0.0000 34.9330 Jul 110.3147 133.4161 20.0124	1.0322 31 77.3410 0.0000 36.4856 Aug 113.8265 140.9410 21.1412	1.0383 30 79.4887 0.0000 38.0382 Sep 117.5268 144.9223 21.7383	1.0448 31 82.8264 0.0000 39.5907 Oct 122.4171 166.1189 Total = Si 24.9178	1.0494 30 86.6848 0.0000 41.1433 Nov 127.8281 182.1146 um(45)m = 27.3172	1.0542 1.0471 31 2.7405 89.8057 0.0000 42.6959 121.9307 Dec 132.5016 207.4655 2025.4320 31.1198 150.0000 1.3938 0.5400 0.7527 23.3325	(42) (42a) (42b) (42c) (43) (44) (45) (46) (47) (48) (49) (55) (56) (57) (59)
HLP (average) Days in mont 4. Water heatin Assumed occupan Hot water usage Hot water usage Hot water usage Average daily h Daily hot water Energy contetenergy contetenergy contetenergy content of the storage of the	1.0645 31 31 31 31 31 31 31 31 31 3	1.0619 28	1.0593 31 31 36 (kWh/year) 86.8221 0.0000 39.5907 /day) Mar 126.4128 194.2918 45)m 29.1438 actor is known actor	1.0471 30 83.0448 0.0000 38.0382 Apr 121.0830 165.7565 24.8635 own (kWh/da 22.5798 22.5798 22.5798 22.5120 0.0000	1.0448 31 80.2573 0.0000 36.4856 May 116.7429 157.1583 23.5737 ay): 23.3325 23.3325 23.2624 0.0000 month	1.0342 30 77.1486 0.0000 34.9330 Jun 112.0816 137.8175 20.6726 22.5798 22.5798 22.5798 22.5798 22.5120 0.0000	75.3817 0.0000 34.9330 Jul 110.3147 133.4161 20.0124 23.3325 23.3325 23.3325 23.2624	1.0322 31 77.3410 0.0000 36.4856 Aug 113.8265 140.9410 21.1412	1.0383 30 79.4887 0.0000 38.0382 Sep 117.5268 144.9223 21.7383 22.5798 22.5798 22.5798 22.5120 0.0000	1.0448 31 82.8264 0.0000 39.5907 Oct 122.4171 166.1189 Total = St 24.9178	1.0494 30 86.6848 0.0000 41.1433 Nov 127.8281 182.1146 um(45) m = 27.3172 22.5798 22.5798 22.5798 22.5798	1.0542 1.0471 31 2.7405 89.8057 0.0000 42.6959 121.9307 Dec 132.5016 207.4655 2025.4320 31.1198 150.0000 0.7527 23.3325 23.3325 23.2624	(42) (42a) (42b) (42c) (43) (44) (45) (46) (47) (48) (49) (55) (56) (57) (59) (61)
HLP (average) Days in mont 4. Water heatin Assumed occupan Hot water usage Hot water usage Average daily h Daily hot water Energy conte Energy content Distribution lo Water storage l Store volume a) If manufact Temperature f Enter (49) or (Total storage l If cylinder con Primary loss Combi loss Total heat requ	1.0645 31 31 31 31 31 32 42.6959 10t water u Jan r use 132.8470 210.3972 (annual) bas (46)m : 31.5596 coss 23.3325 23.325 23.325 23.325 23.325 23.2624 0.0000 ired for w 256.9921 -41.2133	1.0619 28	1.0593 31 31 3 (kWh/year) 86.8221 0.0000 39.5907 day) Mar 126.4128 194.2918 45)m 29.1438 actor is kmd 23.3325 c storage 23.3325 c storage 23.3325 c storage 23.3252 0.0000 ageniculate 240.8867	1.0471 30 83.0448 0.0000 38.0382 Apr 121.0830 165.7565 24.8635 own (kWh/da	1.0448 31 80.2573 0.0000 36.4856 May 116.7429 157.1583 23.5737 ay): 23.3325 23.3325 23.2624 0.0000 month	1.0342 30 77.1486 0.0000 34.9330 Jun 112.0816 137.8175 20.6726 22.5798 22.5798 22.5798 22.5798 22.5120 0.0000	1.0342 31 75.3817 0.0000 34.9330 Jul 110.3147 133.4161 20.0124 23.3325 23.3325 23.3325 23.2624 0.0000	1.0322 31 31 77.3410 0.0000 36.4856 Aug 113.8265 140.9410 21.1412 23.3325 23.3325 23.3325 23.2624 0.0000	1.0383 30 79.4887 0.0000 38.0382 Sep 117.5268 144.9223 21.7383 22.5798 22.5798 22.5798 22.5798 22.5120 0.0000	1.0448 31 82.8264 0.0000 39.5907 Oct 122.4171 166.1189 Total = St 24.9178 23.3325 23.3325 23.3325 23.2624 0.0000	1.0494 30 86.6848 0.0000 41.1433 Nov 127.8281 182.1146 lum(45) m = 27.3172 22.5798 22.5798 22.5798 22.5798 22.5798	1.0542 1.0471 31 2.7405 89.8057 0.0000 42.6959 121.9307 Dec 132.5016 207.4655 2025.4320 31.1198 150.0000 0.7527 23.3325 23.3325 23.3325 23.3252 0.0000	(42) (42a) (42b) (42c) (43) (44) (45) (46) (47) (48) (49) (55) (56) (57) (59) (61) (62) (63a)
HLP (average) Days in mont 4. Water heatin Assumed occupan Hot water usage Hot water usage Hot water usage Energy conte Energy content Distribution lo Water storage 1 Store volume a) If manufact Temperature f Enter (49) or (Total storage 1 If cylinder con Primary loss Combi loss Total heat requi	1.0645 31 31 31 31 31 32 42.6959 10t water u Jan r use 132.8470 210.3972 (annual) bas (46)m : 31.5596 coss 23.3325 23.325 23.325 23.325 23.325 23.2624 0.0000 ired for w 256.9921 -41.2133	1.0619 28	1.0593 31 31 36 (kWh/year) 86.8221 0.0000 39.5907 /day) Mar 126.4128 194.2918 45)m 29.1438 actor is kmc 23.3325 r storage 23.3325 r storage 23.3252 0.0000 ng calculate 240.8867 -38.1677 -0.0000 0.00000	1.0471 30 83.0448 0.0000 38.0382 Apr 121.0830 165.7565 24.8635 own (kWh/da 22.5798 22.5798 22.5798 22.5798 22.5798 22.5798 22.5798 22.5798 23.6044 -0.0000 210.8484 -31.6044 -0.0000 0.00000	1.0448 31 80.2573 0.0000 36.4856 May 116.7429 157.1583 23.5737 ay): 23.3325 23.2624 0.0000 month 203.7532 -29.4541 -0.0000 0.0000	1.0342 30 77.1486 0.0000 34.9330 Jun 112.0816 137.8175 20.6726 22.5798 22.5798 22.5798 22.5798 22.5798 22.5120 0.0000 182.9093 -25.2041 -0.0000 0.0000	75.3817 0.0000 34.9330 Jul 110.3147 133.4161 20.0124 23.3325 23.3325 23.2624 0.0000 180.0110 -23.6248 -0.0000	1.0322 31 77.3410 0.0000 36.4856 Aug 113.8265 140.9410 21.1412 23.3325 23.3325 23.3252 23.2624 0.0000 187.5359 -25.1226 -0.0000 0.0000	1.0383 30 79.4887 0.0000 38.0382 Sep 117.5268 144.9223 21.7383 22.5798 22.5798 22.5598 22.5798 22.5798 22.5798 22.5798 22.5798	1.0448 31 82.8264 0.0000 39.5907 Oct 122.4171 166.1189 Total = Si 24.9178 23.3325 23.3325 23.3325 23.32624 0.0000 212.7138 -30.7421 -0.0000 0.00000	1.0494 30 86.6848 0.0000 41.1433 Nov 127.8281 182.1146 um(45)m = 27.3172 22.5798 22.5798 22.5798 22.5798 22.5790 0.0000 277.2064 -34.8270 -0.0000 0.0000	1.0542 1.0471 31 2.7405 89.8057 0.0000 42.6959 121.9307 Dec 132.5016 207.4655 2025.4320 31.1198 150.0000 0.7527 23.3325 23.3325 23.3252 40.0000 254.0604 -40.4501 -0.0000 0.0000	(42) (42a) (42b) (42c) (43) (44) (45) (46) (47) (48) (49) (55) (56) (57) (59) (61) (62) (63a) (63b) (63c)
HLP (average) Days in mont 4. Water heatin Assumed occupan Hot water usage Hot water usage Hot water usage Average daily h Daily hot water Energy contee Energy content Distribution lo Water storage l Store volume a) If manufact Temperature f Enter (49) or (Total storage l If cylinder con Primary loss Combi loss Total heat requ WWHRS PV diverter Solar input FGRS Output from w/h	1.0645 31 31 31 31 31 31 31 31 31 3	1.0619 28 28 28 28 29 20 21.0745	1.0593 31 31 36 (kWh/year) 86.8221 0.0000 39.5907 day) Mar 126.4128 194.2918 45)m 29.1438 actor is known is kno	1.0471 30 83.0448 0.0000 38.0382 Apr 121.0830 165.7565 24.8635 own (kWh/da 22.5798 22.5798 22.5120 0.0000 ed for each 210.8484 -31.6044 -0.0000 0.0000 0.0000	1.0448 31 80.2573 0.0000 36.4856 May 116.7429 157.1583 23.5737 Ay): 23.3325 23.3252 23.32624 0.0000 0.0000 0.0000 0.0000 0.0000	1.0342 30 77.1486 0.0000 34.9330 Jun 112.0816 137.8175 20.6726 22.5798 22.5798 22.5120 0.0000 182.9093 -25.2041 -0.0000 0.0000 0.0000	75.3817 0.0000 34.9330 Jul 110.3147 133.4161 20.0124 23.3325 23.3325 23.2624 0.0000 180.0110 -23.6248 0.0000 0.0000 0.0000	1.0322 31 77.3410 0.0000 36.4856 Aug 113.8265 140.9410 21.1412 23.3325 23.3325 23.2624 0.0000 187.5359 -25.1226 -0.0000 0.0000	1.0383 30 79.4887 0.0000 38.0382 Sep 117.5268 144.9223 21.7383 22.5798 22.5798 22.5798 22.5120 0.0000 190.0142 -26.0771 -0.0000 0.0000 0.0000	1.0448 31 82.8264 0.0000 39.5907 Oct 122.4171 166.1189 Total = Si 24.9178 23.3325 23.3325 23.32624 0.0000 212.7138 -30.7421 -0.0000 0.0000 0.0000	1.0494 30 86.6848 0.0000 41.1433 Nov 127.8281 182.1146 um(45)m = 27.3172 22.5798 22.5798 22.5798 22.5120 0.0000 227.2064 -34.8270 -0.0000 0.0000 0.0000	1.0542 1.0471 31 2.7405 89.8057 0.0000 42.6959 121.9307 Dec 132.5016 207.4655 2025.4320 31.1198 150.0000 0.7527 23.3325 23.3255 23.2624 0.0000 254.0604 -40.4501 -0.0000 0.0000	(42) (42a) (42b) (42c) (43) (44) (45) (46) (47) (48) (55) (56) (57) (59) (61) (62) (63a) (63c) (63c) (63c) (63d)
HLP (average) Days in mont 4. Water heatin	1.0645 31 31 31 31 31 31 31 31 31 3	1.0619 28	1.0593 31 31 36 (kWh/year) 86.8221 0.0000 39.5907 /day) Mar 126.4128 194.2918 45)m 29.1438 actor is kmc 23.3325 r storage 23.3325 r storage 23.3252 0.0000 ng calculate 240.8867 -38.1677 -0.0000 0.00000	1.0471 30 83.0448 0.0000 38.0382 Apr 121.0830 165.7565 24.8635 own (kWh/da 22.5798 22.5798 22.5120 0.0000 ed for each 210.8484 -31.6044 -0.0000 0.0000 0.0000	1.0448 31 80.2573 0.0000 36.4856 May 116.7429 157.1583 23.5737 Ay): 23.3325 23.3252 23.32624 0.0000 0.0000 0.0000 0.0000 0.0000	1.0342 30 77.1486 0.0000 34.9330 Jun 112.0816 137.8175 20.6726 22.5798 22.5798 22.5798 22.5798 22.5798 22.5120 0.0000 182.9093 -25.2041 -0.0000 0.0000	75.3817 0.0000 34.9330 Jul 110.3147 133.4161 20.0124 23.3325 23.3325 23.2624 0.0000 180.0110 -23.6248 -0.0000	1.0322 31 31 77.3410 0.0000 36.4856 Aug 113.8265 140.9410 21.1412 23.3325 23.3325 23.3252 40.0000 187.5359 -25.1226 -0.0000 0.0000 162.4133	1.0383 30 79.4887 0.0000 38.0382 Sep 117.5268 144.9223 21.7383 22.5798 22.5798 22.5598 22.5798 22.5798 22.5798 22.5798 22.5798	1.0448 31 82.8264 0.0000 39.5907 Oct 122.4171 166.1189 Total = St 24.9178 23.3325 23.3325 23.32624 0.0000 212.7138 -30.7421 -0.0000 0.0000 0.0000 181.9717	1.0494 30 86.6848 0.0000 41.1433 Nov 127.8281 182.1146 182.1146 45)m = 27.3172 22.5798 22.5798 22.5798 22.5798 22.5120 0.0000 277.2064 -34.8270 -0.0000 0.0000 192.3794	1.0542 1.0471 31 2.7405 89.8057 0.0000 42.6959 121.9307 Dec 132.5016 207.4655 2025.4320 31.1198 150.0000 1.3938 0.5400 0.77527 23.3325 23.2624 0.0000 254.0604 -40.4501 -0.0000 0.0000 0.0000	(42) (42a) (42b) (42c) (43) (44) (45) (46) (47) (48) (49) (55) (56) (57) (59) (61) (63a) (63a) (63a) (63c) (63d) (63c) (63d) (64) (64)
HLP (average) Days in mont 4. Water heatin Assumed occupan Hot water usage Hot water usage Hot water usage Average daily h Daily hot water Energy contee Energy content Distribution lo Water storage l Store volume a) If manufact Temperature f Enter (49) or (Total storage l If cylinder con Primary loss Combi loss Total heat requ WWHRS PV diverter Solar input FGRS Output from w/h	1.0645 31 31 ag energy r cry for mixer 90.1511 for baths 0.0000 for other 42.6959 not water u Jan r use 132.8470 210.3972 (annual) bas (46)m : 31.5596 sator from (54) in (55 curer decla factor from (55) curer decla factor from (54) in (55 curer decla factor from (55) curer decla factor from (54) curer decla factor from (55)	1.0619 28	1.0593 31 31 36 (kWh/year) 86.8221 0.0000 39.5907 /day) Mar 126.4128 194.2918 45)m 29.1438 actor is known actor	1.0471 30 83.0448 0.0000 38.0382 Apr 121.0830 165.7565 24.8635 own (kWh/da 22.5798 22.5798 22.5798 22.5120 0.0000 ed for each 210.8484 -31.6044 -31.6044 -0.0000 0.0000 179.2440	1.0448 31 80.2573 0.0000 36.4856 May 116.7429 157.1583 23.5737 ay): 23.3325 23.3252 4 0.0000 month 203.7532 -29.4541 -0.0000 0.0000 174.2991	1.0342 30 77.1486 0.0000 34.9330 Jun 112.0816 137.8175 20.6726 22.5798 22.5798 22.5120 0.0000 182.9093 -25.2041 -0.0000 0.0000 0.00000 157.7052	1.0342 31 75.3817 0.0000 34.9330 Jul 110.3147 133.4161 20.0124 23.3325 23.3325 23.3325 23.2624 0.0000 180.0110 -23.6248 -0.0000 0.0000 0.0000 156.3861	1.0322 31 77.3410 0.0000 36.4856 Aug 113.8265 140.9410 21.1412 23.3325 23.3325 23.3325 23.2624 0.0000 187.5359 -25.1226 -0.0000 0.0000 162.4133 Total pe	1.0383 30 79.4887 0.0000 38.0382 Sep 117.5268 144.9223 21.7383 22.5798 22.5798 22.5120 0.0000 190.0142 -26.0771 -0.0000 0.0000 163.9370 er year (kWh,	1.0448 31 82.8264 0.0000 39.5907 Oct 122.4171 166.1189 Total = St 24.9178 23.3325 23.3252 23.32524 0.0000 0.0000 0.0000 0.0000 181.9717 /year) = St	1.0494 30 86.6848 0.0000 41.1433 Nov 127.8281 182.1146 um(45) m = 27.3172 22.5798 22.5798 22.5798 22.5798 22.5798 22.5120 0.0000 227.2064 -34.8270 -0.0000 0.0000 192.3794 um(64) m =	1.0542 1.0471 31 2.7405 89.8057 0.0000 42.6959 121.9307 Dec 132.5016 207.4655 2025.4320 31.1198 150.0000 0.7527 23.3325 23.3252 23.32624 0.0000 254.0604 -40.4501 -0.0000 0.0000 0.0000 213.6103 2191.1124 2191	(42) (42a) (42b) (42c) (43) (44) (45) (46) (47) (48) (49) (55) (56) (57) (59) (61) (63a) (63a) (63a) (63c) (63d) (64) (64)
HLP (average) Days in mont 4. Water heatin Assumed occupan Hot water usage Hot water usage Hot water usage Energy conte Energy conte Energy content Distribution lo Water storage l Store volume a) If manufact Temperature f Enter (49) or (Total storage l If cylinder con Primary loss Combi loss Total heat requ WWHRS PV diverter Solar input FGRRS Output from w/h	1.0645 31 31 31 31 31 31 31 31 32 31 32 31 31	1.0619 28	1.0593 31 31 36 (kWh/year) 86.8221 0.0000 39.5907 /day) Mar 126.4128 194.2918 45)m 29.1438 actor is kmc 23.3325 23.3252 240.0000 200.0000 0.00000 0.00000	1.0471 30 83.0448 0.0000 38.0382 Apr 121.0830 165.7565 24.8635 own (kWh/da 22.5798 22.5798 22.5120 0.0000 ed for each 210.8844 -31.6044 -0.0000 0.0000 179.2440 0.0000	1.0448 31 80.2573 0.0000 36.4856 May 116.7429 157.1583 23.5737 Ay): 23.3325 23.32524 0.0000 month 203.7532 -29.4541 -0.0000 0.0000 174.2991	1.0342 30 77.1486 0.0000 34.9330 Jun 112.0816 137.8175 20.6726 22.5798 22.5798 22.5120 0.0000 182.9093 -25.2041 -0.0000 0.0000 157.7052	1.0342 31 75.3817 0.0000 34.9330 Jul 110.3147 133.4161 20.0124 23.3325 23.3325 23.2624 0.0000 180.0110 -23.6248 -0.0000 0.0000 156.3861	1.0322 31 77.3410 0.0000 36.4856 Aug 113.8265 140.9410 21.1412 23.3325 23.3325 23.2624 0.0000 187.5359 -25.1226 -0.0000 0.0000 162.4133 Total pe	1.0383 30 79.4887 0.0000 38.0382 Sep 117.5268 144.9223 21.7383 22.5798 22.5798 22.5120 0.0000 190.0142 -26.0771 -0.0000 0.0000 163.9370	1.0448 31 82.8264 0.0000 39.5907 Oct 122.4171 166.1189 Total = Si 24.9178 23.3325 23.3325 23.32624 0.0000 212.7138 -30.7421 -0.0000 0.0000 0.0000 181.9717 /year) = Si 0.0000	1.0494 30 86.6848 0.0000 41.1433 Nov 127.8281 182.1146 um(45)m = 27.3172 22.5798 22.5798 22.5798 22.5120 0.0000 227.2064 -34.8270 -0.0000 0.0000 192.3794 um(64)m = 0.0000	1.0542 1.0471 31 2.7405 89.8057 0.0000 42.6959 121.9307 Dec 132.5016 207.4655 2025.4320 31.1198 150.0000 1.3938 0.5400 0.77527 23.3325 23.2624 0.0000 254.0604 -40.4501 -0.0000 0.0000 0.0000	(42) (42a) (42b) (42c) (43) (44) (45) (46) (47) (48) (55) (56) (57) (59) (61) (63c) (63a) (63b) (63c) (63d) (64) (64) (64)

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5. Internal ga	ains (see Ta	able 5 and	 5a)										
Metabolic gair													
(66)m	Jan	Feb	Mar	Apr 137.0271	May 137.0271	Jun 137.0271	Jul 137.0271	Aug 137.0271	Sep 137.0271	Oct 137.0271	Nov 137.0271	Dec 137.0271	(66)
Lighting gains	131.4313	145.5132	131.4313	135.8123	131.4313	135.8123	131.4313	131.4313	135.8123	131.4313	135.8123	131.4313	(67)
Appliances gai	ins (calcula 256.5055	ated in App 259.1672	endix L, eq 252.4597	uation L13 238.1804	or L13a), a 220.1552	lso see Tab. 203.2141	le 5 191.8964	189.2347	195.9421	210.2215	228.2467	245.1878	
Cooking gains	(calculated	d in Append	ix L, equat	ion L15 or	Ll5a), also	see Table 36.7027	5	36.7027		36.7027	36.7027	36.7027	. ,
Pumps, fans Losses e.g. ev	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000		3.0000		3.0000	
	-109.6217	-109.6217			-109.6217	-109.6217	-109.6217	-109.6217	-109.6217	-109.6217	-109.6217	-109.6217	(71)
Total internal	144.1303	141.6545	136.9327	126.6493	120.3375	113.7469	109.7268	113.0898	117.0280	124.3420	134.2036	142.8201	(72)
Total Internal		613.4430	587.9319	567.7501	539.0320	516.8814	497.1626	497.8638	512.8905	533.1029	565.3707	586.5473	(73)
6. Solar gains	 3												
[Jan]			A	m2	Table 6a	Speci or	fic data	Specific	data	facto	or	Gains W	
				100	W/M2	OF .			7000	nable (00		(70)
Southwest Northwest			6.9	600	11.2829	;) 	0.6300		.7000	0.770	00	131.6751 23.9996	
Solar gains Total gains	155.6747	273.1433	394.9008	524.7924	620.2060	629.9704	601.4287	528.0675	439.5401	307.5906	187.9141	132.2857	(83)
Total gains	754.8499	886.5862	982.8326	1092.5426	1159.2381	1146.8518	1098.5913	1025.9313	952.4306	840.6935	753.2848	718.8330	(84)
7. Mean intern													
Temperature du Utilisation fa	uring heating	ng periods	in the livi	ng area from	m Table 9, Table 9a)							21.0000	(85)
+===	Jan	Feb	Mar	Apr	May	Jun 110.2785	Jul 110.2785	Aug 110.4887	Sep 109.8439	Oct 109.1572	Nov 108.6770	Dec 108.1794	
	8.1423					8.3519				8.2771			
	0.9995	0.9977	0.9906	0.9460	0.7998	0.5752	0.4145	0.4629	0.7341	0.9704	0.9979	0.9996	(86)
MIT Th 2 util rest of h	20.2643	20.4064 20.0321	20.5949 20.0342	20.8312 20.0443	20.9672 20.0462	20.9979 20.0549	20.9999 20.0549	20.9997 20.0566	20.9871 20.0516	20.8043 20.0462		20.2423 20.0384	
MIT 2	0.9992		0.9853 19.6041	0.9194 19.8932	0.7339 20.0257	0.4918 20.0542	0.3256 20.0549	0.3682 20.0565	0.6431	0.9495 19.8710			
Living area fr	raction			20.0572	20.1903	20.2192	20.2201		fLA =	Living area 20.0342	a / (4) =	0.1748	(91)
Temperature ac adjusted MIT	djustment					20.2192	20.2201			20.0342		0.0000	
aujusteu HII	19.3702	19.3404	15.7773	20.0372	20.1903	20.2192	20.2201	20.2214	20.2103	20.0342	19.65/1	19.3409	(53)
8. Space heati	ing requirer												
	Jan	Feb	Mar	Apr	May	Jun 0.5064	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation Useful gains	753.9933	882.7081	966.5368	1004.9404	863.0450	580.7726	374.7649	394.8003	627.6988		750.0833		(94) (95)
Ext temp. Heat loss rate	∍ W					14.6000		16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Space heating		1556.9763	1407.9844	1169.5346	888.0387	581.7642	374.7959	394.8828	635.1282	986.7677	1319.2156	1598.8177	(97)
Space heating	requirement		328.4370 er year (kW		18.5953	0.0000	0.0000	0.0000	0.0000	140.4515	409.7753	655.1238 2757.9143	(98a)
Solar heating Solar heating	0.0000	0.0000 on - total	0.0000 per year (ki	0.0000 Wh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Space heating	kWh		328.4370		18.5953	0.0000	0.0000	0.0000	0.0000	140.4515	409.7753		(98c)
Space heating Space heating	requirement) / (4) =	2757.9143 27.5488	
9a. Energy rec													
Fraction of sp Fraction of sp	pace heat fi	rom main sy	stem(s)		m (Table II	.)						1.0000	(202)
Efficiency of Efficiency of	main space	heating sy	stem 2 (in	%)								92.3000 0.0000	(207)
Efficiency of				_								0.0000	(208)
Space heating			Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating	efficiency	(main heat		1)	18.5953	0.0000	0.0000	0.0000	0.0000	140.4515	409.7753	655.1238	
Space heating	fuel (main		stem)	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	
Space heating	686.7990 efficiency	490.9082 (main heat	355.8364 ing system	2)	20.1466	0.0000	0.0000	0.0000	0.0000	152.1684	443.9602	709.7766	
Space heating	0.0000 fuel (main	0.0000 heating sy	0.0000 stem 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating	0.0000	0.0000 ndary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
	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													
	215.7787	190.6686	202.7190	179.2440	174.2991	157.7052	156.3861	162.4133	163.9370	181.9717	192.3794	213.6103	(64)

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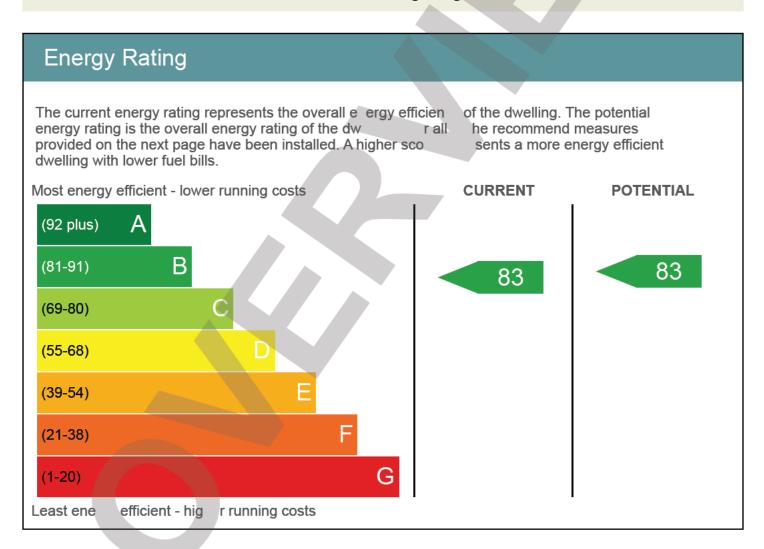
Efficiency of water heater (217)m 86.3275 85.9297 85.1354 83.1543 80.5874 79.8000 7	79.8000 79.8000	79.8000	83.4859	85.7116	79.8000 86.4039	
Fuel for water heating, kWh/month 249.9536 221.8891 238.1136 215.5558 216.2859 197.6255 19	95.9726 203.5254	205.4349	217.9670	224.4496	247.2230	(219)
Space cooling 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	
	7.3041 7.3041 10.1834 13.2368	7.0685 17.1932	7.3041 22.5585	7.0685 25.4797	7.3041 28.0678	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m -33.3301 -48.1257 -70.8212 -81.5673 -89.5920 -84.1816 -8	83.1119 -77.6390	-68.2800	-55.8655	-37.0315	-28.6818	(233a)
	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 i (235c)m 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 -15.5301 -32.9983 -66.2090 -100.3669 -133.6314 -134.6366 -13	33.0886 -112.2958	-81.7710	-47.5374	-20.8440	-12.2592	(233b)
	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 i (235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 Annual totals kWh/year	0.0000 0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Space heating fuel - main system 1 Space heating fuel - main system 2					2987.9895 0.0000	
Space heating fuel - main officers Space heating fuel - secondary Efficiency of water heater					0.0000 79.8000	(215)
Water heating fuel used Space cooling fuel					2633.9959	(219)
Electricity for pumps and fans:						(222)
Total electricity for the above, kWh/year Electricity for lighting (calculated in Appendix L)					86.0000 220.3978	
Energy saving/generation technologies (Appendices M ,N and Q)						(===)
PV generation Wind generation					-1649.3959 0.0000	
Hydro-electric generation (Appendix N) Electricity generated - Micro CHP (Appendix N)					0.0000	(235a)
Appendix Q - special features						` '
Energy saved or generated					-0.0000	(236)
Energy saved or generated Energy used Total delivered energy for all uses					-0.0000 0.0000 4278.9874	(237)
Energy used					0.0000	(237)
Energy used Total delivered energy for all uses					0.0000	(237)
Energy used Total delivered energy for all uses					0.0000 4278.9874	(237) (238)
Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP	Energy kWh/year		ion factor	k	0.0000 4278.9874 Emissions g CO2/year	(237) (238)
Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems	Energy kWh/year 2987.9895	1	rg CO2/kWh 0.2100	k	0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000	(237) (238) (261) (373)
Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating	Energy kWh/year 2987.9895 2633.9959	1	0.2100	kı	0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391 1180.6169	(237) (238) (261) (373) (264) (265)
Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel)	Energy kWh/year 2987.9895	1	rg CO2/kWh 0.2100	kı	0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391	(237) (238) (261) (373) (264) (265) (267)
Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies	Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978	1	0.2100 0.2100 0.1387 0.1443	lei	0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102	(237) (238) (261) (373) (264) (265) (267) (268)
Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported	Energy kWh/year 2987.9895 2633.9959 86.0000	1	0.2100	lo	0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102	(261) (373) (264) (265) (267) (268)
Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year	Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978	1	0.2100 0.2100 0.2100 0.1387 0.1443	lo	0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102 -101.6764 -111.9465 -213.6229 1010.7335	(261) (373) (261) (373) (265) (267) (268)
Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total	Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978	1	0.2100 0.2100 0.2100 0.1387 0.1443	lo	0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102 -101.6764 -111.9465 -213.6229	(261) (373) (261) (373) (265) (267) (268)
Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year	Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978	1	0.2100 0.2100 0.2100 0.1387 0.1443	lo	0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102 -101.6764 -111.9465 -213.6229 1010.7335	(261) (373) (261) (373) (265) (267) (268)
Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year	Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978 -758.2276 -891.1682	1	0.2100 0.2100 0.2100 0.1387 0.1443	lo	0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102 -101.6764 -111.9465 -213.6229 1010.7335	(261) (373) (261) (373) (265) (267) (268)
Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER)	Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978 -758.2276 -891.1682	? Primary ene:	CG CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1341 0.1256	k: Prim	0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102 -101.6764 -111.9465 -213.6229 1010.7335 10.1000	(261) (373) (264) (265) (267) (268) (269) (272) (273)
Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity used in dwelling Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1	Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978 -758.2276 -891.1682	1	CG CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1341 0.1256	kı	0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102 -101.6764 -111.9465 -213.6229 1010.7335 10.1000 ary energy kWh/year 3376.4282	(261) (373) (261) (373) (264) (265) (267) (268) (272) (273)
Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel)	Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978 -758.2276 -891.1682 Energy kWh/year	? Primary ene: }	CG CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1341 0.1256	k Prim	0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102 -101.6764 -111.9465 -213.6229 1010.7335 10.1000 ary energy kWh/year 3376.4282 0.0000 2976.4154	(261) (373) (261) (373) (264) (265) (267) (268) (272) (273) (273)
Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot	Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978 -758.2276 -891.1682 Energy kWh/year 2987.9895 2633.9959 86.0000	Primary ener	CG CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1341 0.1256 CG CO2/kWh 1.1300 1.1300 1.5128	kı Prim	0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102 -101.6764 -111.9465 -213.6229 1010.7335 10.1000 ary energy kWh/year 3376.4282 0.0000 2976.4154 6352.8436 130.1008	(261) (373) (264) (264) (267) (268) (269) (272) (273) (273)
Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting	Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978 -758.2276 -891.1682 Energy 1 kWh/year 2987.9895 2633.9959	Primary ener	CG CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1341 0.1256 CG CO2/kWh 1.1300 1.1300	kı Prim	0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102 -101.6764 -111.9465 -213.6229 1010.7335 10.1000 ary energy kWh/year 376.4282 0.0000 2976.4154	(261) (373) (264) (264) (267) (268) (269) (272) (273) (273)
Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling Energy saving/generation technologies PV Unit electricity used in dwelling	Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978 -758.2276 -891.1682 Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978 -758.2276	Primary enem	CG CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1341 0.1256 CG CO2/kWh 1.1300 1.5128 1.5338 1.4956	kı Prim	0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102 -101.6764 -111.9465 -213.6229 1010.7335 10.1000 ary energy kWh/year 3376.4282 0.0000 2976.4154 6352.8436 130.1008 338.0535	(261) (373) (261) (373) (264) (265) (267) (268) (272) (273) (273) (273) (278) (279) (281) (282)
Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies	Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978 -758.2276 -891.1682 Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978	Primary enem	cg CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1341 0.1256 cgy factor cg CO2/kWh 1.1300 1.5128 1.5338	kı Prim	0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102 -101.6764 -111.9465 -213.6229 1010.7335 10.1000 ary energy kWh/year 3376.4282 0.0000 0976.4154 6352.8436 130.1038 338.0535	(261) (373) (264) (265) (267) (268) (272) (273) (273) (273) (273) (279) (279) (282)

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Dwelling Address	Unit 1, Highland Square , Bristol
Report Date	05/03/2024
Property Type	Maisonette, Semi-Detached
Floor Area [m ²]	100

This document is not an Energy Performance Certificat EPC) s required by the Energy Performance of Buildings Reg io



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Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good	
Feature	Description			gy Performance	
Walls	Average thermal transmi	ttance 0.18 W/m²K		Very Good	
Roof	Average thermal transmi	ttance 0.11 W/m²K		Very Good	
Floor	Average thermal transmi	Average thermal transmittance 0.14 W/m²K			
Windows	High performance glazing			Good	
Main heating	Air source heat pump, radiators, electric			Good	
Main heating controls	Time and temperature z contro			Very Good	
Secondary heating	None				
Hot water	From main sys m			Average	
Lighting	Good ligh g efficien			Good	
Air tightness	Air perme 50] =	4.5 h.m² (assumed)		Good	

Primary Energy use

The primary energy use for this property per year is 39 kilowatt hour (kWh) per square metre

Estim ted CO₂ missions of the dwelling

The estimated ing provides an indication of the dwelling's impact on the environment in terms of carbon dioxide emissions; the higher the rating the less impact it has on the environment.

The estimated CO emissions for this dwellings is: 0.4 per year

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With the recommended measures the potential CO emissions could be:

C

per year

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelli

To reach the dwelling's potential energy rating all of the recommended measures shown would d to be installed.

Having these measures installed individually or in any other order may give a different result omp d with the cumulative potential rating.

Recommended measure	Typical	Potential Rati	C ulative	Cumulative
	Yearly	after	avings	Potential
	Saving	measure insta	(per year)	Rating

Estimated energy use and potential aving

Estimated energy cost for this property over a year

£628

Over a year you could save

£0

The estimated cost and saving how how much the average hou ld would spend in this property heating, lighting and hot water. It not based on how e is used by the people living at the pr

Containg the ssessor and the accreditation scheme

Assessor contact details				
Assessor name				
Assessor's accreditation number				
Email Address				

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Accreditation scheme contact details				
Accreditation scheme Elmhurst Energy Systems Ltd				
Telephone				
Email Address				

Assessment details				
Related party disclosure	No related pa			
Date of assessment	05/03/202			
Date of certificate	05/03/202			
Type of assessment	SAP w dwellin			



Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Tue 05 Mar 2024 08:42:00

Project Information					
Assessed By		Building Type	Maisonette, Semi-detached		
OCDEA Registration	EES/025661	Assessment Date	2024-03-05		

Dwelling Details			
Assessment Type	As designed	Total Floor Area	100 m ²
Site Reference	Unit 6 (HMO)	Plot Reference	PV
Address	Unit 1 Highland Square, Bris	tol	

Client Details	
Name	Tebby & Son
Company	SF Tebby & Son
Address	Unit 11 Avon Gorge Industrial Estate , Bristol, BS2 9XX

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission	rate			
Fuel for main heating system	Electricity			
Target carbon dioxide emission rate	10.1 kgCO ₂ /m ²			
Dwelling carbon dioxide emission rate	2.88 kgCO ₂ /m ²	OK		
1b Target primary energy rate and dwelling primary energy				
Target primary energy	52.7 kWh _{PE} /m ²			
Dwelling primary energy	32.22 kWh _{PE} /m ²	OK		
1c Target fabric energy efficiency and dwelling fabric energy efficiency				
Target fabric energy efficiency	33.7 kWh/m ²			
Dwelling fabric energy efficiency	32.4 kWh/m ²	OK		

2a Fabric U-values						
Element	Maximum permitted average U-Value [W/m²K]	Dwelling average U-Value [W/m²K]	Element with highest individual U-Value			
External walls	0.26	0.18	Walls (1) (0.18)	OK		
Party walls	0.2	0	Party Wall (1) (0)	N/A		
Curtain walls	1.6	0	N/A	N/A		
Floors	0.18	0.14	Exposed Floor (0.18)	OK		
Roofs	0.16	0.11	Roof (1) (0.11)	OK		
Windows, doors,	1.6	1.31	W01 (1.31)	OK		
and roof windows						
Rooflights	2.2	N/A	N/A	N/A		

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))					
Name	Net area [m ²]	U-Value [W/m ² K]			
Exposed wall: Walls (1)	55.27	0.18			
Exposed wall: Walls (2)	4.11	0.18			
Party wall: Party Wall (1)	133.64	0 (!)			
Ground floor: Heatloss Floor 1, Heatloss Floor 1	52.33	0.13			
Upper floor: Exposed Floor, Exposed Floor	9.59	0.18			
Exposed roof: Roof (1)	18.06	0.11			

2c Openings (better than typically expected values are flagged with a subsequent (!))					
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]	
W01, Windows	3.48	South West	0.7	1.31	
W02, Windows	3.48	North West	0.7	1.31	
W03, Windows	3.48	North West	0.7	1.31	
W04, Windows	3.48	South West	0.7	1.31	
W05, Windows	3.49	South West	0.7	1.31	
W06, Windows	1.26	South West	0.7	1.31	

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))
Building part 1 - Main Dwelling: Thermal bridging calculated from linear thermal transmittances for each junction

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other	Not government-approved	0.023 (!)	Telefelioe
	steel lintels)	scheme		
External wall	E3: Sill	Calculated by person with suitable expertise	0.021 (!)	
External wall	E4: Jamb	Calculated by person with suitable expertise	0.016 (!)	
External wall	E24: Eaves (insulation at ceiling level - inverted)	SAP table default	0.15	
Party wall	P3: Intermediate floor between dwellings (in blocks of flats)	SAP table default	0 (!)	
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.043	
External wall	E25: Staggered party wall between dwellings	Calculated by person with suitable expertise	0.036 (!)	
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.046	
External wall	E14: Flat roof	SAP table default	0.16	
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.073	
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.093	
Party wall	P5: Roof (insulation at rafter level)	Calculated by person with suitable expertise	0.101	
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.047	Marmox Spec
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.116	
External wall	E21: Exposed floor (inverted)	SAP table default	0.32	
External wall	E22: Basement floor	Calculated by person with suitable expertise	-0.08	
External wall	E19: Ground floor (inverted)	SAP table default	0.1	
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.001 (!)	
Party wall	P7: Exposed floor (normal)	Calculated by person with suitable expertise	0.185	
Party wall	P8: Exposed floor (inverted)	Calculated by person with suitable expertise	0.185	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))								
Maximum permitted air permeability at 50Pa	8 m ³ /hm ²							
Dwelling air permeability at 50Pa	4.5 m ³ /hm ² , Design value	OK						
Air permeability test certificate reference								

4 Space heating	
Main heating system 1: Heat pump with	n radiators or underfloor heating - Electricity
Efficiency	248.6%
Emitter type	Radiators
Flow temperature	55°C
System type	Heat Pump
Manufacturer	Atlantic
Model	Logic Air 8kW
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water			
Cylinder/store - type: Cylinder	450 14		
Capacity	150 litres		
Declared heat loss	2.09 kWh/day		
Primary pipework insulated	Yes		
Manufacturer			
Model			
Commissioning			
Waste water heat recovery system 1 -	type: N/A		
Efficiency			
Manufacturer			
Model			
6 Controls			
	oturo zono control bu	arrangement of plumbing and electrical	nom do o o
Main heating 1 - type: Time and temper	alure zone control by	arrangement of plumbing and electrical s	services
Function			
Ecodesign class			
Manufacturer			
Model			
Water heating - type: Cylinder thermost	at and HW separately	timed	
Manufacturer			
Model			
7 Lighting			
Minimum permitted light source efficacy	75 lm/W		
Lowest light source efficacy	80 lm/W		OK
External lights control	N/A		UK
External lights control	IN/A		
8 Mechanical ventilation			
System type: N/A			
Maximum permitted specific fan power	N/A		
Specific fan power	N/A		N/A
Minimum permitted heat recovery	N/A		1.4
efficiency			
Heat recovery efficiency	N/A		N/A
Manufacturer/Model	14/74		IV/A
Commissioning			
9 Local generation			
Technology type: Photovoltaic system	(1)		
Peak power	1.045 kWp		
Orientation	South West		
Pitch	45°		
Overshading	None or very little		
Manufacturer			
MCS certificate			
10 Heat networks			
N/A			
11 Supporting documentary evidence			
N/A			
14/74			
12 Declarations			
a. Assessor Declaration			
This declaration by the assessor is co	onfirmation that the co	ntents of this BREL Compliance Report	
		formation submitted for this dwelling for	
		and that the supporting documentary	
evidence (SAP Conventions, Append			
documentary evidence required) has			
Compliance Report.		TIMES OF PROPERTING WITE BILLE	
Compilation Report.			
Signed		Assessor ID:	
Signed:			
		/\ddcddoi ib.	
		7.0303301 12.	
Name:		Date:	

b. Client Declaration

N/A



Property Reference	Unit 6	(HMO)							Issued	d on Date	05/	03/202	4		
Assessment Reference	PV			Prop Type Ref Tebb							Tebby and Son Garage				
Property	Unit 1	Highland	Square , Bri	Bristol											
SAP Rating			83	ВВ	DER		2.8	3		TER		10.10			
Environmental			97	'A	% DER	R < TER						71.49			
CO ₂ Emissions (t/year)			0.3	0.25 DFEE 32.38					TFEE		33.69				
Compliance Check			Se	ee BREL	% DFE	E < TFEE						3.91			
% DPER < TPER			38	3.86	DPER		32.2	22		TPER		52.70			
Assessor Details										Assesso	r ID	U367-(0001		
Client															
SUMMARY FOR INPU	IT DATA FO	R: New E	Build (As I	Designed)											
Orientation			No	ortheast											
Property Tenture			1												
Transaction Type			6												
Terrain Type			Ur	ban											
1.0 Property Type			Ma	aisonette, Semi-D	etached										
Position of Flat			Gr	ound-floor flat											
Which Floor			1												
2.0 Number of Storeys			2												
3.0 Date Built			20	24											
3.0 Property Age Band			L												
4.0 Sheltered Sides			3												
5.0 Sunlight/Shade			Av	erage or unknowr											
6.0 Thermal Mass Parame	ter		Pr	ecise calculation											
Thermal Mass			N/	A					k	J/m²K					
7.0 Electricity Tariff			St	andard											
Smart electricity meter f	itted		No)											
Smart gas meter fitted			No)											
7.0 Measurements				Basemei Ground flor 1st Store 2nd Store 3rd Store 4th Store 5th Store 6th Store 7th Store	nt: or: ey: ey: ey: ey: ey:	t Loss Pe 0.00 m 19.20 n 13.06 n 18.05 n 0.00 m 0.00 m 0.00 m 0.00 m	n n n n i i	r In	0.00 r 0.00 r 52.33 47.78 27.28 0.00 r 0.00 r 0.00 r 0.00 r	m² m² m² m² m² m² m² m²	Avera	ge Sto 0.00 2.50 2.70 2.42 0.00 0.00 0.00 0.00	m m m m m m		
8.0 Living Area			17	7.50					n	n²					
9.0 External Walls Description	Туре	Constructi	ion		[I_Value	Kappa	Gross	Nett Area	Shelter	Shelter	Openi	nas Ar	ea Calculatio		
Cavity Wall	Cavity Wall	Cavity wall	: plasterboard	on dabs, dense block,		(kJ/m²K) / 150.00			Res 0.00	None	18.6	_	Type ter Gross Ar		
Basement Wall	Cavity Wall	Cavity wall	any outside st : plasterboard ; any outside st	on dabs, dense block,	0.18	150.00	4.11	4.11	0.00	None	0.00) En	ter Gross An		
9.1 Party Walls															
Description Party Wall 1	Type Filled Cav Edge Sea	ity with Si	onstructior ingle plaster avity	n board on both sid	es, dense	cellular b	olocks,		Kappa (kJ/m²K) 70.00	Area (m²) 133.64	Shelter Res 0.00	,	Shelter None		
9.2 Internal Walls		.,													
Description			nstruction								(k	appa J/m²K)	Area (r		
Internal Wall 1		De	nse block, d	ense plaster							1	00.00	135.60		

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10.0 External Roofs Description	Туре	Construc	tion			Kappa kJ/m²K)A		Nett Area		Shelte Factor		onOpening
External Roof 1	External Flat Roof	Plasterbo	ard, in	sulated flat roof	0.11	9.00	18.06	(m²) 18.06	8 None	0.00	Enter Gro Area	oss 0.00
10.1 Party Ceilings Description		Const	ructio	n							Kappa	Area (m²
Party Ceiling 1		Precas	st cond	crete planks floor, screed,	carpeted						(kJ/m²K) 30.00	43.86
10.2 Internal Ceilings Description Internal Ceiling 1		Storey Lowest occu	pied	Construction Other							А	rea (m²) 38.19
11.0 Heat Loss Floors Description	Туре	Storey Index	K	Construction		U-1	/alue	Sh	elter Code		Shelter Ka	ppa Area(m
Heatloss Floor 1 Exposed Floor	Ground Floor - Solid Exposed Floor - Solid	d Lowest occu	pied	Suspended concrete floor, carp Other	peted	0	/ m²K) 1.13 1.18		None None	I	0.00 75	m²K) .00 52.33 .00 9.59
11.2 Internal Floors Description Internal Floor 1		Storey Index	Cons	struction r							Kappa (kJ/m²h 40.00	
12.0 Opening Types												
Description Windows	Data Source Manufacturer	Type Window		Glazing Double Low-F Soft	0.05	Glazing Gap	g Filli ı Typ Air Fi	e e	G-value 0.63	Frame Type Wood	Factor	
SOlid dooor	Manufacturer	Solid Doo	r	Bodbie Low L Colt	0.00		Air Fi		0.00	Wood		1.31
13.0 Openings Name W01 W02 W03 W04 W05 W06	Opening Ty Windows Windows Windows Windows Windows	ype		Location Cavity Wall Cavity Wall Cavity Wall Cavity Wall Cavity Wall Cavity Wall		Sout Nortl Nortl Sout Sout	ntation h West h West h West h West h West h West		Area (3.48 3.48 3.48 3.48 1.26	3 3 3 3	ı	Pitch 0 0 0 0 0
***************************************	VVIIIUOWS					3000	II VVCSt		1.20			-
14.0 Conservatory				None								
15.0 Draught Proofing 16.0 Draught Lobby				100 No] %]			
17.0 Thermal Bridging				Calculate Bridges]			
17.1 List of Bridges				oulculate Driages					J			
Bridge Type E2 Other lintels (includi E3 Sill E4 Jamb E24 Eaves (insulation a P3 Party wall - Intermed	at ceiling level - inv	verted)	Non Indep Indep Table	cce Type Gov Approved Schemes bendently assessed bendently assessed 2 K1 - Default 3 K1 - Default	Length 9.19 9.19 25.20 7.26 40.59	Psi 0.02 0.02 0.02 0.15 0.00	Adjus 0.0 0.0 0.0 0.1 0.0	2 2 2 5	eference:			Imported No No No No No
(in blocks of flats) E16 Corner (normal) E25 Staggered party w E18 Party wall between E14 Flat roof E17 Corner (inverted – external area)	dwellings		Inder Inder Table	pendently assessed pendently assessed pendently assessed e K1 - Default pendently assessed	11.40 6.40 13.90 6.90 7.70	0.04 0.04 0.05 0.16 -0.07	0.0 0.0 0.0 0.1 -0.0	4 5 6				No No No No No
P1 Party wall - Ground P5 Party wall - Roof (in E5 Ground floor (norma E20 Exposed floor (nor E21 Exposed floor (inve E22 Basement floor E19 Ground floor (inve E6 Intermediate floor w P7 Party Wall - Expose P8 Party Wall - Expose	sulation at rafter le al) mal) erted) ted) ithin a dwelling d floor (normal)	evel)	Inder	pendently assessed pendently assessed pendently assessed pendently assessed e K1 - Default pendently assessed e K1 - Default pendently assessed pendently assessed pendently assessed pendently assessed	27.54 6.50 13.88 2.16 5.04 4.11 4.11 10.91 4.34 0.93	0.09 0.10 0.05 0.12 0.32 -0.08 0.10 0.00 0.18 0.18	0.0 0.1 0.0 0.1 0.3 -0.0 0.1 0.0 0.1	0 5 M 2 2 0 8 0 8	larmox Sp	ec		No No No No No No No No No
Y-value				0.07					W/m²K			
18.0 Pressure Testing				Yes]			
Designed AP ₅₀				4.50					m³/(h.m²	²) <i>ര</i> ു ട്വ	Pa	
Property Tested?			_	Yes]	, w 50	. u	
Test Method				Blower Door]			
			L						1			

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Mechanical Ventilation Mechanical Ventilation System Present	No						
	140						
20.0 Fans, Open Fireplaces, Flues							
21.0 Fixed Cooling System	No						
22.0 Lighting					_		
No Fixed Lighting	No Name	Efficacy	Pov	/or	Ca	pacity	Count
	Lighting 1	80.00	15		,	1200	5
24.0 Main Heating 1	Database						
Percentage of Heat	100.00				%		
Database Ref. No.	106764						
Fuel Type	Electricity						
SAP Code	0						
In Winter	248.59						
In Summer	188.24						
Model Name	Logic Air 8kW						
Manufacturer	Atlantic						
System Type	Heat Pump						
Controls SAP Code	2207						
Delayed Start Stat	No						
HETAS approved System	No						
Oil Pump Inside	No						
FI Case	0.00						
Flue Type	None or Unknown	1					
Fan Assisted Flue	No						
Is MHS Pumped	Pump in heated s	pace					
Heating Pump Age	2013 or later						
Heat Emitter	Radiators						
Flow Temperature	Enter value						
Flow Temperature Value	55.00						
Boiler Interlock	No						
25.0 Main Heating 2	None				 7		
					<u> </u>		
26.0 Heat Networks	None						
Heat Source Fuel Type Heating L	Jse Efficiency	Percentage Of Heat	Po	leat Ele ower atio	ectrical	Fuel Factor	Efficiency type
Heat source 1 None Heat source 2 None							
Heat source 3 None							
Heat source 4 None Heat source 5 None							
28.0 Water Heating							
Water Heating	Main Heating 1						
SAP Code	901						
Flue Gas Heat Recovery System	No						
Waste Water Heat Recovery Instantaneous System 1	No						
Waste Water Heat Recovery Instantaneous System 2	No						
Waste Water Heat Recovery Storage System	No						
Tradic Trace Treat Tecovery elorage Cyclem							
Solar Panel	No						
	No Yes						

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Cold Water Source From header tank **Bath Count** Supplementary Immersion No No Immersion Only Heating Hot Water 28.1 Showers Description **Shower Type** Flow Rate Rated Power Connected Connected To [l/min] [kW] 7.00 7.00 Combi boiler or unvented hot water system Combi boiler or unvented hot water system No Combi boiler or unvented hot water system No 7.00 28.3 Waste Water Heat Recovery System 29.0 Hot Water Cylinder Hot Water Cylinder Cylinder Stat Yes Yes Cylinder In Heated Space Independent Time Control Yes Insulation Type Measured Loss Cylinder Volume 150.00 Loss 2.09 kWh/day Fully insulated primary pipework Pipes insulation In Airing Cupboard 31.0 Thermal Store None 32.0 Photovoltaic Unit One Dwelling **Export Capable Meter?** Yes Connected To Dwelling No Diverter No Battery Capacity [kWh] 0.00 PV Cells kWp Orientation Elevation Overshading FGHRS MCS Certificate Overshading Panel Factor Certificate Manufacturer Reference South West 45° 1.00 1.04 None Or Little No No 34.0 Small-scale Hydro None 0.00 **Electricity Generated** 0.00 kWh/Year Apportioned Yes Connected to dwelling's electricity meter **Electricity Generation** Annual Mar Apr May Jun Jul Aug Oct Nov Dec Recommendations None Further measures to achieve even higher standards Ratings after improvement Typical Cost Typical savings per year SAP rating Environmental Impact Solar water heating ŏ ŏ

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Property Reference			nit 6 (HMO)							Issued on Da		05/03/2024	
Assessment Refe	rence	P\						Prop Type F	Ref To	ebby and Son	Garage		
Property		Ur	nit 1, Highland	Square , Bristol									
SAP Rating					83 B		DER	2.8	38	TER		10.10	
Environmental					97 A		% DER < TER	₹				71.49	
CO ₂ Emissions (t/	year)				0.25		DFEE	32	.38	TFEE		33.69	
Compliance Chec	k				See BREL		% DFEE < TF	EE				3.91	
% DPER < TPER					38.86		DPER	32	.22	TPER	ł .	52.70	
Assessor Details										Asse	ssor ID	U367-000)1
Client													
SAP 10 WORKSHEET CALCULATION OF I						2022)							
1. Overall dwell Ground floor First floor Total floor area Dwelling volume)(ln)	10	0.1100		47.7800		2.7000	(2b) = (2c) =	Volume (m3) 130.8250 129.0060 259.8310	(lb) - (3 (lc) - (3 (4)
2. Ventilation r	ate										I	n3 per hour	
Number of open of Number of open f Number of chimne Number of flues Number of flues Number of interm Number of passiv Number of fluele	lues ys / flues attached t attached t d chimneys ittent ext e vents	o solid fu o other he ract fans	el boiler	fire							0 * 35 = 0 * 20 = 4 * 10 =	0.0000 0.0000 0.0000 0.0000 40.0000 0.0000	(6b) (6c) (6d) (6e) (6f) (7a) (7b)
Infiltration due Pressure test Pressure Test Me Measured/design Infiltration rat Number of sides	thod AP50	ys, flues	and fans	= (6a)+(6b)	+ (6c) + (6d) + (6e)+(6f)+((6g)+(7a)+(7b)+(7c) =		40.0000	/ (5) =	0.1539 Yes 310wer Door 4.5000 0.3789	(8)
Shelter factor Infiltration rat	e adjusted	l to includ	de shelter	factor					(20) = 1 - (2	[0.075 x 1) = (18)	(19)] = x (20) =	0.7750 0.2937	
Wind speed Wind factor Adj infilt rate			Mar 4.9000 1.2250			Jun 3.8000 0.9500	Jul 3.8000 0.9500		Sep 4.0000 1.0000	Oct 4.3000 1.0750			
	0.3744		0.3598 0.5647			0.2790 0.5389	0.2790 0.5389		0.2937 0.5431				
3. Heat losses a	nd heat lo	ss paramet	er										
Element Windows (Uw = 1. Heatloss Floor 1 Exposed Floor Cavity Wall Basement Wall External Roof 1 Total net area of Fabric heat loss Farty Wall 1 Party Ceiling 1 Internal Wall 1 Internal Floor 1 Internal Floor 1 Internal Ceiling	f external, W/K = Su	.elements m (A x U)		Gross m2 73.9400 4.1100 18.0600	Openings m2	18. 52. 9. 55. 4. 18. 158. 133. 43. 135. 38.	1100 0600 0300	W/m2K 1.2448 0.1300 0.1800 0.1800 0.1800 0.1100 30) + (32) 0.0000	W/ 23.239 6.802 1.726 9.948 0.739 1.986 = 44.444 0.000	K 9 7 9 7 7 2 4 6 15 8 15 6 6 7 3 10 4 4	0.0000 0.0000 9.0000 0.0000 0.0000 0.0000 0.0000	383.6000 8290.5000 616.5000 162.5400 9354.8000 1315.8000 13560.0000 1527.6000	(27) (28a) (28b) (29a) (29a) (30) (31) (33) (32) (32b) (32c) (32d) (32e)
Heat capacity Cm Thermal mass par List of Thermal K1 Eleme E2 Other	ameter (TM Bridges nt	IP = Cm / 1	OFA) in kJ/						(30) + (32 Length P 9.1850) + (32a). si-value 0.0230	(32e) = Tot 0.21	406.1901	

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E3 Sill E4 Jamb E24 Eav P3 Part; E16 Corr E25 Sta: E18 Par E17 Corr P1 Part; P5 Part; E5 Groun E20 Expp E21 Exp E22 Bas: E19 Groot E6 Inte: P7 Part; P8 Part; Thermal bridges Point Thermal b. Total fabric her	25 7 40 11 6 13 6 27 6 13 2 5 4 4 4 10	.1850 .2000 .2600 .5870 .4000 .9000 .9000 .7000 .5400 .5000 .8800 .1600 .0400 .1100 .1100 .9100 .9300	0.0210 0.0160 0.1500 0.0000 0.0430 0.0360 0.1600 -0.0730 0.0930 0.1010 0.0470 0.1160 0.3200 -0.0800 0.0010 0.1850 0.1850	0.19 0.40 1.08 0.00 0.49 0.23 0.63 1.10 -0.56 0.65 0.65 0.25 1.61 -0.32 0.41 0.01 0.80 0.17 (36a) =	32 90 00 02 94 40 21 12 12 24 06 28 88 10 09								
Ventilation hear	t loss cal Jan	lculated mon Feb	nthly (38)m Mar	= 0.33 x (25)m x (5) May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m Heat transfer c	48.8832	48.6498	48.4210	47.3464	47.1453	46.2093	46.2093	46.0360	46.5698	47.1453	47.5520	47.9773	(38)
	103.9270	103.6936	103.4648	102.3901	102.1891	101.2531	101.2531	101.0797	101.6136	102.1891	102.5958	103.0210 102.3892	(39)
Average - Dum(o	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0381	1.0358	1.0335	1.0228	1.0208	1.0114	1.0114	1.0097	1.0150	1.0208	1.0248	1.0291	(40)
HLP (average) Days in mont	31	28	31	30	31	30	31	31	30	31	30	1.0228	
4 Water bestin													
4. Water heating													
Assumed occupano Hot water usage		r showers										2.7405	(42)
	87.8734	86.5281	84.5455	81.4954	78.7627	74.9396	71.9158	75.4508	77.2288	81.0154	84.9588	87.7942	(42a)
Hot water usage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage	for other 42.6959	uses 41.1433	39.5907	38.0382	36.4856	34.9330	34.9330	36.4856	38.0382	39.5907	41.1433	42.6959	(42c)
Average daily h	ot water u	use (litres,	/day)									119.8269	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water	use 130.5693	127.6714	124.1362	119.5336	115.2483	109.8726	106.8488	111.9364	115.2670	120.6061	126.1021	130.4901	(44)
Energy conte : Energy content	192.2206		177.3881	156.1408	148.5091	127.0641	118.0711	131.7512	133.7039	155.4132	170.4312 um(45)m =	191.6343	
Distribution los	ss (46)m												
Water storage 1	28.8331 oss:	25.3403	26.6082	23.4211	22.2764	19.0596	17.7107	19.7627	20.0556	23.3120	25.5647	28.7451	(46)
Store volume a) If manufact		ared loss f	actor is low	oum (MATh/d	latr/\ •							150.0000 2.0900	
Temperature fo	actor from	n Table 2b	uccol is an	OWII (AWII) G	ay,.							0.5400	(49)
Enter (49) or (5 Total storage 1		5)										1.1286	(55)
_	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(56)
If cylinder con	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(57)
Primary loss Combi loss	23.2624 0.0000	21.0112 0.0000	23.2624 0.0000	22.5120 0.0000	23.2624 0.0000	22.5120 0.0000	23.2624 0.0000	23.2624 0.0000	22.5120 0.0000	23.2624 0.0000	22.5120 0.0000	23.2624 0.0000	
Total heat requi	ired for w	water heati	ng calculate	ed for each	month								
WWHRS	250.4696 0.0000	221.5471 0.0000	235.6371 0.0000	212.5108 0.0000	206.7581 0.0000	183.4341 0.0000	176.3201 0.0000	190.0002 0.0000	190.0739 0.0000	213.6622 0.0000	226.8012 0.0000	249.8833 0.0000	
PV diverter Solar input FGHRS	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 0.0000	-0.0000	-0.0000 0.0000	(63b) (63c)
		0.0000	0.0000	0.0000	0.0000	0.0000		0.0000		0.0000			
Output from w/h		221.5471	235.6371	212.5108	206.7581	183.4341	176.3201						
12Total per year	r (kWh/vea	ar)						Total p	er year (kW	h/year) = S	um(64)m =	2557.0976 2557	
Electric shower			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		
					al Energy u							0.0000	
Heat gains from	water nea 110.5126	98.2605	montn 105.5807	97.0128	95.9785	87.3448	85.8578	90.4065	89.5525	98.2741	101.7644	110.3176	(65)
5. Internal gain													
Metabolic gains	(Table E)	Motte											
	Jan	Feb	Mar	Apr	May 137.0271	Jun 137 0271	Jul	Aug	Sep	Oct	Nov	Dec 137 0271	(66)
Lighting gains	(calculate	ed in Appen	dix L, equat	tion L9 or	L9a), also	see Table 5							
Appliances gains					131.4313 or L13a), a			131.4313	135.8123	131.4313	135.8123	131.4313	(67)
	256.5055	259.1672	252.4597	238.1804	220.1552	203.2141	191.8964	189.2347	195.9421	210.2215	228.2467	245.1878	(68)
	36.7027	36.7027	36.7027	36.7027	36.7027	36.7027	36.7027	36.7027				36.7027	
Pumps, fans Losses e.g. eva	0.0000 poration	0.0000 (negative v	0.0000 alues) (Tabi	0.0000 le 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
-:	109.6217	-109.6217			-109.6217	-109.6217	-109.6217	-109.6217	-109.6217	-109.6217	-109.6217	-109.6217	(71)
Water heating g			141.9096	134.7400	129.0033	121.3122	115.4003	121.5141	124.3785	132.0888	141.3394	148.2763	(72)
Total internal	gains				544.6979						569.5065	589.0035	
				1.2.0400			1121001					222.3000	,
6. Solar gains													

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[Jan]				rea m2	Solar flux Table 6a W/m2	Speci or	g fic data Table 6b	Specific or Tab	FF data le 6c	Acce fact Table	or	Gains W	
Southwest Northwest			11.7 6.9	100			0.6300 0.6300	0	.7000 .7000	0.77 0.77		131.6751 23.9996	
Solar gains Total gains													
7. Mean inter	rnal tempera												
Temperature of						Thl (C)						21.0000	(85)
tau	Jan 108.6866	Feb 108.9313	Mar 109.1721	Apr 110.3180	May 110.5350	111.5568						Dec 109.6424	
alpha util living a	8.2458 area n 9994	8.2621 0.9974		8.3545 0.9388	8.3690 0.7837	8.4371 0.5594	8.4371 0.4033		8.4107 0.7157	8.3690 0.9659	8.3398 0.9976	8.3095 0.9996	
Living Non living 24 / 16				20.8482	20.9727	20.9984	20.9999	20.9998	20.9896	20.8207	20.5120	20.2654	` '
Non living 24 / 16 24 / 9				19.9299 0 0	0	20.0733 0 0	20.0738 0 0	0	0	0	0	19.2069 0 0	
16 / 9 MIT	28 20.6358	0 20.4304	20.6175	0 20.8482	0 20.9727	0 20.9984	0 20.9999	0 20.9998	0 20.9896	0 20.8207	0 20.5120	10 20.3682	(87)
Th 2 util rest of		20.0536 0.9961		20.0644 0.9103	20.0661 0.7184	20.0738	20.0738	20.0753 0.3591	20.0708 0.6272	20.0661 0.9431	20.0627 0.9960	20.0592 0.9994	
MIT 2 Living area f	19.7240 fraction	19.4131	19.6505	19.9299		20.0733	20.0738	20.0752	20.0664	19.9072 Living are	19.5252 a / (4) =	19.3605 0.1748	(90) (91)
MIT Temperature a adjusted MIT	adjustment		19.8196 19.8196	20.0905	20.2106	20.2350	20.2357	20.2368	20.2278		19.6977	19.5366 0.0000 19.5366	
aajastea mii	13.0034	15.5510	15.0150	20.0303	20.2100	20.2550	20.2557	20.2300	20.2270	20.0003	13.0377	13.3300	(55)
8. Space heat	ting require	ment											
										0			
Utilisation Useful gains Ext temp.	755.5015		966.5951		May 0.7291 849.2738 11.7000	Jun 0.4936 569.8046 14.6000	Jul 0.3333 368.1029 16.6000		Sep 0.6427 616.8190 14.1000	Oct 0.9431 797.3193 10.6000	Nov 0.9952 753.7583 7.1000	Dec 0.9992 720.7087 4.2000	(95)
Heat loss rat	te W 1619.5341		1378.1075			570.5607	368.1261	387.8277	622.6641		1292.4684		
Space heating Space heating	642.8402		306.1652 per vear (kW		15.1913	0.0000	0.0000	0.0000	0.0000	126.5476	387.8712	639.3081 2652.5029	
Solar heating	g 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 Space heating	g kWh		306.1652	-	15.1913	0.0000	0.0000	0.0000	0.0000	126.5476	387.8712	0.0000	
Space heating Space heating		t after sol	lar contribu	tion - tota	ıl per year	(kWh/year)				(98c) / (4) =	2652.5029 26.4959	
9a. Energy re	equirements	- Individua	al heating s	ystems, inc	luding micr	o-CHP							
Fraction of s Fraction of s Efficiency of Efficiency of Efficiency of	space heat f f main space f main space	rom main sy heating sy heating sy	ystem(s) ystem 1 (in ystem 2 (in	용) 용)	em (Table 11)						0.0000 1.0000 248.5876 0.0000 0.0000	(202) (206) (207)
Space heating	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating	642.8402	429.7618	306.1652 sing system		15.1913	0.0000	0.0000	0.0000	0.0000	126.5476	387.8712	639.3081	(98)
Space heating	248.5876 g fuel (main	248.5876 heating sy	248.5876 /stem)	248.5876	248.5876	0.0000	0.0000	0.0000	0.0000	248.5876	248.5876	248.5876	
Space heating			123.1619 sing system 0.0000	42.1652 2) 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Space heating				0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Space heating	g fuel (seco 0.0000	ndary) 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	g requiremen												
Efficiency of	f water heat	221.5471 er 188.2367		212.5108 188.2367	206.7581 188.2367	183.4341 188.2367	176.3201 188.2367	190.0002 188.2367	190.0739 188.2367	213.6622 188.2367	226.8012 188.2367	249.8833 188.2367 188.2367	(216)
Fuel for wate	er heating,	kWh/month	125.1812	112.8955	109.8394	97.4486	93.6693	100.9368	100.2367	113.5072	120.4872	132.7495	
Space cooling (221)m	g fuel requi 0.0000	rement 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 Lighting Electricity	32.7159		0.0000 23.6315 ndix M) (neg	0.0000 17.3135 ative quant	0.0000 13.3734 (ity)	0.0000 10.9262	0.0000 12.1997	0.0000 15.8576	0.0000 20.5975	0.0000 27.0250	0.0000 30.5246	0.0000 33.6251	
(233a)m Electricity	-20.7063 generated by	-31.7310 wind turbi	-49.0953 ines (Append	-58.4465 lix M) (nega	-65.8373 tive quanti		-61.6276	-56.5507	-47.6304	-37.2376	-23.4939	-17.5986	
(234a)m Electricity ((235a)m	0.0000 generated by 0.0000	0.0000 hydro-elec 0.0000	0.0000 tric genera 0.0000	0.0000 tors (Apper 0.0000	0.0000 dix M) (neg 0.0000	0.0000 ative quant 0.0000	0.0000 (ity) 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Electricity ((235c)m	used or net 0.0000	electricity 0.0000	generated 0.0000	by micro-CH 0.0000	IP (Appendix 0.0000				0.0000	0.0000	0.0000	0.0000	
Electricity (233b)m	-4.1576	-9.5512	-20.6364	-34.1358	-47.7561	-48.8099	-48.3921	-40.1029	-28.7272	-15.3818	-5.9577	-3.2354	(233b)
Electricity ((234b)m Electricity (0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 ity)	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
(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)

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Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generated) (235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 Annual totals kWh/year Space heating fuel - main system 1 Space heating fuel - main system 2 Space heating fuel - secondary Efficiency of water heater Water heating fuel used Space cooling fuel Electricity for pumps and fans: Total electricity for the above, kWh/year Electricity for lighting (calculated in Appendix L) Energy saving/generation technologies (Appendices M ,N and Q) PV generation Wind generation Hydro-electric generation (Appendix N) Electricity generated - Micro CHP (Appendix N) Appendix Q - special features Energy saved or generated Energy used Total delivered energy for all uses	ration) 0.0000	0.0000	0.0000	0.00	1067.029 0.000 0.000 188.236 1358.447 0.000 264.035	(211) (213) (213) (215) (215) (217) (219) (221) (231) (232) (233) (234) (235) (235) (235) (236) (237)	(1)
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP							
Space heating - main system 1 100 Total CO2 associated with community systems Water heating (other fuel) 13: Space and water heating Pumps, fans and electric keep-hot	Energy Wh/year 67.0293 58.4477 0.0000 64.0358		factor CO2/kWh 0.1573 0.1408 0.0000 0.1443		Emission kg CO2/yea 167.895 0.000 191.299 359.195 0.000 38.108	r 9 (261) 0 (373) 7 (264) 6 (265) 0 (267)	
PV Unit electricity used in dwelling -5:	32.4968 06.8441		0.1333 0.1235		-70.982 -37.906 -108.889 288.414 2.880	7 4 (269)	
l3a. Primary energy - Individual heating systems including micro-CHP							
Space heating - main system 1 10 Total CO2 associated with community systems Water heating (other fuel) 13: Space and water heating Pumps, fans and electric keep-hot Energy for lighting 2:	Energy Wh/year 67.0293		CO2/kWh 1.5825		rimary energ kWh/yea 1688.559 0.000 2065.798 3754.357 0.000 404.987	0 (275) 0 (473) 0 (278) 0 (279) 0 (281)	
	32.4968 06.8441		1.4926 0.4534		-794.800 -139.113 -933.914 3225.429 32.220	8 3 (283) 6 (286)	
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS							
	Area (m2) 52.3300 47.7800	(lb) x	height (m) 2.5000 2.7000 3d)+(3e)	(2b) (2c)	Volum (m3 = 130.825 = 129.006 = 259.831) 0 (1b) 0 (1c) (4)	
2. Ventilation rate							
Number of open chimneys Number of open flues Number of chimneys / flues attached to closed fire Number of flues attached to solid fuel boiler Number of flues attached to other heater Number of blocked chimneys Number of intermittent extract fans Number of passive vents Number of flueless gas fires Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)- Pressure test Pressure Test Method	+(7c) =		40.0000	0 * 80 : 0 * 20 : 0 * 10 : 0 * 20 : 0 * 35 : 0 * 20 : 0 * 10 : 0 * 40 : 0 *	= 0.000 = 0.000 = 0.000 = 0.000 = 0.000 = 40.000 = 0.000 nges per hou	0 (6a) 0 (6b) 0 (6c) 0 (6d) 0 (6e) 0 (7a) 0 (7b) 0 (7c) r	

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Measured/design												5.0000	
Infiltration rat Number of sides Shelter factor									(20) = 1 -	IO 07E +	(10)1 -	0.4039 3 0.7750	(19)
Infiltration rat	e adjuste	d to includ	e shelter f	actor						1) = (18)		0.3131	
Wind speed Wind factor Adj infilt rate	Jan 5.1000 1.2750	Feb 5.0000 1.2500	Mar 4.9000 1.2250	Apr 4.4000 1.1000	May 4.3000 1.0750	Jun 3.8000 0.9500	Jul 3.8000 0.9500	Aug 3.7000 0.9250	Sep 4.0000 1.0000	Oct 4.3000 1.0750	Nov 4.5000 1.1250	Dec 4.7000 1.1750	
Effective ac	0.3991 0.5797	0.3913 0.5766	0.3835 0.5735	0.3444 0.5593	0.3365 0.5566	0.2974 0.5442	0.2974 0.5442	0.2896 0.5419	0.3131 0.5490	0.3365 0.5566	0.3522 0.5620	0.3678 0.5677	
3. Heat losses a	and heat l												
Element				Gross m2	Openings m2		tArea m2	U-value W/m2K	A x	K	-value kJ/m2K	A x K kJ/K	(0.7)
TER Opening Type Heatloss Floor 1 Exposed Floor Cavity Wall Basement Wall External Roof 1				73.9400 4.1100 18.0600	18.6700	52 9 55 4 18	.6700 .3300 .5900 .2700 .1100	1.1450 0.1300 0.1300 0.1800 0.1800 0.1100	21.377 6.802 1.246 9.948 0.739 1.986	9 7 6 8			(27) (28a) (28b) (29a) (29a) (30)
Total net area of Fabric heat loss Party Wall 1			Aum (A, m2)				.0300 (26)(3 .6400	30) + (32) = 0.0000	= 42.102 0.000				(31) (33) (32)
Thermal mass par List of Thermal		MP = Cm / T	FA) in kJ/m	2K								410.5713	(35)
K1 Eleme E2 Other E3 Sill E4 Jamb E24 Eave P3 Party E16 Corr E25 Stag E18 Part E14 Flat E17 Corr P1 Party P5 Party E5 Grout E20 Expc E21 Expc E22 Bass E19 Grot E6 Inter	ent clintels is (insular wall - Inter (normal grered parry wall ber croof ler (inversed floor rosed floor meent floor mediate f. Wall - E.	tion at ceintermediate lity wall bet tween dwell ted - interround floor oof (insula normal) (inverted) red (inverted) cor within xposed floor wyosed floor wyosed floor wyosed floor floor work of the correction	ween dwelli ings nal area gr tion at raf a dwelling or (normal)	- inverted) een dwellir ngs eater than ter level)	ngs (in bloc		s)	9 9 9.5 7 400 111. 6 133. 6 6 7, 27. 6 133. 2. 5, 4 4 40.	.1850 .2000 .2000 .2600 .5870 .4000 .9000 .9000 .7000 .5400 .8800 .1600 .0400	si-value 0.0500 0.0500 0.0500 0.2400 0.0600 0.0600 0.0600 0.0800 0.0800 0.0800 0.1600 0.3200 0.3200 0.3200 0.0700 0.0700 0.0700 0.0700 0.1600 0.2400	Total 0.45; 0.45; 1.26; 1.74; 0.00; 1.02; 0.38; 0.55; -0.69; 2.20; 0.52; 2.22; 0.69; 1.61; 0.28; 0.00; 0.69; 0.22;	33 33 30 30 24 40 40 40 40 20 20 20 20 20 20 20 20 20 20 20 20 20	(36)
Point Thermal br Total fabric hea	ridges	isi, caicai	acca asing	Appendia K					(3	3) + (36)	(36a) = + (36a) =	0.0000 56.8674	
Ventilation heat	Jan 49.7025	culated mon Feb 49.4373	thly (38)m Mar 49.1773	= 0.33 x (2 Apr 47.9562	25)m x (5) May 47.7277	Jun 46.6642	Jul 46.6642	Aug 46.4672	Sep 47.0738	Oct 47.7277	Nov 48.1899	Dec 48.6731	(38)
Heat transfer co Average = Sum(39	.06.5699		106.0447	104.8235	104.5951	103.5315	103.5315	103.3346	103.9412	104.5951	105.0573	105.5405 104.8224	(39)
HLP	Jan 1.0645	Feb 1.0619	Mar 1.0593	Apr 1.0471	May 1.0448	Jun 1.0342	Jul 1.0342	Aug 1.0322	Sep 1.0383	Oct 1.0448	Nov 1.0494	Dec 1.0542	(40)
HLP (average) Days in mont	31	28	31	30	31	30	31	31	30	31	30	1.0471 31	
4. Water heating			(kWh/year)										
Assumed occupand Hot water usage	y for mixer	showers										2.7405	
Hot water usage	90.1511 for baths 0.0000		86.8221 0.0000	0.0000	80.2573 0.0000	77.1486	75.3817 0.0000	77.3410	79.4887 0.0000	0.0000	0.0000	89.8057 0.0000	
	for other 42.6959	uses 41.1433	39.5907	38.0382	36.4856	34.9330	34.9330	36.4856	38.0382	39.5907	41.1433	42.6959 121.9307	(42c)
Average daily ho	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(43)
Daily hot water Energy conte 2	32.8470		126.4128 194.2918	121.0830 165.7565	116.7429 157.1583	112.0816 137.8175	110.3147 133.4161	113.8265 140.9410	117.5268 144.9223	122.4171 166.1189	127.8281 182.1146	132.5016 207.4655	
Energy content Distribution los			5)m 29.1438	24.8635	23.5737	20.6726	20.0124	21.1412	21.7383	Total = St 24.9178	um(45)m = 27.3172	2025.4320 31.1198	(46)
Water storage lo Store volume	ss:					20.0720	20.0124	211112	21.7505	24.3170	27.5172	150.0000	(47)
a) If manufactu Temperature fa Enter (49) or (5 Total storage lo	ctor from (4) in (55)	Table 2b	ctor is kno	wn (kwn/da	iy):							1.3938 0.5400 0.7527	(49)
If cylinder cont	23.3325 ains dedic			22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	
Primary loss Combi loss	23.3325 23.2624 0.0000	21.0112 0.0000	23.3325 23.2624 0.0000	22.5798 22.5120 0.0000	23.3325 23.2624 0.0000	22.5798 22.5120 0.0000	23.3325 23.2624 0.0000	23.3325 23.2624 0.0000	22.5798 22.5120 0.0000	23.3325 23.2624 0.0000	22.5798 22.5120 0.0000	23.3325 23.2624 0.0000	(59)
WWHRS - PV diverter Solar input	256.9921 -41.2133 -0.0000 0.0000 0.0000	227.1180 -36.4494 -0.0000 0.0000		d for each 210.8484 -31.6044 -0.0000 0.0000	month 203.7532 -29.4541 -0.0000 0.0000 0.0000	182.9093 -25.2041 -0.0000 0.0000 0.0000	180.0110 -23.6248 -0.0000 0.0000 0.0000	187.5359 -25.1226 -0.0000 0.0000 0.0000	-26.0771 -0.0000 0.0000	212.7138 -30.7421 -0.0000 0.0000 0.0000	227.2064 -34.8270 -0.0000 0.0000 0.0000	254.0604 -40.4501 -0.0000 0.0000 0.0000	(63a) (63b) (63c)

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12Total per ye	ar (kWh/yea		202.7190	179.2440	174.2991	157.7052	156.3861			181.9717 h/year) = Si			(64)
Electric showe	er(s) 0.0000	0.0000	0.0000	0.0000 Tot	0.0000 al Energy u	0.0000	0.0000	0.0000			0.0000 n(64a)m =		
Heat gains fro	m water hea 107.2330	ating, kWh/ 95.1918	month 101.8780		89.5311	_		84.1388		92.5105			
5. Internal ga	ins (see Ta	able 5 and	5a)										
Metabolic gain	s (Table 5)	, Watts										_	
(66)m Lighting gains	137.0271			137.0271	137.0271			Aug 137.0271	Sep 137.0271	Oct 137.0271	Nov 137.0271	Dec 137.0271	(66)
Appliances gai	131.4313	145.5132	131.4313	135.8123	131.4313	135.8123	131.4313	131.4313	135.8123	131.4313	135.8123	131.4313	(67)
Cooking gains	256.5055 (calculated	259.1672 d in Append	252.4597 lix L, equat:	238.1804 ion L15 or	220.1552 L15a), also	203.2141 see Table	191.8964 5			210.2215	228.2467	245.1878	(68)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	36.7027 3.0000	36.7027 0.0000	36.7027 0.0000	36.7027 0.0000	36.7027 0.0000	36.7027 3.0000	36.7027 3.0000	36.7027 3.0000	
Losses e.g. ev Water heating	-109.6217	-109.6217			-109.6217	-109.6217	-109.6217	-109.6217	-109.6217	-109.6217	-109.6217	-109.6217	(71)
Total internal	144.1303		136.9327	126.6493	120.3375	113.7469	109.7268	113.0898	117.0280	124.3420	134.2036	142.8201	(72)
Total Intellial		613.4430	587.9319	567.7501	539.0320	516.8814	497.1626	497.8638	512.8905	533.1029	565.3707	586.5473	(73)
6. Solar gains													
[Jan]				rea	Solar flux	Ci	g	C: 5: -	FF	Acces		Gains	
				m2 	Solar flux Table 6a W/m2	or or	Table 6b	or Tab	le 6c	facto Table (5d	W	
Southwest Northwest			11.7	100 600	36.7938 11.2829		0.6300 0.6300	0	.7000 .7000	0.770 0.770	00 00	131.6751 23.9996	(79) (81)
	155 6949								400 5401	005 5006	100 0141	100 0055	(00)
Solar gains Total gains	754.8499	886.5862	982.8326	1092.5426	1159.2381	1146.8518	1098.5913	1025.9313	952.4306	840.6935	753.2848	718.8330	(84)
7. Mean intern	al temperat	ture (heati	ng season)										
Temperature du	ring heatin	ng periods	in the livi	ng area fro	m Table 9, 1	Thl (C)						21.0000	(85)
Utilisation fa	Jan	Feb	Mar	Apr		Jun	Jul 110,2785	Aug 110.4887	Sep 109.8439	Oct 109.1572	Nov 108.6770	Dec 108.1794	
alpha util living ar	8.1423	8.1601				8.3519	8.3519	8.3659	8.3229	8.2771	8.2451	8.2120	
_	0.9995	0.9977	0.9906	0.9460	0.7998	0.5752	0.4145	0.4629	0.7341	0.9704	0.9979	0.9996	
MIT Th 2 util rest of h	20.0299		20.5949 20.0342	20.8312 20.0443	20.9672 20.0462	20.9979 20.0549	20.9999 20.0549	20.9997 20.0566	20.9871 20.0516	20.8043 20.0462			
MIT 2	0.9992		0.9853 19.6041	0.9194 19.8932	0.7339 20.0257	0.4918 20.0542	0.3256 20.0549	0.3682 20.0565	0.6431 20.0459	0.9495 19.8710	0.9966 19.4805		
Living area fr			19.7773		20.1903	20.2192	20.2201	20.2214	fLA =	Living area 20.0342	a / (4) =	0.1748	(91)
Temperature ad adjusted MIT	ljustment 19.3702	19.5464	19.7773	20.0572	20.1903	20.2192	20.2201	20.2214	20.2105	20.0342	19.6571	0.0000 19.3489	(93)
8. Space heati													
Utilisation		Feb 0.9956		Apr 0.9198		Jun 0.5064	Jul 0.3411		Sep 0.6590	0.9492	Nov 0.9957		
Useful gains Ext temp. Heat loss rate	4.3000				863.0450 11.7000	580.7726 14.6000	374.7649 16.6000	394.8003 16.4000	627.6988 14.1000	797.9889 10.6000	750.0833 7.1000	718.2750 4.2000	
	1606.0302	1556.9763	1407.9844	1169.5346	888.0387	581.7642	374.7959	394.8828	635.1282	986.7677	1319.2156	1598.8177	(97)
Space heating	633.9154		328.4370 er year (kW		18.5953	0.0000	0.0000	0.0000	0.0000	140.4515	409.7753	655.1238 2757.9143	(98a)
Solar heating	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 Space heating	kWh		ger year (m 328.4370		18.5953	0.0000	0.0000	0.0000	0.0000	140 4515	409 7753	0.0000 655.1238	(98c)
Space heating Space heating	requirement						0.0000	0.0000	0.0000		/ (4) =	2757.9143 27.5488	
	-												
9a. Energy req												0.0000	(201)
Fraction of sp Efficiency of	ace heat fi	rom main sy	stem(s)		m (labic ii,	,						1.0000 92.3000	(202)
Efficiency of Efficiency of	main space	heating sy	stem 2 (in	8)								0.0000	(207)
Course Nove 1	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating Space heating	633.9154	453.1082	328.4370		18.5953	0.0000	0.0000	0.0000	0.0000	140.4515	409.7753	655.1238	(98)
Space heating	92.3000	92.3000	92.3000		92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
			355.8364	128.3941	20.1466	0.0000	0.0000	0.0000	0.0000	152.1684	443.9602	709.7766	(211)

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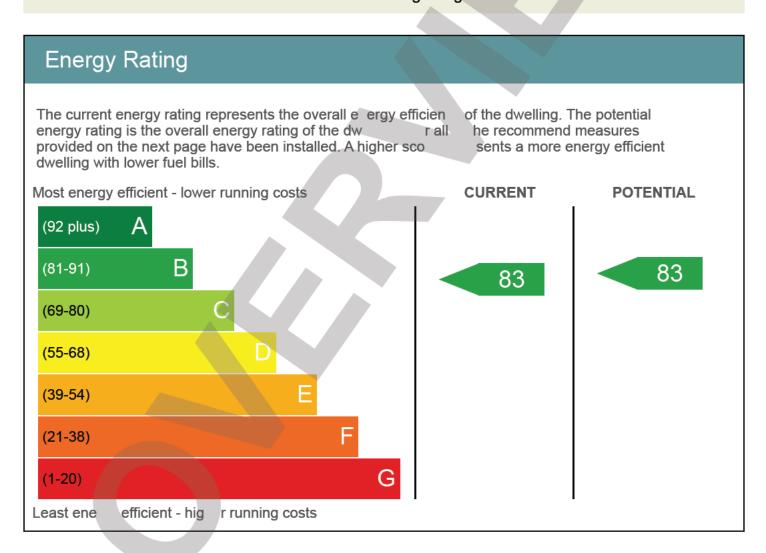
Space heating efficiency (main heating system 2) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0000 0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)					0.0000	
Space heating fuel (secondary)	0.0000 0.0000	0.0000	0.0000	0.0000	0.0000	
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.	0.0000 0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating Water heating requirement						
	5.3861 162.4133	163.9370	181.9717	192.3794	213.6103 79.8000	
(217)m 86.3275 85.9297 85.1354 83.1543 80.5874 79.8000 79.	9.8000 79.8000	79.8000	83.4859	85.7116	86.4039	
	5.9726 203.5254	205.4349	217.9670	224.4496	247.2230	(219)
Space cooling fuel requirement (221)m 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.000	0.0000 0.0000	0.0000	0.0000	0.0000	0.0000	(221)
	7.3041 7.3041 0.1834 13.2368	7.0685 17.1932	7.3041 22.5585	7.0685 25.4797	7.3041 28.0678	
Electricity generated by FVs (Appendix M) (negative quantity) (233a)m -33.3301 -48.1257 -70.8212 -81.5673 -89.5920 -84.1816 -83.		-68.2800	-55.8655	-37.0315	-28.6818	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000 0.0000	0.0000	0.0000	0.0000	0.0000	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)						
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if		0.0000	0.0000	0.0000	0.0000	
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
(233b)m -15.5301 -32.9983 -66.2090 -100.3669 -133.6314 -134.6366 -133. Electricity generated by wind turbines (Appendix M) (negative quantity)	3.0886 -112.2958	-81.7710	-47.5374	-20.8440	-12.2592	(233b)
	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
	0.0000 0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
(235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.		0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year Space heating fuel - main system 1					2987.9895	
Space heating fuel - main system 2 Space heating fuel - secondary					0.0000	
Efficiency of water heater Water heating fuel used					79.8000 2633.9959	(219)
Space cooling fuel					0.0000	(221)
Electricity for pumps and fans:						(001)
Total electricity for the above, kWh/year Electricity for lighting (calculated in Appendix L)					86.0000 220.3978	
Energy saving/generation technologies (Appendices M ,N and Q)						
PV generation Wind generation					-1649.3959 0.0000	
Hydro-electric generation (Appendix N) Electricity generated - Micro CHP (Appendix N)					0.0000	
					0.0000	(235)
Appendix Q - special features					0.0000	
Appendix Q - special features Energy saved or generated Energy used					-0.0000 0.0000	(236) (237)
Appendix Q - special features Energy saved or generated					-0.0000	(236) (237)
Appendix Q - special features Energy saved or generated Energy used					-0.0000 0.0000	(236) (237)
Appendix Q - special features Energy saved or generated Energy used					-0.0000 0.0000	(236) (237)
Appendix Q - special features Energy saved or generated Energy used Total delivered energy for all uses	Energy	Emissio:	n factor		-0.0000 0.0000	(236) (237)
Appendix Q - special features Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP	Energy kWh/year	kg	CO2/kWh	k	-0.0000 0.0000 4278.9874 Emissions g CO2/year	(236) (237) (238)
Appendix Q - special features Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems	Energy kWh/year 2987.9895	kg	0.2100	k	-0.0000 0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000	(236) (237) (238) (261) (373)
Appendix Q - special features Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating	Energy kWh/year 2987.9895 2633.9959	kg	CO2/kWh 0.2100 0.2100	k	-0.0000 0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391 1180.6169	(236) (237) (238) (261) (373) (264) (265)
Appendix 0 - special features Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel)	Energy kWh/year 2987.9895	kg	0.2100	k	-0.0000 0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391	(236) (237) (238) (261) (373) (264) (265) (267)
Appendix 0 - special features Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies	Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978	kg	CO2/kWh 0.2100 0.2100 0.1387 0.1443	k	-0.0000 0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102	(261) (373) (261) (373) (264) (267) (268)
Appendix Q - special features Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported	Energy kWh/year 2987.9895 2633.9959 86.0000	kg	CO2/kWh 0.2100 0.2100 0.1387	k	-0.0000 0.0000 4278.9874 Emissions G CO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102	(236) (237) (238) (261) (373) (264) (267) (267) (268)
Appendix Q - special features Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling	Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978	kg	CO2/kWh 0.2100 0.2100 0.1387 0.1443	k	-0.0000 0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102	(236) (237) (238) (261) (373) (264) (267) (267) (268)
Appendix Q - special features Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total	Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978	kg	CO2/kWh 0.2100 0.2100 0.1387 0.1443	k	-0.0000 0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102 -101.6764 -111.9465 -213.6229	(261) (373) (238) (261) (373) (264) (267) (268)
Appendix 0 - special features Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year	Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978	kg	CO2/kWh 0.2100 0.2100 0.1387 0.1443	k	-0.0000 0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102 -101.6764 -111.9465 -213.6229 1010.7335	(261) (373) (238) (261) (373) (264) (267) (268)
Appendix 0 - special features Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year	Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978	kg	CO2/kWh 0.2100 0.2100 0.1387 0.1443	k	-0.0000 0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102 -101.6764 -111.9465 -213.6229 1010.7335	(261) (373) (238) (261) (373) (264) (267) (268)
Appendix Q - special features Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER)	Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978 -758.2276 -891.1682	kg	CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1341 0.1256	k	-0.0000 0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102 -101.6764 -111.9465 -213.6229 1010.7335	(261) (373) (238) (261) (373) (264) (267) (268)
Appendix 0 - special features Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER)	Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978 -758.2276 -891.1682	kg Primary energy kg	CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1341 0.1256	k	-0.0000 0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102 -101.6764 -111.9465 -213.6229 101.7335 10.1000 ary energy	(261) (237) (238) (261) (373) (264) (267) (268) (269) (272) (273)
Appendix 0 - special features Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems	Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978 -758.2276 -891.1682 Energy F kWh/year 2987.9895	kg Primary energ kg	CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1341 0.1256 y factor CO2/kWh 1.1300	Prim	-0.0000 0.0000 4278.9874 Emissions GCO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102 -101.6764 -111.9465 -213.6229 1010.7335 10.1000 ary energy kWh/year 3376.4282 0.0000	(236) (237) (238) (261) (373) (264) (267) (268) (269) (272) (273)
Appendix 0 - special features Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating	Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978 -758.2276 -891.1682 Energy kWh/year 2987.9895 2633.9959	kg Primary energy kg	CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1341 0.1256 y factor CO2/kWh 1.1300 1.1300	k	-0.0000 0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102 -101.6764 -111.9465 -213.6229 1010.7335 10.1000 ary energy kWh/year 3376.4282 0.0000 2976.4154	(236) (237) (238) (238) (261) (263) (264) (265) (267) (268) (272) (273) (273)
Appendix Q - special features Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel)	Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978 -758.2276 -891.1682 Energy F kWh/year 2987.9895	kg Primary energy kg	CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1341 0.1256 y factor CO2/kWh 1.1300	k	-0.0000 0.0000 4278.9874 Emissions GCO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102 -101.6764 -111.9465 -213.6229 1010.7335 10.1000 ary energy kWh/year 3376.4282 0.0000	(261) (373) (238) (261) (373) (264) (267) (268) (267) (272) (273) (273)
Appendix Q - special features Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies	Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978 -758.2276 -891.1682 Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978	kg Primary energ kg	CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1341 0.1256 y factor CO2/kWh 1.1300 1.1300 1.5128 1.5338	Prim	-0.0000 0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102 -101.6764 -111.9465 -213.6229 1010.7335 10.1000 ary energy kWh/year 3376.4282 0.0000 2976.4154 6352.8436 130.1038	(261) (373) (238) (261) (373) (264) (267) (268) (267) (272) (273) (273)
Appendix Q - special features Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling Pumps, fans and electric keep-hot Energy saving/generation technologies PV Unit electricity used in dwelling	Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978 -758.2276 -891.1682 Energy F kWh/year 2987.9895 2633.9959 86.0000	kg Primary energ kg	CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1341 0.1256 y factor CO2/kWh 1.1300 1.1300 1.5128	Prim	-0.0000 0.0000 4278.9874 Emissions GCO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102 -101.6764 -111.9465 -213.6229 1010.7335 10.1000 ary energy kWh/year 3376.4282 0.0000 2976.4154 6352.8436 6352.8436	(236) (237) (238) (238) (261) (373) (264) (265) (267) (268) (272) (273) (273) (273) (278) (279) (281) (282)
Appendix Q - special features Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total	Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978 -758.2276 -891.1682 Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978 -758.2276	kg Primary energ kg	CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1341 0.1256 y factor CO2/kWh 1.1300 1.1300 1.5128 1.5338	Prim	-0.0000 0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102 -101.6764 -111.9465 -213.6229 1010.7335 10.1000 ary energy kWh/year 3376.4282 0.0000 2976.4154 6352.8436 130.1008 338.0535	(236) (237) (238) (238) (261) (373) (264) (265) (267) (268) (272) (273) (273) (273) (278) (279) (282)
Appendix Q - special features Energy saved or generated Energy used Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total Total CO2, kg/year EPC Target Carbon Dioxide Emission Rate (TER) Space heating - main system 1 Total CO2 associated with community systems Water heating (other fuel) Space and water heating Pumps, fans and electric keep-hot Energy for lighting Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported	Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978 -758.2276 -891.1682 Energy kWh/year 2987.9895 2633.9959 86.0000 220.3978 -758.2276	kg Primary energ kg	CO2/kWh 0.2100 0.2100 0.1387 0.1443 0.1341 0.1256 y factor CO2/kWh 1.1300 1.1300 1.5128 1.5338	Prim	-0.0000 0.0000 4278.9874 Emissions g CO2/year 627.4778 0.0000 553.1391 1180.6169 11.9293 31.8102 -101.6764 -111.9465 -213.6229 100.0703 10.1000 ary energy kWh/year 3376.4282 0.0000 2976.4154 6352.8436 6352.8436 6352.8436 6352.8436	(261) (373) (238) (261) (373) (264) (267) (268) (267) (272) (273) (273) (273) (278) (279) (279) (281) (282)

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Dwelling Address	Unit 1, Highland Square , Bristol
Report Date	05/03/2024
Property Type	Maisonette, Semi-Detached
Floor Area [m ²]	100

This document is not an Energy Performance Certificat EPC) s required by the Energy Performance of Buildings Reg io



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Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good
Feature	Description			gy Performance
Walls	Average thermal transmi	ttance 0.18 W/m²K		Very Good
Roof	Average thermal transmi	ttance 0.11 W/m²K		Very Good
Floor	Average thermal transmi	Very Good		
Windows	High performance glazin	Good		
Main heating	Air source heat pump, ra	Good		
Main heating controls	Time and temperature z	Very Good		
Secondary heating	None			
Hot water	From main sys m	Average		
Lighting	Good ligh g efficien	Good		
Air tightness	Air perme 50] =	4.5 h.m² (assumed)		Good

Primary Energy use

The primary energy use for this property per year is 29 kilowatt hour (kWh) per square metre

Estim ted CO₂ missions of the dwelling

The estimated ing provides an indication of the dwelling's impact on the environment in terms of carbon dioxide emissions; the higher the rating the less impact it has on the environment.

The estimated CO emissions for this dwellings is: 0.3 per year

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With the recommended measures the potential CO emissions could be:

0

per year

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelli

To reach the dwelling's potential energy rating all of the recommended measures shown would d to be installed.

Having these measures installed individually or in any other order may give a different result omp d with the cumulative potential rating.

Recommended measure	Typical	Potential Rati	C ulative	Cumulative
	Yearly	after	avings	Potential
	Saving	measure insta	(per year)	Rating

Estimated energy use and potential aving

Estimated energy cost for this property over a year

£628

Over a year you could save

£0

The estimated cost and saving how how much the average hou ld would spend in this property heating, lighting and hot water. It not based on how e is used by the people living at the pr

Containg the ssessor and the accreditation scheme

As	ssessor contact details	
Assessor name		
Assessor's accreditation number		
Email Address		

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Accreditation scheme contact details						
Accreditation scheme	Elmhurst Energy Systems Ltd					
Telephone						
Email Address						

Assessment details					
Related party disclosure	No related pa				
Date of assessment	05/03/202				
Date of certificate	05/03/202				
Type of assessment	SAP w dwellin				











BRIDGING THE PERFORMANCE GAP

Building Energy Experts is an award-winning sustainability consulting, testing, and retrofit company. We help housebuilders, homeowners, architects, and planners to design robust sustainability strategies, calculate energy profiles, and model the energy performance of new buildings.















