

Project No: 21784

Bury Metropolitan Borough Council
Energy Statement

Proposed Development on Land Adjacent to 176 Bury New Road, Whitefield,
Manchester, M45 6QF

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SAP Calculations – SBEM Calculations – Renewable Energy Statements – Energy Performance Certificates
Air Tightness Testing – Extract Fan Testing – Water Calculations – DEC Assessments – Room Integrity Testing



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1	05/03/2025	AB	Issued for submission

Executive Summary

This report has been commissioned in response to the Sustainable and Low Carbon Planning Policy requirements of Bury Metropolitan Borough Council and moreover the Places for Everyone (PfE) Joint Development Plan Document (DPD), in respect to the proposed construction of a Commercial Class E unit and a residential flat above on Land Adjacent to 176 Bury New Road, Whitefield, Manchester, M45 6QF.

The Statement outlines an overall commitment to reducing energy consumption under occupancy through the adoption of enhanced insulation standards and improved HVAC & lighting efficiencies, together with the installation of low carbon and renewable technologies. The methodology used herein is consistent with the widely regarded energy hierarchy approach to improving the energy performance of buildings and Approved Document L 2021 of the Building Regulations.

The report clearly demonstrates that the proposed development will be net zero carbon with predicted overall carbon dioxide emissions of **-60.80 kg/year**, whilst the residential aspect will also have a space heating demand of **12.99 kWh/m²/year**, together with a **47.58%** reduction in the energy required for water heating.

This will be achieved through enhanced insulation standards, the installation of air source heat pumps, together with a PV array with a minimum output capacity of 5.785 kWp. It is initially proposed that the PV installation will comprise of 10 x 445 W panels being installed on the south west facing pitched roof to the front and a further 3 x 445 W panels on the south east facing pitched roof space to the side, which will require approx. 19.40 m² and 5.80 m² of roof space respectively.

In the circumstances, the proposed energy strategy and predicted energy performance of the proposed development is therefore deemed to satisfy the mandatory planning requirements of *Policy JP-S2: Carbon and Energy* of the PfE Joint DPD (March 2024).

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1.0 Introduction

- 1.1 EPS Group have been appointed to provide an Energy Statement to support the planning application in relation to the proposed construction of a Commercial Class E unit and a residential flat above on Land Adjacent to 176 Bury New Road, Whitefield, Manchester, M45 6QF.
- 1.2 It is anticipated that the residential flat will need to comply with the requirements of Approved Document L1 2021 of the Building Regulations, whilst the Commercial Class E unit will need to satisfy Approved Document L2 2021.
- 1.3 The energy consumption of the proposed dwelling has therefore been assessed using the National Calculations Method (NCM) - SAP 10 (Standard Assessment Procedure) and the Commercial Class E unit with NCM - SBEM (Simplified Building Energy Model) v6.1e, in order to determine the predicted annual regulated carbon dioxide (CO₂) emissions of the development and the associated reduction targets.
- 1.4 The following fuel emissions factors have been used within the underlying calculations as defined by the updated NCM:

Fuel	CO ₂ emission factor (kgCO ₂ /kWh)
Grid supplied electricity	0.136
Grid displaced electricity	0.136

- 1.5 This report should be used for planning purposes only and should be reassessed and where necessary, resubmitted at the Building Control stage if alternative building specifications or proposed HVAC systems are adopted as oppose to those outlined within the report.
- 1.6 It is also highlighted that the SAP & SBEM calculations utilised within the report rely on a number of standard operational parameters which may not ultimately match the actual measures adopted within the finalised development. Whilst they provide a 'like for like' comparison for the purpose of this report, they are not valid for Building Control applications or for the actual operation of the development post completion.
- 1.7 The dimensions for all units that are referenced within this report are based upon SAP & SBEM measurement conventions which may result in slight differences with other dimensions quoted elsewhere.

2.0 Planning Policy Context

2.1 National

The National Planning Policy Framework (NPPF) outlines the Government's planning policies for England and how these are expected to be applied by local authorities. Section 14 of this document details how local policies should address climate change through the promotion of energy efficiency and the adoption of low carbon and renewable technologies. It states:

"14.0 Meeting the challenge of climate change, flooding and coastal change

161. *The planning system should support the transition to net zero by 2050 and take full account of all climate impacts including overheating, water scarcity, storm and flood risks and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.*

Planning for climate change

162. *Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating and drought from rising temperatures⁶¹. Policies should support appropriate measures to ensure the future health and resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.*

163. *The need to mitigate and adapt to climate change should also be considered in preparing and assessing planning applications, taking into account the full range of potential climate change impacts.*

164. *New development should be planned for in ways that:*

a) avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through incorporating green infrastructure and sustainable drainage systems; and

b) help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings in plans should reflect the Government's policy for national technical standards.

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

a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, and their future re-powering and life extension, while ensuring that adverse impacts are addressed appropriately (including cumulative landscape and visual impacts);

b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and

- c) *identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.*
166. *In determining planning applications, local planning authorities should expect new development to: a) comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and b) take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.*
167. *Local planning authorities should also give significant weight to the need to support energy efficiency and low carbon heating improvements to existing buildings, both domestic and non-domestic (including through installation of heat pumps and solar panels where these do not already benefit from permitted development rights). Where the proposals would affect conservation areas, listed buildings or other relevant designated heritage assets, local planning authorities should also apply the policies set out in chapter 16 of this Framework.*
168. *When determining planning applications for all forms of renewable and low carbon energy developments and their associated infrastructure, local planning authorities should:*
- a) *not require applicants to demonstrate the overall need for renewable or low carbon energy, and give significant weight to the benefits associated with renewable and low carbon energy generation and the proposal's contribution to a net zero future;*
 - b) *recognise that small-scale and community-led projects provide a valuable contribution to cutting greenhouse gas emissions;*
 - c) *in the case of applications for the repowering and life-extension of existing renewable sites, give significant weight to the benefits of utilising an established site.*
- 169 *Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas."*

2.2 Local

The Places for Everyone Joint Development Plan 2022 to 2039 was adopted with effect from 21 March 2024 and includes the following relevant policy

"Policy JP-S2: Carbon and Energy

The aim of delivering a carbon neutral Greater Manchester no later than 2038, with a dramatic reduction in greenhouse gas emissions, will be supported through a range of measures including:

1. *Promoting the retrofitting of existing buildings with measures to improve energy efficiency and generate renewable and low carbon energy, heating and cooling;*
2. *Promoting the use of life cycle cost and carbon assessment tools to ensure the long-term impacts from development can be captured;*
3. *Taking a positive approach to renewable and low carbon energy schemes, particularly schemes that are led by, or meet the needs of local communities;*

4. *Increasing the range of nature-based solutions including carbon sequestration through the restoration of peat-based habitats, woodland management, tree planting and natural flood management techniques;*
5. *An expectation that new development will, unless it can be demonstrated that it is not practicable or financially viable;*
 - a. *Be net zero carbon which applies:*
 - *from adoption – to regulated operational carbon emissions;*
 - *from 2028 – to all emissions ‘in construction’.*

From 2025 development should also calculate and minimise carbon emissions from unregulated emissions alongside regulated emissions.

Development proposals should set out how this has been achieved in an energy statement in accordance with the energy hierarchy, which in order of importance seeks to:

- i. *Minimise energy demand;*
- ii. *Maximise energy efficiency;*
- iii. *Use renewable energy;*
- iv. *Use low carbon energy; and*
- v. *Utilise other energy sources.*

From 2025 any residual carbon emissions that cannot be fully mitigated on-site should be offset, in agreement with the relevant local planning authority through a financial contribution to a carbon offset fund.

As an interim measure, development should be consistent with the 2022 Part L Building Regulations unless superseded by changes to building regulations and/or national or local planning policies.

b. Incorporate adequate electric vehicle charging points, in line with Part S of the Building Regulations, unless superseded by relevant Local Plan policies, to future proof for the likely long-term demand, taking account of the potential maximum energy demand for the site;

c. Where practicable, prioritise connection to a renewable energy/heating/cooling network in the first instance or a low carbon energy/heating/cooling network that is adaptable to non-fossil fuels at a later date;

d. In residential developments, achieve energy demand reductions in terms of space heat demand; hot water energy demand and the delivery of on-site renewable energy generation, in accordance with Table 5.1.

For renewable energy generation priority should be given to PV installation where technically feasible, alternative technologies will be appropriate where the equivalent generation is evidenced.

e. For non-residential developments, achieve at least BREEAM excellent standard (or equivalent) for the ‘Ene 01 – reduction of energy use and carbon emissions’ category rising to ‘BREEAM outstanding’ equivalent for ENE 01 from 2028.

f. Include a detailed energy statement to demonstrate via site relevant evidence how the development has sought to maximize reductions in carbon emissions in line with relevant policy targets, including the minimisation of

overheating risks and appropriate measures for post occupancy evaluation. Whole life cycle emissions should be considered where possible.

Districts may set out specific carbon emission reduction and energy demand targets within Local Plans."

Table 5.1 Best Practice Thresholds for Reducing Energy Demand and Onsite Renewable Energy Generation within residential developments

-	Space Heat Demand²⁵	Hot Water Energy Demand²⁶	Renewable Energy Generation Targets
2021 - 2025	Houses (30kWh/m ²) Flats (25kWh/m ²)	20% energy demand reduction in the total heat required for water heating	*Photovoltaic installation: 20% ground floorspace
2025 - onwards	Houses (20kWh/m ²) Flats (15kWh/m ²)	^20% energy demand reduction in the total heat required for water heating	*Photovoltaic installation: 40% ground floorspace
*Ground floorspace used as a proxy for available roof area.	-	-	-
^will need to be reviewed with Future Homes Standard 2025 to determine if savings already embedded.	-	-	-

2.3 Conclusions

On review of the above planning requirements, it is evident that there is a need to construct dwellings with an energy performance standard significantly beyond the mandatory requirements of Approved Document L 2021 of the Building Regulations.

In particular, the development will need to target net zero carbon and the residential aspect will need to achieve a maximum space heating demand of 25 kWh/m²/yr, together with a 20% reduction in the energy required for water heating.

Furthermore, the development will need to incorporate a Photovoltaic installation equivalent to 20% of the ground floor space.

3.0 Proposed Energy Strategy

- 3.1 The proposed development benefits from a range of passive design features including an internal layout that facilitates natural cross-ventilation, which should act to reduce overheating risks during the summer months and reduce the likelihood of any future installation of mechanical cooling in the flat.
- 3.2 In accordance with the 'Lean' principles of the Energy Hierarchy, it is provisionally proposed to adopt the following minimum fabric, heating and lighting standards within the development as a means of reducing the overall regulated energy demand prior to considering the use of renewable technologies:

Table 1: Proposed 'Lean' Fabric and Lighting Standards		
Element / Feature	Current Approved Document L 2021 Minimal Acceptable Standard	Proposed Development Target
External Wall U-value	0.26 W/m ² K	0.17 W/m²K
Ground Floor U-Value (Flat)	0.18 W/m ² K	0.15 W/m²K
Ground Floor U-Value (Commercial)	0.18 W/m ² K	0.16 W/m²K
Pitched Roof U-Value	0.16 W/m ² k	0.14 W/m²K
Windows U-Value	1.60 W/m ² K	1.20 W/m²K
Air Permeability	8.00 m ³ /m ² .h	2.50 m³/m².h
Thermal Bridging	-	Combination of Recognised and Acceptable Irish Construction Details
Lighting to Flat	All fixed lighting to have an efficacy of 75 lm/W	80 lm/W
Lighting to Commercial	All fixed lighting to have an efficacy of 95 lm/W	120 lm/W
Lighting Controls to Commercial	-	Local manual switching to WC and standalone daylight dimming sensors with a parasitic power if 0.10 W/m² to sales area
Proposed HVAC Standards		
Heating to Flat	MCS Approved Air Source Heat Pump to Zoned Underfloor Heating (Mitsubishi Ecodan 6 kW PUZ-WM60VAA)	
Hot Water to Flat	150 litre storage cylinder with a declared heat loss of 1.86 kWh/day Shower to have max. 9 l/s flow rate	
Heating Controls to Flat	Time and Temperature Zone Control	
Heating, Cooling & Hot Water to Commercial	Highly efficient Air to Air Source Heat Pump with a SCOP of 4.61, SEER of 8.51 & EER of 5.20. (Daikin Mutli+)	
Hot Water Storage to Commercial	COP of 2.19 with 90 litres storage capacity and a standing heat loss of 1.10 kWh/day (Daikin EKHWE90-BV3)	

Ventilation to Flat	Mechanical Ventilation with Heat Recovery Unit (Nuaire MRXBOX-ECO3)
Ventilation to Commercial	Natural Ventilation with Intermittent Extract Fan to WC

- 3.3 The above build standards will ensure that the development has a vastly reduced energy demand in comparison to the minimum requirements of Approved Document L 2021 of the Building Regulations. This will help to reduce the overall energy consumption and the associated CO₂ emissions arising from occupancy.

4.0 Review of Low Carbon and Renewable Technologies

4.1 In response to the local planning requirements and in line with the 'Green' principles of the Energy Hierarchy a number of different low carbon and renewable technologies were reviewed in terms of their overall suitability for use within the proposed development.

4.2 Wind Turbine (Column or Roof Mounted)

Benefits	When installed in optimum positions, wind turbines can generate a large amount of renewable electricity, the surplus of which can be exported at financial gain to the national grid via the Smart Export Guarantee scheme.
Site Limitations / Restrictions	- Not aesthetically pleasing and will not be in keeping with the immediate local area. - The site is too sheltered as a result of its urban location which would result in unreliable and insufficient outputs. - Require on-going maintenance which future occupants may neglect. - Can produce unacceptable levels of noise to occupants and neighbours.
Conclusion	The technology is not deemed as being suitable for use within the proposed development.

4.3 Solar Photovoltaic

Benefits	- When installed in optimum positions photovoltaic (PV) arrays can generate a large amount of renewable electricity which can be used locally or exported at financial gain to the national grid via the Smart Export Guarantee scheme. - Minimal on-going costs & maintenance issues following installation. - The development benefits from near optimum south east and south west facing pitched roof spaces, which will increase the efficiency and generation capacity of the PV panels. - Easy to integrate into a conventional build specification.
Site Limitations / Restrictions	- PV panels are not always aesthetically pleasing and may detract from the visual appearance of the development. - As a result of the rapid decarbonisation of the national grid the amount of CO₂ savings with this technology is limited as the CO₂ emission factor for grid displaced electricity is relatively low.
Conclusion	It is proposed to use this technology within the proposed development.

4.4 Solar Thermal

Benefits	- Solar hot water systems can provide an efficient way of contributing to a dwelling's overall hot water requirements. - Minimal on-going costs & maintenance issues following installation.
Site Limitations / Restrictions	- The amount of CO₂ / useful energy savings with this technology is restricted as there is no benefit to producing more hot water than is used within a building. - Solar collectors are not always aesthetically pleasing and may detract from the visual appearance of the development.
Conclusion	The technology is not deemed as being suitable for use within the proposed development.

4.5 **Ground Source Heat Pump**

Benefits	- High operating efficiencies (CoPs). - Reliable and proven technology. - Generally low maintenance costs. - No visual impact on the development.
Site Limitations / Restrictions	- Detailed ground surveys required. - Trench installations require significant areas of land. - Minimal space to facilitate an installation. - High capital installation costs potentially rendering the technology financially unviable. - If sufficient capacity isn't available within the Distribution Network, then local upgrades may be required which could render the technology financially unviable.
Conclusion	It is not proposed to use this technology within the proposed development.

4.6 **Air Source Heat Pump**

Benefits	- High operating efficiencies (CoPs). - Reduced visual impact on the property. - Reliable and proven technology. - Generally low maintenance costs.
Site Limitations / Restrictions	- Often require a supplementary immersion heating system for the production of hot water. - The external compressors can result in some noise problems, although this can be limited through the careful selection of particular models with low acoustic levels of operation and the potential use of acoustic housing units.
Conclusion	It is proposed to use this technology within the proposed development (as detailed in Table 1).

4.7 **Biomass Boilers**

Benefits	Reliable and proven technology.
Site Limitations / Restrictions	- Require large storage facilities for the fuel. - On-going cleaning, maintenance and management requirements. - Require regular fuel deliveries. - Would contribute to poor local air quality.
Conclusion	It is not proposed to use this technology within the proposed development.

4.8 On review of the above technologies, the use of PV panels is recommended as being the most viable and cost effective technology for use within the proposed development. This will provide a local source of renewable electricity for occupant use as well as an affordable reduction in the calculated carbon dioxide emissions.

4.9 It is therefore proposed to install a PV array with a total minimum output capacity of 5.785 kWp. It is initially thought that the PV installation will comprise of 10 x 445 W panels being installed on the south west facing pitched roof to the front and a further 3 x 445 W panels on the south east facing pitched roof space to the side, which will require approx. 19.40 m² and 5.80 m² of roof space respectively.

4.10 Furthermore, as detailed in Section 3, the use of Air Source Heat Pump technology is proposed as a means of providing the dwelling with a decentralised source of low carbon heating and hot water, whilst the Commercial Unit will also have low carbon heating, hot water and cooling through an Air to Air Source Heat Pump.

4.11 The heat pump and hot water systems will be designed, tested and commissioned to current approved standards.

5.0 Calculated Energy Performance - Illustrative

- 5.1 SAP 10 has been utilised as an appropriate method for calculating the predicted energy consumption arising from the proposed dwelling, whilst SBEM v6.1e has been used for the proposed Commercial Class E Unit. The benefit of this method is that it enables improvements in both build fabric and system efficiencies to be fully quantified. As such, it is consistent with the Energy Hierarchy approach to energy conservation.
- 5.2 Predictive SAP 10 and SBEM v6.1e Calculations were prepared for the development based upon the proposed design parameters outlined within Section 3 of this report, together with the PV proposals outlined in Paragraph 4.9.
- 5.3 The key results of these calculations are summarised within the tables below with the full SAP calculation worksheets and corresponding BRUKL document provided within the Appendices of this report for detailed review:

Table 2: Residential Development CO ₂ Emissions (SAP 10)		
Floor Area (m ²)	Dwelling Emission Rate (DER)	Annual Proposed CO ₂ Emissions (Kg / Year)
63.18	-0.21	-13.34

Table 3: Residential Development Energy Demand			
Floor Area (m ²)	Space Heating Demand (kWh/m ² /yr)	Target Hot Water Demand (kWh/yr)	Proposed Hot Water Demand (kWh/yr)
63.18	12.99	2,582.56	1,353.68
Percentage Reduction in the Hot Water Energy Demand			47.58%

Table 4: Commercial Development CO ₂ Emissions (SAP 10)		
Floor Area (m ²)	Building Emission Rate (DER)	Annual Proposed CO ₂ Emissions (Kg / Year)
69.79	-0.68	-47.46

- 5.4 Upon review of the above, it is evident that the proposed development will be net zero carbon with predicted overall carbon dioxide emissions of **-60.80 kg/year**, whilst the residential aspect will also have a space heating demand of **12.99 kWh/m²/year**, together with a **47.58%** reduction in the energy required for water heating.
- 5.5 In the circumstances, the proposed energy strategy and predicted energy performance of the proposed development is therefore deemed to satisfy the mandatory planning requirements of *Policy JP-S2: Carbon and Energy* of the PfE Joint DPD (March 2024).



Appendix 1:

BRUKL Report (SBEM Derived)

Project name

Commercial Unit

As designed

Date: Wed Mar 05 13:50:08 2025

Administrative information

Building Details

Address: Commercial Unit, LA to 176 Bury New Road,
Whitefield, M45 6QF

Certifier details

Name: Daniel Towns

Telephone number: 0115 7270599

Address: EPS Group 3C Pelham Court Pelham Road,
Nottingham, NG5 1AP

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v7.2.0

BRUKL compliance module version: v6.1.e.1

Foundation area [m²]: 34.9

The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	4.87
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	-0.68
Target primary energy rate (TPER), kWh _{PE} /m ² .annum	52.21
Building primary energy rate (BPER), kWh _{PE} /m ² .annum	-9.96
Do the building's emission and primary energy rates exceed the targets?	BER =< TER BPER =< TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _a -Limit	U _a -Calc	U _i -Calc	First surface with maximum value
Walls*	0.26	0.17	0.17	Ground Floor - Dis. WC_W_7
Floors	0.18	0.16	0.16	Ground Floor - Dis. WC_S_3
Pitched roofs	0.16	0.14	0.14	Ground Floor - Dis. WC_R_4
Flat roofs	0.18	-	-	No heat loss flat roofs
Windows** and roof windows	1.6	1.2	1.2	Ground Floor - Dis. WC_G_9
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	-	-	No external personnel doors
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

U_a-Limit = Limiting area-weighted average U-values [W/(m²K)]

U_a-Calc = Calculated area-weighted average U-values [W/(m²K)]

U_i-Calc = Calculated maximum individual element U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	2.5

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Daikin Multi+

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.61	8.51	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- Daikin Multi+

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	0.058
Standard value	N/A	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1			
Ground Floor - Dis. WC	0.3	-	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
Ground Floor - Dis. WC	125	-	-
Ground Floor - Sales Area	125	125	1.2

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Ground Floor - Dis. WC	NO (-81.6%)	NO
Ground Floor - Sales Area	NO (-40.2%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	69.8	69.8
External area [m ²]	153.8	153.8
Weather	MAN	MAN
Infiltration [m ³ /hm ² @ 50Pa]	3	3
Average conductance [W/K]	39.12	59.07
Average U-value [W/m ² K]	0.25	0.38
Alpha value* [%]	28.5	35.96

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
100	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	5.22	14.61
Cooling	5.72	5.5
Auxiliary	0.39	0.52
Lighting	13.73	13.87
Hot water	1.68	0.57
Equipment*	20.22	20.22
TOTAL **	26.74	35.07

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	34.31	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>34.31</i>	<i>0</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	204.99	226.04
Primary energy [kWh _{PE} /m ²]	-9.96	52.21
Total emissions [kg/m ²]	-0.68	4.87

HVAC Systems Performance

System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	80.7	124.3	5.2	5.7	0.4	4.3	6.04	4.61	8.51
Notional	138.9	87.2	14.6	5.5	0.5	2.64	4.4	----	----

Key to terms

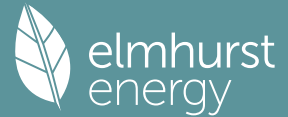
Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type



Appendix 2:

Full SAP 10 Calculation Printout

Full SAP Calculation Printout



Property Reference	1st Floor Flat				Issued on Date	05/03/2025		
Assessment Reference	21784			Prop Type Ref				
Property								
SAP Rating	96 A		DER	-0.21		TER	11.64	
Environmental	100 A		% DER < TER				101.80	
CO ₂ Emissions (t/year)	-0.02		DFEE	32.58		TFEE	32.80	
Compliance Check	See BREL		% DFEE < TFEE				0.65	
% DPER < TPER	76.84		DPER	14.08		TPER	60.80	
Assessor Details	Mr. Daniel Towns					Assessor ID	Y077-0001	
Client	21784, Avni Brucaj							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	3.1900 (1b)	x 2.6000 (2b)	= 8.2940 (1b) - (3b)
First floor	59.9900 (1c)	x 2.4000 (2c)	= 143.9760 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.1800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.2700 (5)

2. Ventilation rate

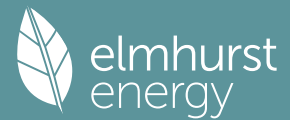
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	2.5000 (17)
Infiltration rate	0.1250 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1062 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1355	0.1328	0.1302	0.1169	0.1142	0.1009	0.1009	0.0983	0.1062	0.1142	0.1195	0.1248 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000 (23c)
Effective ac	0.2305	0.2278	0.2252	0.2119	0.2092	0.1959	0.1959	0.1933	0.2012	0.2092	0.2145	0.2198 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			11.9500	1.1450	13.6832		(27)
Ground Floor			3.1900	0.1500	0.4785	20.0000	63.8000 (28a)
External Wall	63.2900	11.9500	51.3400	0.1700	8.7278	110.0000	5647.4000 (29a)
Roof	59.9900		59.9900	0.1400	8.3986	9.0000	539.9100 (30)
Total net area of external elements Aum(A, m ²)			126.4700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.2881		(33)
Main dwelling							
Party Wall			37.3400	0.0000	0.0000	70.0000	2613.8000 (32)
Party Floor			56.8000			30.0000	1704.0000 (32d)
Internal Wall			96.0000			9.0000	864.0000 (32c)
Internal Floor			3.1900			18.0000	57.4200 (32d)
Internal Ceiling			3.1900			9.0000	28.7100 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11519.0400 (34)

Full SAP Calculation Printout



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

182.3210 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	9.5000	0.0234	0.2223
E2 Other lintels (including other steel lintels)	8.5000	0.0230	0.1955
E3 Sill	15.7000	0.0180	0.2826
E4 Jamb	1.1200	0.1580	0.1770
E5 Ground floor (normal)	13.9000	0.0010	0.0139
E6 Intermediate floor within a dwelling	24.0400	0.0410	0.9856
E7 Party floor between dwellings (in blocks of flats)	12.3900	0.0200	0.2478
E11 Eaves (insulation at rafter level)	14.7000	0.0670	0.9849
E13 Gable (insulation at rafter level)	7.2000	0.0400	0.2880
E16 Corner (normal)	2.4000	-0.0820	-0.1968
E17 Corner (inverted - internal area greater than external area)	7.4000	0.0320	0.2368
E18 Party wall between dwellings	7.5600	0.1600	1.2096
P1 Party wall - Ground floor	10.7600	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	4.1700	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.4000	0.2400	2.0160
P5 Party wall - Roof (insulation at rafter level)	11.8100	0.1200	1.4172
R4 Ridge (vaulted ceiling)	8.5400	0.1200	1.0248
R5 Ridge (inverted)			

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

9.1052 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 40.3933 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	11.5808	11.4474	11.3139	10.6465	10.5131	9.8457	9.8457	9.7122	10.1126	10.5131	10.7800	11.0470
Heat transfer coeff	51.9742	51.8407	51.7072	51.0398	50.9064	50.2390	50.2390	50.1055	50.5059	50.9064	51.1733	51.4403
Average = Sum(39)m / 12 =												51.0065

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8226	0.8205	0.8184	0.8078	0.8057	0.7952	0.7952	0.7931	0.7994	0.8057	0.8100	0.8142
HLP (average)												0.8073
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0700 (42)
Hot water usage for mixer showers	66.2920	65.2957	63.8440	61.0664	59.0166	56.7307	55.4314	56.8721	58.4514	60.9058	63.7431	66.0380
Hot water usage for baths	25.4634	25.0853	24.5527	23.5708	22.8356	22.0203	21.5799	22.1088	22.6845	23.5569	24.5590	25.3773
Hot water usage for other uses	35.8286	34.5257	33.2229	31.9200	30.6171	29.3143	29.3143	30.6171	31.9200	33.2229	34.5257	35.8286
Average daily hot water use (litres/day)												117.2990

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	127.5840	124.9067	121.6196	116.5572	112.4693	108.0653	106.3256	109.5980	113.0560	117.6856	122.8278	127.2439
Energy conte	202.0618	177.8655	186.9248	159.5610	151.4053	132.8789	128.5916	135.7052	139.4093	159.6982	174.9907	199.2332
Energy content (annual)												1948.3255
Distribution loss (46)m = 0.15 x (45)m	30.3093	26.6798	28.0387	23.9342	22.7108	19.9318	19.2887	20.3558	20.9114	23.9547	26.2486	29.8850

Water storage loss:

Store volume												150.0000
a) If manufacturer declared loss factor is known (kWh/day):												1.8600
Temperature factor from Table 2b												0.5400
Enter (49) or (54) in (55)												1.0044

Total storage loss

31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364
If cylinder contains dedicated solar storage												
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total heat required for water heating calculated for each month												
256.4606	226.9999	241.3236	212.2050	205.8041	185.5229	182.9904	190.1040	192.0533	214.0970	227.6347	253.6320	258.8275
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Output from w/h												
256.4606	226.9999	241.3236	212.2050	205.8041	185.5229	182.9904	190.1040	192.0533	214.0970	227.6347	253.6320	258.8275

12Total per year (kWh/year)

Total per year (kWh/year) = Sum(64)m = 2588.8275 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
												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

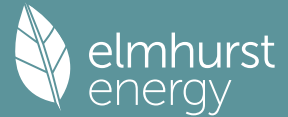
110.7046	98.4478	105.6715	95.1692	93.8613	86.2974	86.2758	88.6410	88.4688	96.6187	100.2996	109.7641	109.7641
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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	103.4985	103.4985	103.4985	103.4985	103.4985	103.4985	103.4985	103.4985	103.4985	103.4985	103.4985	103.4985
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	92.5036	102.4147	92.5036	95.5870	92.5036	92.5036	95.5870	92.5036	95.5870	92.5036	95.5870	92.5036
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.8899	182.7669	178.0368	167.9668	155.2553	143.3083	135.3270	133.4499	138.1801	148.2500	160.9615	172.9085
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3499	33.3499	33.3499	33.3499	33.3499	33.3499	33.3499	33.3499	33.3499	33.3499	33.3499	33.3499
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Losses e.g. evaporation (negative values) (Table 5)	-82.7988	-82.7988	-82.7988	-82.7988	-82.7988	-82.7988	-82.7988	-82.7988	-82.7988	-82.7988	-82.7988	-82.7988
Water heating gains (Table 5)	148.7965	146.4997	142.0316	132.1795	126.1577	119.8575	115.9620	119.1412	122.8733	129.8638	139.3050	147.5324
Total internal gains	476.2395	485.7309	466.6215	449.7829	427.9661	412.8024	397.8421	399.1442	410.6900	424.6670	449.9031	466.9940

6. Solar gains

Full SAP Calculation Printout



[Jan]			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast			4.4400	11.2829	0.6300	0.7000	0.7700	15.3101 (75)
Southwest			6.6700	36.7938	0.6300	0.7000	0.7700	75.0020 (79)
Northwest			0.8400	11.2829	0.6300	0.7000	0.7700	2.8965 (81)

Solar gains	93.2085	164.8161	241.5718	326.2436	389.9953	397.9849	379.2014	329.9871	270.6337	186.4880	112.7437	79.0545 (83)
Total gains	569.4480	650.5470	708.1933	776.0265	817.9615	810.7874	777.0435	729.1313	681.3237	611.1549	562.6468	546.0485 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.5639	61.7224	61.8818	62.6909	62.8553	63.6902	63.6902	63.8599	63.3536	62.8553	62.5274	62.2029	
alpha	5.1043	5.1148	5.1255	5.1794	5.1904	5.2460	5.2460	5.2573	5.2236	5.1904	5.1685	5.1469	
util living area	0.9567	0.9212	0.8596	0.7300	0.5640	0.3947	0.2842	0.3156	0.5038	0.7729	0.9186	0.9631 (86)	
Living	20.3731	20.5268	20.6923	20.8503	20.9190	20.9382	20.9405	20.9404	20.9315	20.8399	20.5983	20.3459	
Non living	19.5085	19.6980	19.8969	20.0827	20.1540	20.1800	20.1815	20.1834	20.1713	20.0773	19.7962	19.4811	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.6793	20.5268	20.6923	20.8503	20.9190	20.9382	20.9405	20.9404	20.9315	20.8399	20.5983	20.4374 (87)	
Th 2	20.2338	20.2356	20.2374	20.2465	20.2484	20.2575	20.2575	20.2594	20.2539	20.2484	20.2447	20.2411 (88)	
util rest of house	0.9486	0.9078	0.8380	0.6965	0.5224	0.3496	0.2364	0.2650	0.4520	0.7352	0.9027	0.9561 (89)	
MIT 2	19.9446	19.6980	19.8969	20.0827	20.1540	20.1800	20.1815	20.1834	20.1713	20.0773	19.7962	19.6180 (90)	
Living area fraction									fLA = Living area / (4) =				0.3121 (91)
MIT	20.1739	19.9567	20.1451	20.3223	20.3928	20.4167	20.4184	20.4197	20.4086	20.3153	20.0465	19.8738 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.1739	19.9567	20.1451	20.3223	20.3928	20.4167	20.4184	20.4197	20.4086	20.3153	20.0465	19.8738 (93)	

8. Space heating requirement

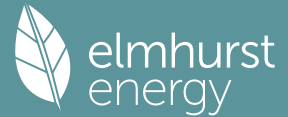
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9479	0.9024	0.8352	0.7000	0.5305	0.3593	0.2468	0.2760	0.4629	0.7388	0.8980	0.9522 (94)
Useful gains	539.7764	587.0261	591.4685	543.2356	433.9532	291.3372	191.7407	201.2394	315.3921	451.5060	505.2446	519.9567 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	825.0344	780.5502	705.5521	582.9908	442.5186	292.2231	191.8346	201.4078	318.6216	494.5726	662.5175	806.2626 (97)
Space heating kWh	212.2320	130.0482	84.8782	28.6237	6.3726	0.0000	0.0000	0.0000	0.0000	32.0416	113.2365	213.0116 (98a)
Space heating requirement - total per year (kWh/year)												820.4444
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	212.2320	130.0482	84.8782	28.6237	6.3726	0.0000	0.0000	0.0000	0.0000	32.0416	113.2365	213.0116 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												820.4444
Space heating per m2										(98c) / (4) =		12.9858 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												325.5818 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	212.2320	130.0482	84.8782	28.6237	6.3726	0.0000	0.0000	0.0000	0.0000	32.0416	113.2365	213.0116 (98)
Space heating efficiency (main heating system 1)	325.5818	325.5818	325.5818	325.5818	325.5818	0.0000	0.0000	0.0000	0.0000	325.5818	325.5818	325.5818 (210)
Space heating fuel (main heating system)	65.1855	39.9433	26.0697	8.7916	1.9573	0.0000	0.0000	0.0000	0.0000	9.8413	34.7797	65.4249 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	256.4606	226.9999	241.3236	212.2050	205.8041	185.5229	182.9904	190.1040	192.0533	214.0970	227.6347	253.6320 (64)
Efficiency of water heater												191.2437 (216)
(217)m	191.2437	191.2437	191.2437	191.2437	191.2437	191.2437	191.2437	191.2437	191.2437	191.2437	191.2437	191.2437 (217)
Fuel for water heating, kWh/month	134.1015	118.6967	126.1864	110.9605	107.6136	97.0086	95.6844	99.4041	100.4234	111.9498	119.0286	132.6224 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	9.8610	8.9068	9.8610	9.5429	9.8610	9.5429	9.8610	9.8610	9.5429	9.8610	9.5429	9.8610 (231)
Lighting	19.2204	15.4193	13.8834	10.1716	7.8568	6.4191	7.1672	9.3163	12.1009	15.8770	17.9331	19.7546 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-40.8546	-59.9373	-89.4176	-102.2417	-111.6716	-104.6876	-103.2676	-97.0035	-84.5803	-68.8432	-45.3322	-34.9292 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-17.9941	-40.9473	-88.3656	-142.7876	-195.5169	-198.8137	-195.6206	-161.4225	-113.2949	-61.8591	-25.0276	-13.9262 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

2. Ventilation rate			m3 per hour
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		2 * 10 =	20.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)

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Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1313 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.3813 (18)
Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3241 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4133	0.4052	0.3971	0.3566	0.3485	0.3079	0.3079	0.2998	0.3241	0.3485	0.3647	0.3809	(22b)
Effective ac	0.5854	0.5821	0.5788	0.5636	0.5607	0.5474	0.5474	0.5449	0.5525	0.5607	0.5665	0.5725	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opening Type			11.9500	1.1450	13.6832			(27)
Ground Floor			3.1900	0.1300	0.4147			(28a)
External Wall	63.2900	11.9500	51.3400	0.1800	9.2412			(29a)
Roof	59.9900		59.9900	0.1100	6.5989			(30)
Total net area of external elements Aum(A, m2)			126.4700					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 29.9380			(33)
Main dwelling								
Party Wall			37.3400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 182.3210 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	9.5000	0.0500	0.4750	
E3 Sill	8.5000	0.0500	0.4250	
E4 Jamb	15.7000	0.0500	0.7850	
E5 Ground floor (normal)	1.1200	0.1600	0.1792	
E6 Intermediate floor within a dwelling	13.9000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	24.0400	0.0700	1.6828	
E11 Eaves (insulation at rafter level)	12.3900	0.0400	0.4956	
E13 Gable (insulation at rafter level)	14.7000	0.0800	1.1760	
E16 Corner (normal)	7.2000	0.0900	0.6480	
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0900	-0.2160	
E18 Party wall between dwellings	7.4000	0.0600	0.4440	
P1 Party wall - Ground floor	7.5600	0.0800	0.6048	
P2 Party wall - Intermediate floor within a dwelling	10.7600	0.0000	0.0000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	4.1700	0.0000	0.0000	
P5 Party wall - Roof (insulation at rafter level)	8.4000	0.0800	0.6720	
R4 Ridge (vaulted ceiling)	11.8100	0.0800	0.9448	
R5 Ridge (inverted)	8.5400	0.0400	0.3416	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.6578 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 38.5958 (37)

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

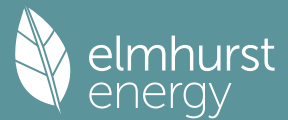
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.4159	29.2493	29.0859	28.3187	28.1752	27.5070	27.5070	27.3832	27.7644	28.1752	28.4656	28.7691	(38)
Heat transfer coeff	68.0117	67.8451	67.6817	66.9145	66.7710	66.1028	66.1028	65.9790	66.3602	66.7710	67.0614	67.3650	(39)
Average = Sum(39)m / 12 =												66.9138	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0765	1.0738	1.0713	1.0591	1.0568	1.0463	1.0463	1.0443	1.0503	1.0568	1.0614	1.0662	(40)
HLP (average)												1.0591	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0700 (42)
Hot water usage for mixer showers													
58.9262	58.0407	56.7502	54.2813	52.4592	50.4273	49.2724	50.5530	51.9568	54.1385	56.6605	58.7004	58.7004	(42a)
Hot water usage for baths													
25.4634	25.0853	24.5527	23.5708	22.8356	22.0203	21.5799	22.1088	22.6845	23.5569	24.5590	25.3773	25.3773	(42b)
Hot water usage for other uses													
35.8286	34.5257	33.2229	31.9200	30.6171	29.3143	29.3143	30.6171	31.9200	33.2229	34.5257	35.8286	35.8286	(42c)
Average daily hot water use (litres/day)													110.5080 (43)
Daily hot water use													
120.2182	117.6516	114.5258	109.7721	105.9119	101.7619	100.1666	103.2789	106.5614	110.9182	115.7452	119.9063	119.9063	(44)
Energy conte	190.3962	167.5343	176.0219	150.2725	142.5778	125.1281	121.1428	127.8808	131.4008	150.5150	164.9003	187.7443	(45)
Energy content (annual)										Total = Sum(45)m =	1835.5150		
Distribution loss (46)m = 0.15 x (45)m													
28.5594	25.1302	26.4033	22.5409	21.3867	18.7692	18.1714	19.1821	19.7101	22.5773	24.7350	28.1617	28.1617	(46)
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3938 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7527 (55)
Total storage loss													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	(56)
If cylinder contains dedicated solar storage													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
236.9911	209.6201	222.6168	195.3643	189.1727	170.2199	167.7377	174.4757	176.4927	197.1099	209.9922	234.3392	234.3392	(62)
WWHRS	-26.9386	-23.8247	-24.9479	-20.6578	-19.2523	-16.4744	-15.4421	-16.4211	-17.0450	-20.0942	-22.7643	-26.4397	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													

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210.0525	185.7953	197.6689	174.7065	169.9204	153.7456	152.2956	158.0546	159.4476	177.0157	187.2279	207.8995 (64)
Total per year (kWh/year) = Sum(64)m =											2133.8302 (64)
Electric shower(s)											2134 (64a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month											
100.5827	89.3737	95.8032	86.0391	84.6830	77.6786	77.5559	79.7963	79.7642	87.3222	90.9028	99.7009 (65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	103.4985	103.4985	103.4985	103.4985	103.4985	103.4985	103.4985	103.4985	103.4985	103.4985	103.4985	103.4985 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	92.5036	102.4147	92.5036	95.5870	92.5036	95.5870	92.5036	92.5036	95.5870	92.5036	95.5870	92.5036 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.8899	182.7669	178.0368	167.9668	155.2553	143.3083	135.3270	133.4499	138.1801	148.2500	160.9615	172.9085 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3499	33.3499	33.3499	33.3499	33.3499	33.3499	33.3499	33.3499	33.3499	33.3499	33.3499	33.3499 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-82.7988	-82.7988	-82.7988	-82.7988	-82.7988	-82.7988	-82.7988	-82.7988	-82.7988	-82.7988	-82.7988	-82.7988 (71)
Water heating gains (Table 5)	135.1918	132.9966	128.7677	119.4987	113.8213	107.8869	104.2418	107.2531	110.7837	117.3685	126.2539	134.0066 (72)
Total internal gains	465.6348	475.2278	456.3577	440.1021	418.6298	400.8318	386.1219	387.2561	398.6003	415.1716	439.8520	456.4683 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W		
Northeast				4.4400	11.2829	0.6300		0.7000		0.7700	15.3101 (75)		
Southwest				6.6700	36.7938	0.6300		0.7000		0.7700	75.0020 (79)		
Northwest				0.8400	11.2829	0.6300		0.7000		0.7700	2.8965 (81)		
Solar gains		93.2085	164.8161	241.5718	326.2436	389.9953	397.9849	379.2014	329.9871	270.6337	186.4880	112.7437	79.0545 (83)
Total gains		558.8433	640.0439	697.9295	766.3457	808.6251	798.8167	765.3233	717.2432	669.2340	601.6596	552.5957	535.5227 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	47.0468	47.1624	47.2762	47.8182	47.9210	48.4054	48.4054	48.4962	48.2177	47.9210	47.7135	47.4985
alpha	4.1365	4.1442	4.1517	4.1879	4.1947	4.2270	4.2270	4.2331	4.2145	4.1947	4.1809	4.1666
util living area	0.9722	0.9517	0.9152	0.8288	0.6891	0.5120	0.3761	0.4167	0.6335	0.8606	0.9510	0.9762 (86)
MIT	19.6989	19.9383	20.2466	20.6151	20.8593	20.9689	20.9933	20.9897	20.9251	20.6103	20.1038	19.6594 (87)
Th 2	20.0201	20.0223	20.0244	20.0344	20.0362	20.0450	20.0450	20.0466	20.0416	20.0362	20.0325	20.0285 (88)
util rest of house	0.9662	0.9416	0.8976	0.7957	0.6361	0.4419	0.2963	0.3333	0.5614	0.8257	0.9390	0.9709 (89)
MIT 2	18.5288	18.8287	19.2094	19.6516	19.9165	20.0254	20.0423	20.0421	19.9889	19.6588	19.0472	18.4852 (90)
Living area fraction	fLA = Living area / (4) = 0.3121 (91)											
MIT	18.8940	19.1750	19.5331	19.9523	20.2108	20.3199	20.3391	20.3379	20.2811	19.9558	19.3770	18.8517 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.8940	19.1750	19.5331	19.9523	20.2108	20.3199	20.3391	20.3379	20.2811	19.9558	19.3770	18.8517 (93)

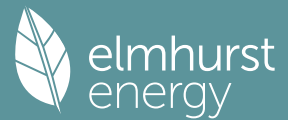
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9572	0.9308	0.8873	0.7926	0.6461	0.4625	0.3211	0.3591	0.5802	0.8224	0.9289	0.9626 (94)
Useful gains	534.9012	595.7842	619.2813	607.4206	522.4788	369.4921	245.7521	257.5546	388.3017	494.7794	513.3076	515.4993 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	992.5637	968.4890	882.1033	739.5625	568.2722	378.0986	247.1643	259.8176	410.1775	624.6974	823.3109	987.0126 (97)
Space heating kWh												
	340.5009	250.4577	195.5395	95.1422	34.0703	0.0000	0.0000	0.0000	0.0000	96.6590	223.2024	350.8059 (98a)
Space heating requirement - total per year (kWh/year)												
												1586.3778
Solar heating kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												
												0.0000
Space heating kWh												
	340.5009	250.4577	195.5395	95.1422	34.0703	0.0000	0.0000	0.0000	0.0000	96.6590	223.2024	350.8059 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												
												1586.3778
Space heating per m2												
										(98c) / (4) =		25.1089 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement												
	340.5009	250.4577	195.5395	95.1422	34.0703	0.0000	0.0000	0.0000	0.0000	96.6590	223.2024	350.8059 (98)
Space heating efficiency (main heating system 1)												
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)												

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Space heating efficiency (main heating system 2)	368.9067	271.3517	211.8522	103.0793	36.9125	0.0000	0.0000	0.0000	0.0000	104.7226	241.8227	380.0714	(211)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
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	(213)
Water heating requirement	210.0525	185.7953	197.6689	174.7065	169.9204	153.7456	152.2956	158.0546	159.4476	177.0157	187.2279	207.8995	(64)
Efficiency of water heater (217)m	85.1366	84.7302	84.0355	82.7573	81.1741	79.8000	79.8000	79.8000	79.8000	82.7626	84.4549	79.8000	(216)
Fuel for water heating, kWh/month	246.7241	219.2788	235.2208	211.1072	209.3284	192.6636	190.8466	198.0634	199.8091	213.8837	221.6897	243.9465	(217)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	19.2204	15.4193	13.8834	10.1716	7.8568	6.4191	7.1672	9.3163	12.1009	15.8770	17.9331	19.7546	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-29.8165	-42.1723	-60.8289	-68.6618	-74.2955	-69.4704	-68.6367	-64.6806	-57.7212	-48.3659	-32.8374	-25.7641	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-16.4375	-34.6244	-68.8920	-103.5678	-137.0209	-137.6757	-136.0314	-115.1228	-84.3259	-49.5213	-21.9509	-12.9930	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1718.7191	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	(216)
Water heating fuel used												2582.5618	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												155.1198	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1561.4149	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2980.9858	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1718.7191	0.2100	360.9310	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2582.5618	0.2100	542.3380	(264)
Space and water heating			903.2690	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	155.1198	0.1443	22.3886	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-643.2513	0.1345	-86.5172	
PV Unit electricity exported	-918.1636	0.1259	-115.5721	
Total			-202.0893	(269)
Total CO2, kg/year			735.4975	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.6400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1718.7191	1.1300	1942.1526	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2582.5618	1.1300	2918.2949	(278)
Space and water heating			4860.4475	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	155.1198	1.5338	237.9279	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-643.2513	1.4971	-963.0011	
PV Unit electricity exported	-918.1636	0.4620	-424.2286	
Total			-1387.2297	(283)
Total Primary energy kWh/year			3841.2465	(286)
Target Primary Energy Rate (TPER)			60.8000	(287)