

11603 - Energy & Sustainability Statement



Client: The Broughton
Charitable Trust

Site: 27-29 Middelton Road

Date: 11th October 2023

Ref: 27-29 Middelton Road

Contact: Jordan Bury & Matt
Holland

Complete Sustainability Solutions Ltd

76 King Street, Manchester, M2 4NH

0161 706 0298

info@completesustainability.co.uk

www.completesustainability.co.uk

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1.0 Executive Summary

An energy and sustainability statement has been carried out for the development known as 27-29 Middleton Road, in Manchester. The structure and philosophy of the report has been based upon utilising best practice methodology and adheres to the “Be Lean, Be Clean and Be Green” hierarchy as follows:

Energy Efficient Measures (Be Lean – Use Less Energy)

To maximise the energy efficiency of the development and reduce the energy demand, the development will benefit from the following:

- High specification building fabric.
- U values that improve on Part L2 standard values.
- Low air leakage rates.

Energy Efficient Systems (Be Clean – Supply Energy Efficiently)

- Dedicated LED low energy efficient light fittings within all areas
- Hot Water is provided via high efficiency systems.

Renewable Technologies (Be Green – Use Renewable Energy)

The following renewable technologies have been evaluated as part of this report:

- Solar Thermal
- Solar PV
- Combined Heat and Power (CHP)
- Air Source Heat Pump
- Ground Source Heat Pump

It can be concluded via the SBEM calculations that the CO₂ emissions of predicted energy use of the development will meet the targets in Part L of the Building Regulations and the Manchester’s Local Development Framework Core Strategy Development Plan 2012 – 2027.

2.0 Introduction

2.1 Project Scope

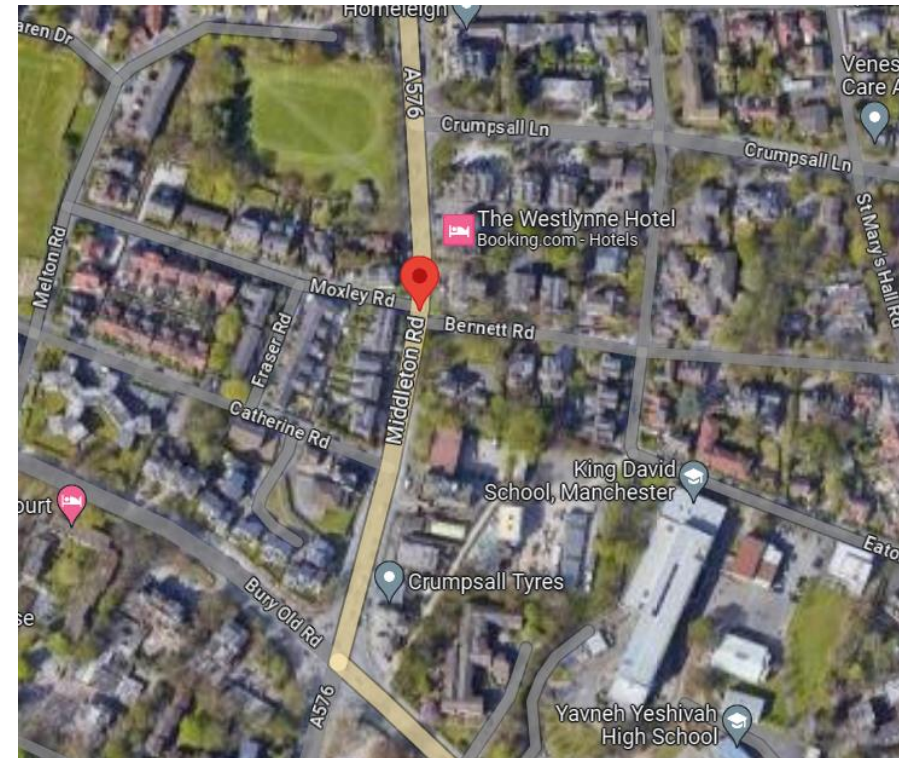
Complete Sustainability Solutions have been commissioned to prepare an Energy & Sustainability Statement to assist with the planning submission.

The purpose of this energy statement is to model the development, utilising SBEM software, identify the baseline carbon emissions; then utilise the energy hierarchy to minimise energy usage and carbon emissions, thus ensuring compliance with both national and local policy.

2.2 Development Description

The development is located at 27-29 Middleton Road, Crumpsall, Manchester, M8 5DS. The proposal is for the demolition of the existing buildings and redevelopment of the site with a new building to provide a synagogue.

2.3 Site Location



3.0 Policy Context

Within this section of the report we will review both local and national policy, establishing key principles that can be taken forward and applied across the development.

3.1 National Policy Context – National Planning Policy Framework July 2021

Achieving sustainable development means that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways (so that opportunities can be taken to secure net gains across each of the different objectives):

- a) **an economic objective** – to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure;
- b) **a social objective** – to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering a well-designed and safe built environment, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being.

- c) **an environmental objective** – to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

3.2 Policy Context – Local

Manchester's Local Development Framework Core Strategy Development Plan 2012 – 2027.

3.2.1 Strategic Areas for low and zero carbon decentralised energy infrastructure.

Within Manchester it is considered that the following strategic areas, indicated on the key diagram, will have a major role to play in achieving an increase in the level of decentralised, low and zero-carbon energy supplies available:

3.2.2 Manchester City Council's Policy EN 6 of Core Strategy.

Policy EN 6 requires applications for new development of 10 or more units and all other development over 1,000 sq. m to achieve a 15% reduction in CO2 emissions on Part L 2010, this equates to a 9% improvement upon Building Regulations Part L 2016.

After reviewing the Local Planning Policies, the development is required to achieve a 9% improvement above Building Regulations Part L 2016.

4.0 Design Criteria

Within this section of the report we will, utilising SBEM software, carry out an assessment of the development against current Building Regulations. We will establish CO₂ baseline, then following the energy hierarchy, establish a low-carbon specification to ensure CO₂ emissions meet the requirements of both national and local policy.

Full SBEM calculations will be carried out at detailed design to ensure the specification meets the local policy. If any amendments to the design are required these will be incorporated at this point and calculations updated to ensure compliance.

4.1 Review and implement the Energy Hierarchy: Be Lean – Be Clean – Be Green

The Energy Hierarchy is a classification of energy options, prioritised to assist progress towards a more sustainable energy system. The energy hierarchy uses a step-by-step process:

- Step 1 Be lean – Use less energy.
- Step 2 Be Clean – Use energy efficiently
- Step 3 Be Green – Utilise renewable technology.

4.2 Be Lean – Use Less Energy

The developer, in accordance with both national and local planning policy, has stated their wish towards ensuring the development follows a fabric first approach, therefore reducing demand on the national grid as reasonably possible.

Below we have highlighted the As Designed U-values, going beyond the requirements of Building Regulations; thus improving upon the baseline CO₂ emissions.

Table 1: Summary of Be Lean Measures

Element	As Designed U Value (W/m ² K)	Minimum Fabric Efficiency (Part L2A 2013) (W/m ² K)
Ground Floor	0.15	0.25
External Wall	0.18	0.35
Roof	0.15	0.18
Windows including roof	1.60 G-value = 0.63	2.20
External Doors	1.2	2.2
Air Permeability (m ³ /(h/m ²))	5	10

4.3 Be Clean – Supply Energy Efficiently

Within this section of the energy hierarchy, we see an emphasis being placed upon ensuring the regulated energy demands of the development are met as efficiently as possible.

District and site-wide heat networks can be utilised to provide heating and hot water to a development in an efficient manner. In this instance there isn't a district wide network within the vicinity of the scheme (see appendix B).

Furthermore, in many cases we also see opportunities to include a combined heat and power system (CHP), which allows for the production of electricity. Although the scheme will provide a mix of users which could allow for a site side heat network and CHP, The development programme, size of the development, and uses are not aligned in a way to allow for CHP to be considered.

The next stage is to look at possible be clean measures that can be introduced to individual plots on site. Below we have identified the practical measures to be introduced:

Table 2: Summary of Be Clean Measures

Be Clean
Heating provided via high efficiency systems
100% LED lighting - 100lm/W
MVHR with high heat recovery efficiencies

4.4 Be Green – Use Less Energy

The final phase of the report is to ascertain if the development will benefit from renewable/low carbon technologies and the following renewable/low carbon technologies will be analysed for this development;

- Solar Thermal
- Solar PV
- CHP
- Air Source Heat Pump
- Ground Source Heat Pump

See Appendix A for detailed summary and suitability matrix of Be Green technologies.

Renewable technology in the form air source heat pumps have been selected as the best fit renewable technologies for the site.

Be Green
We have reviewed the renewable options available to this site and have included the following: • Air Source Heat Pump to provide heating and HW.

5.0 Summary of Results

5.1 Summary of Energy Strategy: Be Lean – Be Clean – Be Green – Non-Residential

Tables 3 summarises the performance of the development using the guidance outlined in Part L2A for existing buildings respectively as the baseline target.

It can be concluded that CO₂ emissions of predicted energy use of the development will be reduced by over 10% under Part L2A 2013 through energy efficiency measures alone (demonstrated in Be Lean, Clean and Green) over the Part L baseline in total.

Table 3: Summary of implemented Energy Strategy:

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	4.38
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	4.3
Target primary energy rate (TPER), kWh _e /m ² annum	45.86
Building primary energy rate (BPER), kWh _e /m ² annum	45.57
Do the building's emission and primary energy rates exceed the targets?	BER =< TER BPER =< TPER

The proposed development at 27-29 Middleton Road has been assessed to part L 2021 new build standards. The Table above demonstrates compliance within part L 2021. **This equates to over a 27% improvement under Part L 2016 – thus showing the proposed development complies with both the national and local planning policies.**

6.0 Conclusion

This report is based upon a review of the proposals and a thorough analysis of relevant national and local planning policy requirements. Both the National Planning Policy Framework 2021 and Manchester's Councils Local Policy.

Manchester's Policy requires that emissions, of predicted energy use of the development will be reduced by over 9%
The development will follow the Be Lean, Be Clean, Be Green Energy Hierarchy as follows:

Energy Efficient Measures (Be Lean – Use Less Energy)

To maximise the energy efficiency of the development and reduce the energy demand, the development benefits from a high specification of building fabric with U values that will improve on Part L2A 2016 standard values.

Energy Efficient Measures (Be Lean – Use Less Energy)

All developments will try to utilise electric as a primary fuel for heating and hot water, be provided with a high level of user control including local and central temperature controls. The scheme will also utilize:

- Dedicated LED low energy efficient light fittings within all areas
- Hot Water provided via high efficiency systems.

Renewable Technologies (Be Green – Use Renewable Energy)

All The following renewable technologies have been evaluated as part of this report;

- Solar Thermal
- Solar PV
- Combined Heat and Power (CHP)
- Air Source Heat Pump
- Ground Source Heat Pump

Air Source Heat Pumps have been installed as these technologies are deemed suitable for the proposed development.

It can be concluded that the content of this report highlights, via SBEM calculations, the scheme is on target to meet the minimum of 9% improvement over Part L 2016. The scheme has been assessed to new Part L 2021 standards and achieves compliance. This equates to over a 27% improvement under Part L 2016 – thus showing the proposed development complies with both the national and local planning policies.

APPENDIX A					
Technology	Description	Pros	Cons	Project Suitability	Included in Development
Solar Thermal	Solar thermal hot water collectors are panels or evacuated tubes which are typically located on the roof of the buildings. The collectors harness the sun's energy to warm domestic hot water	- Reduced fuel bills and carbon footprint - Low maintenance - Proven technology	- Only compatible with boilers that have hot water storage - Need south facing roofs to optimise efficiency - Carbon saved is low comparative to the savings offered by PV	Solar thermal HW is not deemed suitable for this development due to the nature of the scheme in particular the level of hot water demand thus making the suitability of a system unfeasible.	
Solar PV	Solar Photovoltaic (PV) panels work by converting energy from the sun into electricity. This can then be used with the development to offset the electrical usage.	- Reduced bills and carbon footprint - Benefit from the feed in tariff - Proven technology - Relatively maintenance free	PV panels lose efficiency over their lifetime	PV would be suited to this development as it is a simple bolt on technology that will assist with meeting the energy demand of the building and ensure compliance with the local planning policy. However, the scheme would benefit more with the use of an air source heat pump.	
Combined Heat & Power (CHP)	CHP is a technology which develops heat and power from the same energy source, typically mains gas. The CHP engine is fed by mains gas which then drives an alternator to provide electricity. CHP is highly energy efficient as the heat and electricity are produced on site, therefore reducing transmission losses. Typical efficiencies are 50% for the heat and 35% for the electric.	- Reduced fuel bills and carbon footprints - Eligible for the feed in tariff. - Proven technology which is in use in many schemes in the UK - Suited to large developments	- Not a true renewable technology - Heating and electricity demand must remain fairly stable to ensure CHP is running at optimum efficiency - Requires a centralised/district heating network - Noise. / Capital intensive	The total size and nature of the development does not lend itself to CHP. It would add to the capital costs of the development making the development not financially viable. For these reasons, CHP has been discounted	

APPENDIX A					
Technology	Description	Pros	Cons	Project Suitability	Included in Development
Air Source Heat Pump	Air source heat pumps extract heat from the external air which can be used to heat radiators/underfloor heating and hot water within a dwelling. ASHP can still extract heat from air as cold as -15 degrees centigrade. ASHP are particularly useful on sites where gas is not available. There are two forms of ASHP – air to air and air to water.	• Can offer lower heating bills and reduce carbon footprints (when compared to electric systems) • Relatively maintenance free • Offers high efficiencies • Can offer heating and cooling depending on system chosen (air to air)	• Requires space to locate the external condenser unit. The unit requires lots of space around it to ensure adequate air flow. • Requires the use of underfloor heating or large radiators due to low grade heat. • Noise issues	Air source heat pumps have been included on this development due to the lower emissions associated with this technology.	
Ground Source Heat Pump	Ground source heat pumps (GSHP) work in a similar way to air source heat pumps, however they extract heat from the ground. A ground loop is buried within the garden and a mixture of water and refrigerant is circulated along the loop. The heat from the ground is then absorbed within the fluid and then passes through a heat exchanger within the GSHP. Ground loops can be laid horizontally at depths of 1-2m or vertically at depths of up to 100m.	• Can offer lower heating bills and reduce carbon footprints (when compared to electric systems). • Relatively maintenance free • Offers high efficiencies	• High capital costs • Requires space for boreholes or trenches to locate ground loops • Requires the use of under floor heating or large radiators due to low grade heat	Ground source heat pumps have been discounted on this development predominantly due to the nature of the development and the lower emissions associated with an air source heat pump.	

Project name

27-29 Middleton Road**As designed****Date:** Wed Oct 11 15:48:45 2023

Administrative information

Building Details

Address: Crumpsall, Manchester, M8 5DT

Certifier details

Name:**Telephone number:****Address:** , ,

Certification tool

Calculation engine: Apache**Calculation engine version:** 7.0.22**Interface to calculation engine:** IES Virtual Environment**Interface to calculation engine version:** 7.0.22**BRUKL compliance module version:** v6.1.e.1**Foundation area [m²]:** 173.45The 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	4.68
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	4.53
Target primary energy rate (TPER), kWh _{PE} /m ² annum	49.09
Building primary energy rate (BPER), kWh _{PE} /m ² annum	47.95
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	0.18	0.18	00000003:Surf[4]
Floors	0.18	0.15	0.15	00000005:Surf[46]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.15	0.15	00000000:Surf[6]
Windows** and roof windows	1.6	1.4	1.4	00000003:Surf[0]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.2	1.2	00000003:Surf[5]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

U_{a-Limit} = Limiting area-weighted average U-values [W/(m²K)]U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]U_{a-Calc} = Calculated area-weighted average 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	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- 01 ASHP Rads NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.5	-	0.2	-	-
Standard value	2.5*	N/A	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.					

2- 02 MVHR Rads Heating EV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.5	-	0.2	-	-
Standard value	2.5*	N/A	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.					

3- 03 ASHP Rads Heating MVHR

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.5	-	0.2	-	0.8
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

"No HWS in project, or hot water is provided by HVAC system"

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			
003 Accessible WC	0.3	-	-	-	-	-	-	-	-	-	-	N/A
005 Mens WCs	0.3	-	-	-	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]										HR efficiency	
	ID of system type	A	B	C	D	E	F	G	H	I		
	Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
008 Tea Room		0.3	-	-	-	-	-	-	-	-	-	N/A
009 Shul		-	-	-	1.6	-	-	-	-	-	-	N/A
106 Ezras Noshim		-	-	-	1.6	-	-	-	-	-	-	N/A
108 Ladies WCs		0.3	-	-	-	-	-	-	-	-	-	N/A
B03 Mikvah		-	-	-	1.6	-	-	-	-	-	-	N/A
B05 WCs		0.3	-	-	-	-	-	-	-	-	-	N/A
B08 Changing Room		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
001 Entrance Foyer		100	-	-
002 Entrance Hall		100	-	-
003 Accessible WC		100	-	-
005 Mens WCs		100	-	-
006 Cloaks		100	-	-
007 Stairs		100	-	-
008 Tea Room		100	-	-
009 Shul		100	-	-
100 Void		100	-	-
101 Stairs		100	-	-
102 Landing		100	-	-
103 Store		100	-	-
106 Ezras Noshim		100	-	-
107 Ladies Cloaks		100	-	-
108 Ladies WCs		100	-	-
110 Office		100	-	-
B01 Stairs		100	-	-
B02 Foyer		100	-	-
B03 Mikvah		100	-	-
B05 WCs		100	-	-
B06 Store		100	-	-
B08 Changing Room		100	-	-
B10 Utilities		100	-	-

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?
008 Tea Room	NO (-34.2%)	NO
009 Shul	NO (-30.7%)	NO
106 Ezras Noshim	NO (-25.1%)	NO
110 Office	NO (-39.1%)	NO
B03 Mikvah	N/A	N/A

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	541.1	541.1
External area [m ²]	1124.9	1124.9
Weather	MAN	MAN
Infiltration [m ³ /hm ² @ 50Pa]	5	3
Average conductance [W/K]	305.68	530.84
Average U-value [W/m ² K]	0.27	0.47
Alpha value* [%]	12.49	10

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

Building Use

% Area Building Type

Retail/Financial and Professional Services
 Restaurants and Cafes/Drinking Establishments/Takeaways
 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
100 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	10.54	15.83
Cooling	0	0
Auxiliary	7.13	5.3
Lighting	7.89	6.39
Hot water	5.65	5.07
Equipment*	10.81	10.81
TOTAL **	31.21	32.59

* 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	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>0</i>	<i>0</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	94.85	158.4
Primary energy [kWh _{PE} /m ²]	47.95	49.09
Total emissions [kg/m ²]	4.53	4.68

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] Central heating using water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	208.1	0	23.1	0	1.7	2.5	0	2.5	0
	Notional	336.9	0	33.7	0	1.6	2.78	0	----	----
[ST] Central heating using water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	235.1	0	26.1	0	14.6	2.5	0	2.5	0
	Notional	432.5	0	43.2	0	17.8	2.78	0	----	----
[ST] Central heating using water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	46.2	0	5.1	0	8.3	2.5	0	2.5	0
	Notional	72.8	0	7.3	0	4.7	2.78	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

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