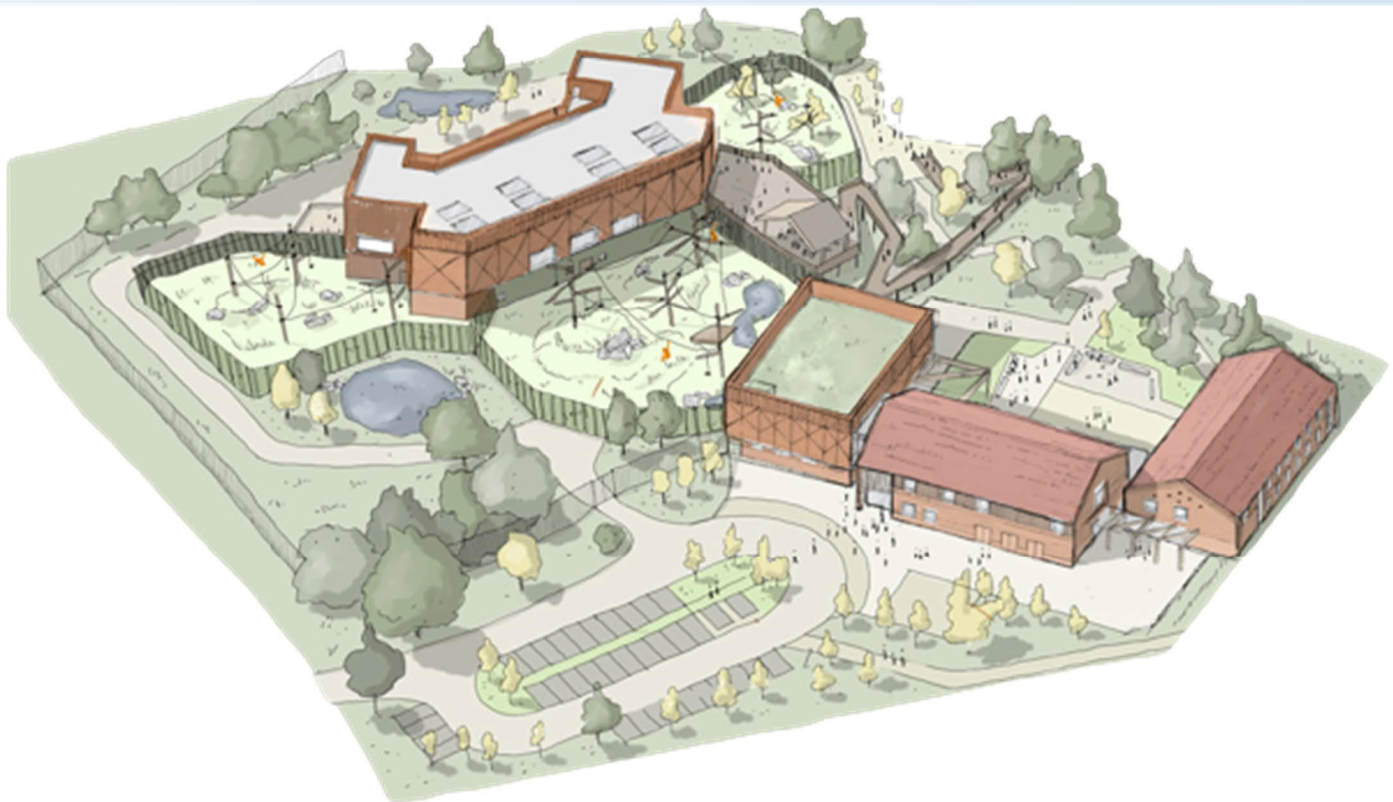




Twycross Zoo

ENERGY STATEMENT

National Science Conservation Centre





Twycross Zoo

ENERGY STATEMENT

National Science Conservation Centre

TYPE OF DOCUMENT (VERSION) PUBLIC

PROJECT NO. 70093774

OUR REF. NO. 001

DATE: OCTOBER 2023

WSP

8 First Street

Manchester

M15 4RP

Phone: +44 161 200 5000

WSP.com

QUALITY CONTROL

Issue/revision	First issue	001
Remarks		
Date	02/10/2023	04/10/2023
Prepared by	Saba Maskin	Saba Maskin
Signature		
Checked by	Joshua Sykes	Joshua Sykes
Signature		
Authorised by	Joshua Sykes	Joshua Sykes
Signature		 Digitally signed by Joshua Sykes@wsp.com DN: cn=Joshua Sykes@wsp.com Reason: I attest to the accuracy and integrity of this document Date: 2023.10.04 10:47:16 +0100
Project number	70093774	70093774
Report number	001	001

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APPENDICES

APPENDIX A

BRUKLS



EXECUTIVE SUMMARY

WSP have prepared this energy statement on behalf of Twycross Zoo in support of the proposed development to the southwest of the Twycross Zoo site. The development includes the following:

- Orangutan Habitat
- National Science Conservation Centre
- Residential Facility

Delivering a sustainable, low energy development is a priority for Twycross Zoo. This has been achieved through the specification of high-performance fabric, low energy systems and renewable energy generation.

This approach has resulted in an improvement over the baseline model (Part L 2021) as detailed in the table below.

Building	BER (Building Emissions Rate) (kgCO ₂ /m ²)	TER (Target Emissions Rate) (kgCO ₂ /m ²)	% Beyond Part L 2021
National Science Conservation Centre	3.85	4.33	11%
Orangutan Habitat	1.52	1.69	10%
Residential Facility	3.98	4.47	11%

Contact name Josh Sykes

Contact details +447551034388 | Joshua.Sykes@wsp.com

1 INTRODUCTION

WSP have prepared this energy statement on behalf of Twycross Zoo in support of the proposed development to the southwest of the Twycross Zoo site.

DEVELOPMENT DETAILS

Twycross Zoo, working with Hinckley & Bosworth Borough Council, are looking to deliver three new buildings on the Zoo site, with associated landscape works.

Firstly, a new Orangutan Habitat will provide a new home for the zoo's existing animals in a much-enhanced environment. It includes both internal and external habitats, animal dens and enrichment equipment. The building also includes zookeeper back-of-house spaces and a visitor centre.

Secondly, a National Science Conservation Centre that comprises of a two-storey higher education campus building. The NSCC will be a purpose-built centre located adjacent to Twycross Zoo. It will offer researchers from around the world the opportunity to study the 4 Great Apes, plus over 100 endangered species, in naturalistic complex environments whilst supporting conservationists and scientists with a world class facility. The centre will provide excellent teaching and research facilities (FE and HE), focussing on conservation, animal welfare, biosciences, STEM activities and public engagement with science. The centre will have both national and international appeal, including a unique 200-seater venue for scientific conferences.

Lastly there is to be a residential facility adjacent to the NSCC building for the researchers studying at the NSCC building to stay. The building will have a small cafe provision to support the NSCC building and users.

The new Orangutan Habitat is to be the focus of a new 'Indonesian village' in the zoo, teaching visitors about this part of the world. This area will comprise of a number of ancillary structures to support the development, as well as several to support the NSCC. Ancillary structures are not subject to further consideration in this document given their size/ nature.

DESIGN TEAM

The analysis carried out and presented in this document is based upon information provided from the Architect and MEP Engineer, in collaboration with the core design team listed below:

- **Project Manager / Cost Consultant:** Baker Mallett
- **Architect and Interior Designer:** HLM Architects
- **Landscape:** HLM Architects
- **Zoo Specialist Designer:** Dearadh Zú
- **Civil & Structural Engineers:** Clancy
- **MEP Engineers:** Cundall
- **NZC Consultant and Energy Modelling:** WSP
- **Planning Consultant:** WSP
- **Fire Engineer:** Hydrock
- **Acoustic Engineer:** Hydrock
- **Principal Designer:** Vextrix

2 POLICY CONTECT

2.1 OVERVIEW

The Proposed development is designed in line with current national, regional, and local policy. The key policies are set out in the National Planning Policy Framework (July 2021) and the Hinckley and Bosworth Local Development Framework Core strategy.

2.2 NATIONAL PLANNING POLICY

The National Planning Policy Framework (NPPF) sets the planning context for sustainable design and construction. It is this that Local Planning Policies are based on and adapted to account for regionally specific requirements.

The NPPF identifies three dimensions to sustainable development – economic, social, and environmental – which should be applied jointly and simultaneously:

- 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.
- 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; and
- 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.

The NPPF promotes the pursuit of sustainable development by seeking positive improvements to the built and natural environment, and to people's quality of life. This will include:

- Delivering a sufficient supply of homes.
- Building a strong, competitive economy.
- Ensuring the vitality of town centres.
- Promoting healthy and safe communities.
- Promoting sustainable transport.
- Supporting high quality communications.
- Making effective use of land.
- Achieving well-designed places.
- Protecting green belt land.
- Meeting the challenge of climate change, flooding and coastal change.
- Conserving and enhancing the natural environment.
- Conserving and enhancing the historic environment; and
- Facilitating the sustainable use of materials

3 BASELINE CARBON EMISSIONS

The first stage of the energy assessment is to establish the baseline site energy demand and CO₂ emissions. This is based on the notional building specifications as prescribed in *National Calculation Methodology (NCM) modelling guide (for buildings other than dwellings in England) 2021*.

Detailed energy modelling has been undertaken based on the methodology from Part L2A of the Building Regulations to establish the baseline carbon emissions for the proposed development. The figures below show renders of the energy model.

Figure 3-1 - National Science Conservation Centre

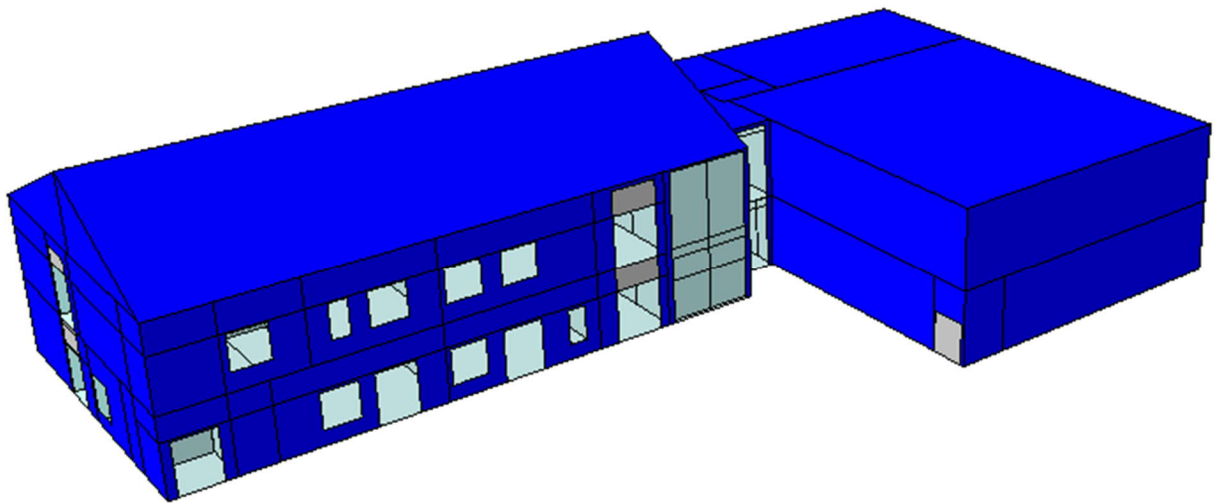


Figure 3-2 - Orangutan Habitat

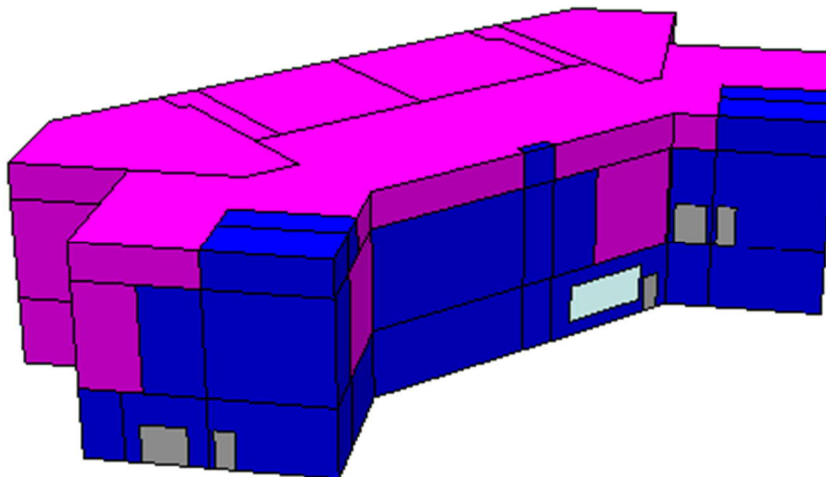


Figure 3-3 - Residential Facility

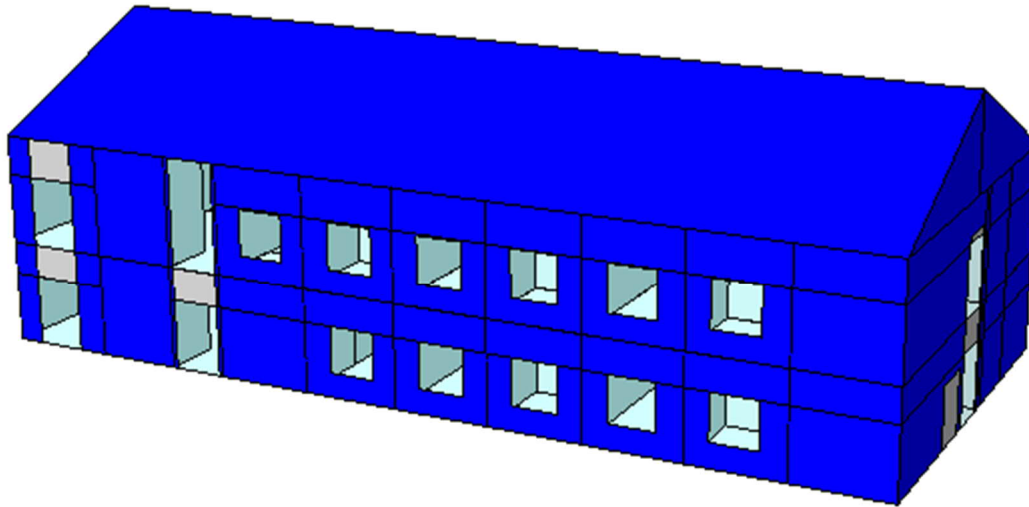


Table 3-1 – Baseline Carbon Emissions

Building	TER (Target Emissions Rate) (kgCO ₂ /m ²)
National Science Conservation Centre	4.33
Orangutan Habitat	1.69
Residential Facility	4.47

4 DESIGN SPECIFICATIONS

4.1 BUILDING FABRIC

From the outset the design has taken a fabric first approach. Targeted performance has been based upon current best practice guidance from the London Energy Transformation Initiative (LETI), detailed in the table below.

Table 4-1 – Fabric Performance

Parameter	Targeted Performance
Ground floor U-value (W/m ² .K)	0.10
External wall U-value (W/m ² .K)	0.12
Roof U-value (W/m ² .K)	0.12
Glazing U-value (W/m ² .K)	1.2
Glazing g-value	0.30
Air permeability (m ³ /hr/m ² @50pa)	1

4.2 BUILDING SERVICES

To achieve a low carbon design, an all-electric servicing strategy has been developed, with no gas being utilised.

Element	Design Rationale
Air Handling Plant	Where practicable natural ventilation is prioritised. Mechanical air handling plant is designed to achieve low specific fan powers.
Energy Recovery	Air handling systems will incorporate heat recovery. These transfer waste heat from the exhaust air stream to the supply air stream.
Space Heating	Heating is provided by a combination of air source heat pumps (ASHP) and panel heaters. ASHP are air-water with a SCOP of 4.0
Lighting Technology	High-efficiency lighting will be provided throughout to significantly exceed the minimum requirements of the Part L2. This includes the use of high-efficiency fluorescent and/or LED luminaires with a minimum efficacy of 100 lm/W.

5 RENEWABLE ENERGY

5.1 PHOTOVOLTAIC PANELS

Discussions are ongoing with the Network Operator to determine if onsite generation can be installed given the constrained network in the area.

It has been determined that Photovoltaic (PV) panels are the most appropriate renewable technology to utilise at the proposed development. PV will be roof mounted, area of active panels are as per the table below.

Building	Area PV (m ²)
National Science Conservation Centre	130
Orangutan Habitat	80
Residential Facility	120

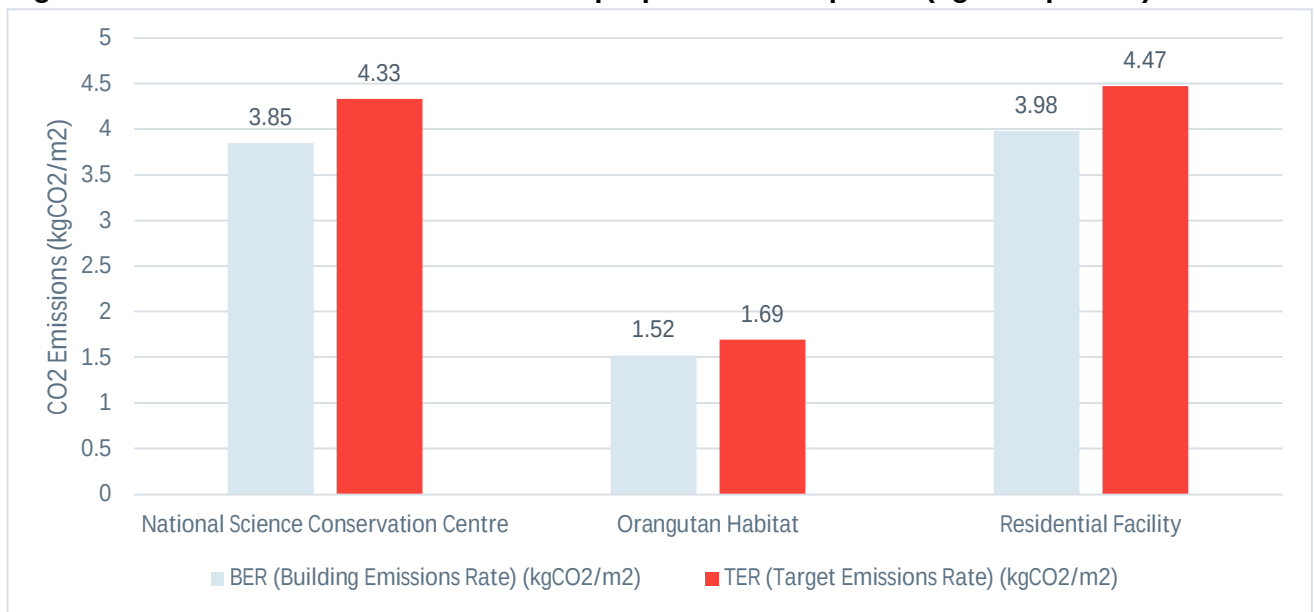
6 RESULTS

An improvement has been achieved over the Part L 2021 Compliant Notional Building for all three buildings within the development, as detailed in the table and figure below.

Table 6-1 - Carbon dioxide emissions for proposed development

Building	BER (Building Emissions Rate) (kgCO ₂ /m ²)	TER (Target Emissions Rate) (kgCO ₂ /m ²)	% Beyond Part L 2021
National Science Conservation Centre	3.85	4.33	11%
Orangutan Habitat	1.52	1.69	10%
Residential Facility	3.98	4.47	11%

Figure 6-1 - Carbon dioxide emissions for proposed development (kg CO₂ per m²)



Appendix A

BRUKLS



Project name

20230918_TwycrossZoo_Rev01_NSCC
130m2 PV

As designed

Date: Wed Oct 04 10:11:03 2023

Administrative information

Building Details

Address: Address 1, City, Postcode

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.18

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.18

BRUKL compliance module version: v6.1.d.0

Foundation area [m²]: 833.6

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	4.33
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	3.85
Target primary energy rate (TPER), kWh/m ² .annum	46.33
Building primary energy rate (BPER), kWh/m ² .annum	40.91
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	0.12	0.12	00000008:Surf[3]
Floors	0.18	0.1	0.1	00000008:Surf[0]
Pitched roofs	0.16	0.1	0.1	0000007A:Surf[3]
Flat roofs	0.18	0.1	0.1	00000002:Surf[6]
Windows** and roof windows	1.6	1.2	1.2	00000008:Surf[1]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors [^]	1.6	1.2	1.2	00000001:Surf[2]
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	1

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	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- 7. NCSS LTHW Radiators + NV (Breakout)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	-	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					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- 3. NSCC Wair Air Heating & Cooling + AHU (Lecture)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.47	3.28	0	1.65	0.84
Standard value	2.5*	4.5**	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					
** Standard shown is for air-cooled chillers >=400 kW. For chillers <400 kW, limiting SEER is 4.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

3- 1. NSCC LTHW Radiators + NV (Circulation)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	-	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					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

4- 2. NSCC ASHP LTHW Warm Air Heating + MVHR (Office/Classrooms)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.98	-	0.2	0.31	0.42
Standard value	2.5*	N/A	N/A	1.9^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

5- 8. NCSS LTHW Rad + MVHR (GF)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	-	-	-	0.79
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					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

6- 9. NCSS LTHW Rad + MVHR (FF)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	-	-	-	0.84
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					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

7- 5. NSCC DX Heating & Cooling (Comms)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.4	6.5	0	-	-
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					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

8- 6. NCSS DX

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	4	0	-	-
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					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

9- 4. NSCC DX AHU + DX Heating & Cooling (Lab/Prep Room)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.4	6.13	0	1.3	0.7
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

1- ASHP NSCC DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	3.09	0.003
Standard value	1	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		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
01.00.06 NSCC Kitchen 01	-	-	-	0.3	-	-	-	-	-	-	N/A
01.01.14 NSCC Kitchen/Breakout	-	-	-	1.7	-	-	-	-	-	-	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
01.00.09 NSCC Breakout 01		100	-	-
01.00.07 NSCC Changing Place 01		100	-	-
01.00.04 NSCC Circulation 01		100	-	-
01.00.12 NSCC Circulation 02		100	-	-
01.00.14 NSCC Circulation 03		100	-	-
01.00.27 NSCC Circulation 04		100	-	-
01.00.18 NSCC Circulation 05		100	-	-
01.00.25 NSCC Circulation 06		100	-	-
01.00.16 NSCC Classroom 01		100	-	-
01.00.17 NSCC Classroom 02		100	-	-
01.00.19 NSCC Cleaner Store 03		100	-	-
01.00.10 NSCC Entrance Lobby 01		100	-	-
01.00.22 NSCC Female WC 01		100	-	-
01.00.06 NSCC Kitchen 01		100	-	-
01.00.03 NSCC Lecture Theatre 01		100	-	-
01.00.00 NSCC Lobby 01		100	-	-
01.00.01 NSCC Lobby 02		100	-	-
01.00.08 NSCC Lobby 03		100	-	-
01.00.15 NSCC Male WC 01		100	-	-
01.00.05 NSCC Store 01		100	-	-
01.00.16 NSCC Store 02		100	-	-
01.00.28 NSCC Store 04		100	-	-
01.00.26 NSCC Store 05		100	-	-
01.00.29 NSCC Store 06		100	-	-
01.00.21 NSCC WC 01		100	-	-
01.00.20 NSCC WC/Shower 01		100	-	-
01.01.14 NSCC Kitchen/Breakout		100	-	-
01.01.02. NSCC Circulation 01		100	-	-
01.01.04. NSCC Circulation 02		100	-	-
01.01.13. NSCC Circulation 02		100	-	-
01.01.12. NSCC Circulation 04		100	-	-
01.01.16 NSCC Cleaner Store 01		100	-	-
01.01.18 NSCC Comms 01		100	-	-
01.01.03 NSCC First Floor Breakout 01		100	-	-
01.01.01. NSCC Lobby 01		100	-	-
01.01.10. NSCC Lobby 02		100	-	-
01.01.00 NSCC Plant 01		100	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95	80	0.3
01.01.06. NSCC Store 02		100	-	-
01.01.11. NSCC Freezer Room		100	-	-
01.01.17 NSCC WC 01		100	-	-
01.01.15 NSCC WC 02		100	-	-
01.00.11 NSCC Entrance Lobby 02		100	-	-
01.01.23 NSCC Meeting Room 01		100	-	-
01.01.22 NSCC Office 01		100	-	-
01.01.21 NSCC Office 02		100	-	-
01.01.12. NSCC Circulation 03		100	-	-
01.01.09. NSCC Prep Room 01		100	-	-
01.01.08. NSCC Lab 01		100	-	-
01.01.07. NSCC Classroom 01		100	-	-
01.00.23 NSCC Plant 01		100	-	-
01.00.24 NSCC Plant 02		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?
01.00.07 NSCC Changing Place 01	N/A	N/A
01.00.16 NSCC Classroom 01	NO (-44.9%)	NO
01.00.17 NSCC Classroom 02	NO (-55.5%)	NO
01.00.19 NSCC Cleaner Store 03	N/A	N/A
01.00.22 NSCC Female WC 01	N/A	N/A
01.00.03 NSCC Lecture Theatre 01	NO (-76.9%)	NO
01.00.15 NSCC Male WC 01	N/A	N/A
01.00.21 NSCC WC 01	N/A	N/A
01.00.20 NSCC WC/Shower 01	N/A	N/A
01.01.16 NSCC Cleaner Store 01	N/A	N/A
01.01.18 NSCC Comms 01	N/A	N/A
01.01.11. NSCC Freezer Room	N/A	N/A
01.01.17 NSCC WC 01	N/A	N/A
01.01.15 NSCC WC 02	N/A	N/A
01.01.23 NSCC Meeting Room 01	NO (-76.7%)	NO
01.01.22 NSCC Office 01	NO (-68.9%)	NO
01.01.21 NSCC Office 02	NO (-62.8%)	NO
01.01.09. NSCC Prep Room 01	NO (-61.7%)	NO
01.01.08. NSCC Lab 01	NO (-64.2%)	NO
01.01.07. NSCC Classroom 01	NO (-62.8%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
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]	1865.6	1865.6
External area [m ²]	3402.5	3402.5
Weather	BIR	BIR
Infiltration [m ³ /hm ² @ 50Pa]	1	3
Average conductance [W/K]	626.95	967.38
Average U-value [W/m ² K]	0.18	0.28
Alpha value* [%]	27.77	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

99 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

1 Others: Miscellaneous 24hr Activities

Others: Car Parks 24 hrs
 Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	4.47	7.01
Cooling	3.95	1.43
Auxiliary	10.53	6.98
Lighting	11.87	8.83
Hot water	7.88	6.86
Equipment*	45.71	45.71
TOTAL**	38.69	31.11

* 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	11.11	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>11.11</i>	<i>0</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	88.26	93.9
Primary energy [kWh/m ²]	40.91	46.33
Total emissions [kg/m ²]	3.85	4.33

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	131.9	0	9.7	0	3.1	3.76	0	4	0	
Notional	158.3	0	15.8	0	1.9	2.78	0	----	----	
[ST] Central heating using air distribution, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	36.4	0	4.2	0	2	2.38	0	2.98	0	
Notional	27.8	0	2.8	0	5.5	2.78	0	----	----	
[ST] Constant volume system (fixed fresh air rate), [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	2.5	48.9	0.2	8.3	21.2	4.01	1.63	4.47	3.28	
Notional	14.6	39.5	1.5	2.4	11.8	2.78	4.63	----	----	
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	8.4	89.5	0.5	6	4.6	4.26	4.14	4.4	6.13	
Notional	17.5	45	1.8	2.7	7.8	2.78	4.63	----	----	
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	0	1430.2	0	81.8	0	4.32	4.86	4.4	6.5	
Notional	0	1140.7	0	68.4	0	2.78	4.63	----	----	
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	281.5	67.8	19.9	6.3	0	3.92	2.99	4	4	
Notional	340.3	14.9	34	0.9	0	2.78	4.63	----	----	
[ST] Central heating using water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	0	0	0	0	4.2	3.76	0	4	0	
Notional	0	0	0	0	3.8	2.78	0	----	----	
[ST] Central heating using water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	0	0	0	0	7.3	3.76	0	4	0	
Notional	7.1	0	0.7	0	2.1	2.78	0	----	----	
[ST] Central heating using water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	305.1	0	22.6	0	3.1	3.76	0	4	0	
Notional	357.1	0	35.7	0	1.9	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

Project name

**20230926_TwycrossZoo_Orangutan_Rev
01**

As designed

Date: Fri Sep 29 15:32:41 2023

Administrative information

Building Details

Address: Address 1, City, Postcode

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.18

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.18

BRUKL compliance module version: v6.1.d.0

Foundation area [m²]: 198.59The 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	1.69
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	1.52
Target primary energy rate (TPER), kWh/m ² .annum	16.7
Building primary energy rate (BPER), kWh/m ² .annum	14.2
Do the building's emission and primary energy rates exceed the targets?	BER ≤ TER BPER ≤ TPER

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

Fabric element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.12	0.12	00000000:Surf[1]
Floors	0.18	0.1	0.1	00000000:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.1	0.1	0000001E:Surf[0]
Windows** and roof windows	1.6	1.2	1.2	00000018:Surf[3]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors [^]	1.6	1.2	1.2	00000002:Surf[2]
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	1

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	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- Electric panel heaters + EV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	0.2	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

2- Comms room

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3	4	0	-	-
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					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

3- Electric Panel Heaters

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	0.2	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

4- Electric panel heaters + mhvr

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	0.2	-	0.71
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	-
Standard value	1	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			
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard	
00.00.Accessible WC 01	0.3	-	-	-	-	-	-	-	-	-	N/A	
00.01.Research (Visitor Viewing) 01	-	-	-	1.6	-	-	-	-	-	-	N/A	
00.01.Research (Visitor Viewing) 02	-	-	-	1.6	-	-	-	-	-	-	N/A	
00.01.Visitor Corridor 01	-	-	-	1.6	-	-	-	-	-	-	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	
00.00.Circulation 01	100	-	-	
00.00.Store 02	100	-	-	
00.00.Accessible WC 01	100	-	-	
00.00.Water Tank and Pump Room 01	100	-	-	
00.00.Store 01	100	-	-	
00.00.Service Lobby 01	100	-	-	
00.00.Habitat Access 02	100	-	-	
00.00.Habitat Access 1A/B	100	-	-	
00.00.Habitat Access 03	100	-	-	
00.00.Comms Hubroom 01	100	-	-	
00.00.Service Lobby 02	100	-	-	
00.00.Circulation 02	100	-	-	
00.00.Store 03	100	-	-	
00.00.Keeper Corridor 01	100	-	-	
00.01.Circulation 03	100	-	-	
00.01.Lobby 01	100	-	-	
00.01.Research (Visitor Viewing) 01	100	-	-	
00.01.Keeper Lobby 01	100	-	-	
00.01.Research (Visitor Viewing) 02	100	-	-	
00.01.Lobby 02	100	-	-	
00.01.Circulation 04	100	-	-	
00.01.Lobby 03	100	-	-	
00.02.Circulation 07	100	-	-	
00.02.Circulation 05	100	-	-	
00.02.Circulation 06	100	-	-	
00.02.Circulation 08	100	-	-	
00.01.Visitor Corridor 01	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?
00.00.Comms Hubroom 01	N/A	N/A
00.01.Research (Visitor Viewing) 01	N/A	N/A
00.01.Research (Visitor Viewing) 02	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?	NO
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]	937.9	937.9
External area [m ²]	1313.1	1313.1
Weather	BIR	BIR
Infiltration [m ³ /hm ² @ 50Pa]	1	3
Average conductance [W/K]	222.1	511.1
Average U-value [W/m ² K]	0.17	0.39
Alpha value* [%]	25.29	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
100 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	9.49	10.03
Cooling	0.27	0.15
Auxiliary	3.65	0.87
Lighting	9.1	6.45
Hot water	0.19	0.18
Equipment*	15.31	15.31
TOTAL**	22.7	17.68

* 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	13.59	6.8
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>13.59</i>	<i>6.8</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	37.07	53.54
Primary energy [kWh/m ²]	14.2	16.7
Total emissions [kg/m ²]	1.52	1.69

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] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity									
Actual	353.1	0	98.1	0	0	1	0	1	0
Notional	444.4	0	87.5	0	0	1.41	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity									
Actual	294.5	0	81.8	0	15.4	1	0	1	0
Notional	434.6	0	85.6	0	20.5	1.41	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity									
Actual	52.8	0	14.7	0	9.5	1	0	1	0
Notional	86.4	0	17	0	2	1.41	0	----	----
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	9	602.1	0.8	55.9	0	2.94	2.99	3	4
Notional	37.4	531.4	3.7	31.9	0	2.78	4.63	----	----
[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

Project name

20230918_TwycrossZoo_Rev01_ResidentialBuilding 120m2 PV

As designed

Date: Wed Oct 04 10:18:42 2023

Administrative information

Building Details

Address: Address 1, City, Postcode

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.18

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.18

BRUKL compliance module version: v6.1.d.0

Foundation area [m²]: 438.4The 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	4.47
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	3.98
Target primary energy rate (TPER), kWh/m ² .annum	45.74
Building primary energy rate (BPER), kWh/m ² .annum	39.35
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	0.12	0.12	0000002F:Surf[3]
Floors	0.18	0.1	0.1	0000002F:Surf[0]
Pitched roofs	0.16	0.1	0.1	01000002:Surf[2]
Flat roofs	0.18	-	-	No flat roofs in building
Windows** and roof windows	1.6	1.2	1.2	0000002F:Surf[2]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.2	1.2	0000002F:Surf[1]
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	1

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	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- 1. Res Electric Radiators (Circulation)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	0.2	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

2- 2. Res Electric Panel Heaters + MVHR (Bedroom)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	0.2	-	0.79
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

3- 3. Res Electric Panel Heaters + MVHR (En-Suite)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	0.2	-	0.79
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

4- 4. Res Electric Panel Heaters + NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	0.2	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- ASHP Res DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	3.09	0.003
Standard value	1	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			
00.01.01 RESIDENTIAL Bedroom 01	-	-	-	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	Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1		
00.01.02 RESIDENTIAL Bedroom 03	-	-	-	0.3	-	-	-	-	-	-	N/A
00.01.03 RESIDENTIAL Bedroom 04	-	-	-	0.3	-	-	-	-	-	-	N/A
00.01.04 RESIDENTIAL Bedroom 05	-	-	-	0.3	-	-	-	-	-	-	N/A
00.01.05 RESIDENTIAL Bedroom 06	-	-	-	0.3	-	-	-	-	-	-	N/A
00.01.07 RESIDENTIAL Bedroom 08	-	-	-	0.3	-	-	-	-	-	-	N/A
00.01.08 RESIDENTIAL Bedroom 11	-	-	-	0.3	-	-	-	-	-	-	N/A
00.01.09 RESIDENTIAL Bedroom 12	-	-	-	0.3	-	-	-	-	-	-	N/A
00.01.10 RESIDENTIAL Bedroom 13	-	-	-	0.3	-	-	-	-	-	-	N/A
00.01.15 RESIDENTIAL En-Suite 01	-	-	-	0.3	-	-	-	-	-	-	N/A
00.01.16 RESIDENTIAL En-Suite 02	-	-	-	0.3	-	-	-	-	-	-	N/A
00.01.17 RESIDENTIAL En-Suite 03	-	-	-	0.3	-	-	-	-	-	-	N/A
00.01.18 RESIDENTIAL En-Suite 04	-	-	-	0.3	-	-	-	-	-	-	N/A
00.01.19 RESIDENTIAL En-Suite 05	-	-	-	0.3	-	-	-	-	-	-	N/A
00.01.20 RESIDENTIAL En-Suite 06	-	-	-	0.3	-	-	-	-	-	-	N/A
00.01.21 RESIDENTIAL En-Suite 07	-	-	-	0.3	-	-	-	-	-	-	N/A
00.01.22 RESIDENTIAL En-Suite 08	-	-	-	0.3	-	-	-	-	-	-	N/A
00.01.23 RESIDENTIAL En-Suite 09	-	-	-	0.3	-	-	-	-	-	-	N/A
00.01.24 RESIDENTIAL En-Suite 10	-	-	-	0.3	-	-	-	-	-	-	N/A
00.01.25 RESIDENTIAL En-Suite 11	-	-	-	0.3	-	-	-	-	-	-	N/A
00.01.26 RESIDENTIAL En-Suite 12	-	-	-	0.3	-	-	-	-	-	-	N/A
00.01.27 RESIDENTIAL En-Suite 13	-	-	-	0.3	-	-	-	-	-	-	N/A
00.01.36 RESIDENTIAL Bedroom 09	-	-	-	0.3	-	-	-	-	-	-	N/A
00.01.37 RESIDENTIAL Bedroom 10	-	-	-	0.3	-	-	-	-	-	-	N/A
00.01.38 RESIDENTIAL Bedroom 02	-	-	-	0.3	-	-	-	-	-	-	N/A
00.00.13 RESIDENTIAL Cafe 01	-	-	-	0.3	-	-	-	-	-	-	N/A
00.00.00 WC 01	-	-	0.4	-	-	-	-	-	-	-	N/A
00.00.01 Laundry	-	-	-	0.3	-	-	-	-	-	-	N/A
00.00.02 RESIDENTIAL Bedroom 01	-	-	-	0.3	-	-	-	-	-	-	N/A
00.00.03 RESIDENTIAL Bedroom 02	-	-	-	0.3	-	-	-	-	-	-	N/A
00.00.04 RESIDENTIAL Bedroom 03	-	-	-	0.3	-	-	-	-	-	-	N/A
00.00.05 RESIDENTIAL Bedroom 04	-	-	-	0.3	-	-	-	-	-	-	N/A
00.00.06 RESIDENTIAL Bedroom 05	-	-	-	0.3	-	-	-	-	-	-	N/A
00.00.07 RESIDENTIAL Bedroom 06	-	-	-	0.3	-	-	-	-	-	-	N/A
00.00.08 RESIDENTIAL Bedroom 07	-	-	-	0.3	-	-	-	-	-	-	N/A
00.00.09 RESIDENTIAL Bedroom 08	-	-	-	0.3	-	-	-	-	-	-	N/A
00.00.10 RESIDENTIAL Bedroom 09	-	-	-	0.3	-	-	-	-	-	-	N/A
00.00.11 RESIDENTIAL Bedroom 10	-	-	-	0.3	-	-	-	-	-	-	N/A
00.00.12 RESIDENTIAL Bedroom 11	-	-	-	0.3	-	-	-	-	-	-	N/A
00.00.19 RESIDENTIAL Cleaner Store-01	-	-	0.4	-	-	-	-	-	-	-	N/A
00.00.20 RESIDENTIAL En-Suite 01	-	-	-	0.3	-	-	-	-	-	-	N/A
00.00.21 RESIDENTIAL En-Suite 02	-	-	-	0.3	-	-	-	-	-	-	N/A
00.00.22 RESIDENTIAL En-Suite 03	-	-	-	0.3	-	-	-	-	-	-	N/A
00.00.23 RESIDENTIAL En-Suite 04	-	-	-	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
00.00.24 RESIDENTIAL En-Suite 05	-	-	-	0.3	-	-	-	-	-	-	N/A
00.00.25 RESIDENTIAL En-Suite 06	-	-	-	0.3	-	-	-	-	-	-	N/A
00.00.26 RESIDENTIAL En-Suite 07	-	-	-	0.3	-	-	-	-	-	-	N/A
00.00.27 RESIDENTIAL En-Suite 08	-	-	-	0.3	-	-	-	-	-	-	N/A
00.00.28 RESIDENTIAL En-Suite 09	-	-	-	0.3	-	-	-	-	-	-	N/A
00.00.29 RESIDENTIAL En-Suite 10	-	-	-	0.3	-	-	-	-	-	-	N/A
00.00.30 RESIDENTIAL En-Suite 11	-	-	-	0.3	-	-	-	-	-	-	N/A
00.01.06 RESIDENTIAL Bedroom 07	-	-	-	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
00.00.14 RESIDENTIAL Circulation 01		100	-	-
00.00.18 RESIDENTIAL Circulation 05		100	-	-
00.01.01 RESIDENTIAL Bedroom 01		100	-	-
00.01.02 RESIDENTIAL Bedroom 03		100	-	-
00.01.03 RESIDENTIAL Bedroom 04		100	-	-
00.01.04 RESIDENTIAL Bedroom 05		100	-	-
00.01.05 RESIDENTIAL Bedroom 06		100	-	-
00.01.07 RESIDENTIAL Bedroom 08		100	-	-
00.01.08 RESIDENTIAL Bedroom 11		100	-	-
00.01.09 RESIDENTIAL Bedroom 12		100	-	-
00.01.10 RESIDENTIAL Bedroom 13		100	-	-
00.01.11 RESIDENTIAL Circulation 01		100	-	-
00.01.12 RESIDENTIAL Circulation 02		100	-	-
00.01.13 RESIDENTIAL Circulation 03		100	-	-
00.01.15 RESIDENTIAL En-Suite 01		100	-	-
00.01.16 RESIDENTIAL En-Suite 02		100	-	-
00.01.17 RESIDENTIAL En-Suite 03		100	-	-
00.01.18 RESIDENTIAL En-Suite 04		100	-	-
00.01.19 RESIDENTIAL En-Suite 05		100	-	-
00.01.20 RESIDENTIAL En-Suite 06		100	-	-
00.01.21 RESIDENTIAL En-Suite 07		100	-	-
00.01.22 RESIDENTIAL En-Suite 08		100	-	-
00.01.23 RESIDENTIAL En-Suite 09		100	-	-
00.01.24 RESIDENTIAL En-Suite 10		100	-	-
00.01.25 RESIDENTIAL En-Suite 11		100	-	-
00.01.26 RESIDENTIAL En-Suite 12		100	-	-
00.01.27 RESIDENTIAL En-Suite 13		100	-	-
00.01.36 RESIDENTIAL Bedroom 09		100	-	-
00.01.37 RESIDENTIAL Bedroom 10		100	-	-
00.01.38 RESIDENTIAL Bedroom 02		100	-	-
00.00.17 RESIDENTIAL Circulation 04		100	-	-

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
00.00.32 RESIDENTIAL Plant 01		100	-	-
00.00.13 RESIDENTIAL Cafe 01		100	-	-
00.00.00 WC 01		100	-	-
00.00.01 Laundry		100	-	-
00.00.02 RESIDENTIAL Bedroom 01		100	-	-
00.00.03 RESIDENTIAL Bedroom 02		100	-	-
00.00.04 RESIDENTIAL Bedroom 03		100	-	-
00.00.05 RESIDENTIAL Bedroom 04		100	-	-
00.00.06 RESIDENTIAL Bedroom 05		100	-	-
00.00.07 RESIDENTIAL Bedroom 06		100	-	-
00.00.08 RESIDENTIAL Bedroom 07		100	-	-
00.00.09 RESIDENTIAL Bedroom 08		100	-	-
00.00.10 RESIDENTIAL Bedroom 09		100	-	-
00.00.11 RESIDENTIAL Bedroom 10		100	-	-
00.00.12 RESIDENTIAL Bedroom 11		100	-	-
00.00.15 RESIDENTIAL Circulation 02		100	-	-
00.00.16 RESIDENTIAL Circulation 03		100	-	-
00.00.19 RESIDENTIAL Cleaner Store 01		100	-	-
00.00.20 RESIDENTIAL En-Suite 01		100	-	-
00.00.21 RESIDENTIAL En-Suite 02		100	-	-
00.00.22 RESIDENTIAL En-Suite 03		100	-	-
00.00.23 RESIDENTIAL En-Suite 04		100	-	-
00.00.24 RESIDENTIAL En-Suite 05		100	-	-
00.00.25 RESIDENTIAL En-Suite 06		100	-	-
00.00.26 RESIDENTIAL En-Suite 07		100	-	-
00.00.27 RESIDENTIAL En-Suite 08		100	-	-
00.00.28 RESIDENTIAL En-Suite 09		100	-	-
00.00.29 RESIDENTIAL En-Suite 10		100	-	-
00.00.30 RESIDENTIAL En-Suite 11		100	-	-
00.01.06 RESIDENTIAL Bedroom 07		100	-	-
00.01.14 RESIDENTIAL Circulation 04		100	-	-
00.01.00 RESIDENTIAL Breakout 01		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?
00.01.01 RESIDENTIAL Bedroom 01	NO (-83.5%)	NO
00.01.02 RESIDENTIAL Bedroom 03	NO (-68%)	NO
00.01.03 RESIDENTIAL Bedroom 04	NO (-67.9%)	NO
00.01.04 RESIDENTIAL Bedroom 05	NO (-69.1%)	NO
00.01.05 RESIDENTIAL Bedroom 06	NO (-69.8%)	NO
00.01.07 RESIDENTIAL Bedroom 08	NO (-53.4%)	NO
00.01.08 RESIDENTIAL Bedroom 11	NO (-53.4%)	NO
00.01.09 RESIDENTIAL Bedroom 12	NO (-53%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00.01.10 RESIDENTIAL Bedroom 13	NO (-75%)	NO
00.01.36 RESIDENTIAL Bedroom 09	NO (-52.6%)	NO
00.01.37 RESIDENTIAL Bedroom 10	NO (-53%)	NO
00.01.38 RESIDENTIAL Bedroom 02	NO (-67.6%)	NO
00.00.32 RESIDENTIAL Plant 01	N/A	N/A
00.00.02 RESIDENTIAL Bedroom 01	NO (-84.2%)	NO
00.00.03 RESIDENTIAL Bedroom 02	NO (-69%)	NO
00.00.04 RESIDENTIAL Bedroom 03	NO (-69.9%)	NO
00.00.05 RESIDENTIAL Bedroom 04	NO (-70.2%)	NO
00.00.06 RESIDENTIAL Bedroom 05	NO (-73.4%)	NO
00.00.07 RESIDENTIAL Bedroom 06	NO (-76.3%)	NO
00.00.08 RESIDENTIAL Bedroom 07	NO (-52.9%)	NO
00.00.09 RESIDENTIAL Bedroom 08	NO (-53.6%)	NO
00.00.10 RESIDENTIAL Bedroom 09	NO (-52.9%)	NO
00.00.11 RESIDENTIAL Bedroom 10	NO (-53.3%)	NO
00.00.12 RESIDENTIAL Bedroom 11	NO (-53.6%)	NO
00.01.06 RESIDENTIAL Bedroom 07	NO (-52.6%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
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]	884	884
External area [m ²]	1665.3	1665.3
Weather	BIR	BIR
Infiltration [m ³ /hm ² @ 50Pa]	1	3
Average conductance [W/K]	337.86	557.89
Average U-value [W/m ² K]	0.2	0.34
Alpha value* [%]	33.62	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
2 Residential Institutions: Residential Schools
12 Residential Institutions: Universities and Colleges
 Secure Residential Institutions
86 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	15.97	17
Cooling	0	0
Auxiliary	2.4	1.73
Lighting	6.56	6.3
Hot water	22.45	21.22
Equipment*	17.34	17.34
TOTAL**	47.38	46.26

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

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	21.63	15.96
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>21.63</i>	<i>15.96</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	52.78	86.33
Primary energy [kWh/m ²]	39.35	45.74
Total emissions [kg/m ²]	3.98	4.47

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] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity									
Actual	36.5	0	12	0	0	0.84	0	1	0
Notional	67	0	13.2	0	0	1.41	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity									
Actual	28.1	0	9.3	0	0.7	0.84	0	1	0
Notional	60.1	0	11.8	0	1	1.41	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity									
Actual	11	0	3.1	0	0.4	1	0	1	0
Notional	39.1	0	7.7	0	0.4	1.41	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity									
Actual	484.5	0	134.6	0	0	1	0	1	0
Notional	568.3	0	111.9	0	0	1.41	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



8 First Street
Manchester
M15 4RP

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