Electric Park – Buildings A, B and C

Updated Energy Statement for Planning

6th September 2023

MAX FORDHA

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ISSUE HISTORY

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P01	30/08/2023	For Information
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MAX FORDHAM LLP TEAM CONTRIBUTORS

Engineer (Initials)	Role
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1.0 EXECUTIVE SUMMARY

Electric Park is a proposed development of 5 no. office buildings. However, this energy report applies only to Buildings A, B and C as their designs have been updated. The energy strategies of Buildings D and E is as per the previously approved scheme.

The energy strategy for the development is driven by the following policy and guidance:

- Building Regulations Part L
- Manchester City Council Planning guidance
- Greater Manchester's zero carbon aspirations

The proposed energy and carbon reduction strategy targets for the scheme are as follows:

- Meet the minimum compliance requirements of Approved Document L2A 2013 (w. 2016 amendments)
- Manchester SPD Target: minimum 25% improvement on Part L 2013
- Manchester's LDF Core Strategy: 10% improvement over Part L 2010 or compliance with current regs - whichever is greater

How the building designs will reduce operational energy consumption:

- Improve fabric performance;
- All electric operation, no use of fossil fuels on site (except for emergency backup);
- Efficient LED lighting with daylight controls and presence detection;
- Local mechanical ventilation with heat recovery;
- VRF heating and cooling for majority of spaces (including offices);
- Direct electric heating via air distribution for WCs and adjacent lobbies;
- Domestic hot water for ground floor showers via an air source heat pump;
- Domestic hot water for upper floor via instantaneous direct electric to remove storage and distribution losses.

Rooftop PV arrays on Building B and C will further minimise operational carbon emissions by generating renewable energy on-site.

Table **1** shows the results from the Part L compliance modelling.

Table 1 **Results of Part L modelling for Electric Park**

Building	Energy strategy	BER kg CO_2/m^2	TER kg CO_2/m^2	% improvement against Part L 2013	% improvement against Part L 2010	PV area
Building A	VRF & MVHR	11.0	14.6	**24.7%**	**28.9%**	-
Building B	VRF & MVHR	10.3	16.6	**38.0%**	**40.9%**	100 m^2
Building C	VRF & MVHR	10.1	16.4	**38.4%**	**49.2%**	100 m^2

2.0 INTRODUCTION

This report details the energy strategy for the proposed development at Electric Park. It highlights the way in which the scheme aims to minimise energy usage and carbon emissions in line with national and local policies.

The new development will consist of 5no. new buildings on the land around the New Islington Metrolink station in Manchester. However, this energy report applies only to Buildings A, B and C as their designs have been updated. The energy strategies of Buildings D and E is as per the previously approved scheme.

2.1 This report

There is an **executive summary** at the beginning of the report which summarises the whole report in one page.

This **Introduction** section provides information about the use and size of the proposed buildings.

The **Legislation, Policy and Drivers** section summarises key national and local policy, as well and industry guidance on interpretation and compliance with the polices.

Section 4 summarises the overall **Energy Strategy** of the development.

Section 5 summarises our **renewable energy generation feasibly study** and gives reasons for selecting and omitting certain technologies.

Section 6 presents the results of the **Building Regulations Part L compliance** modelling which only looks at regulated energy usage (heating, cooling, fans, pumps, lighting and hot water).

Section 7 provides a more complete analysis of predicted **operational energy usage** looking at both regulated energy (included in Building regulations Part L compliance) and unregulated energy use (lifts, small power, catering etc).

2.2 Site location

Address
Electric Park
Manchester
M4 7DS

Location
Grid reference **SJ 85486 98212**
Eastings **385486**
Northings **398212**
Latitude **53.480427**
Longitude **-2.2201679**

Local Council **Manchester City Council**

- **https://www.manchester.gov.uk/planning**

2.3 Proposed mix of uses

- Flexible use spaces at ground floors to include possible future retail, restaurant, offices, gym etc
- Central cores include reception, lifts, WC provision, staircase and risers
- Cat-A office provision on upper floors
- Back of house bin stores on ground floors
- Bike store and shower facilities on ground floor
- Ground floor plantrooms and electrical substations

2.4 Proposed building systems strategy for the development

The proposed buildings will be 'all-electric', not using any fossil fuels directly as an energy source in operation. Building MEP systems have been designed to be simple to control and localised, minimising distribution losses and the frequency of standby operation. In addition, this should make systems easier to maintain, upgrade and replace as required.

Specifically, the proposed building systems are as follows:

- Local mechanical ventilation systems with heat recovery. Each unit is zoned to an individual office bay and controlled by CO_2 sensors;
- VRF heating and cooling for majority of spaces (including offices);
- Direct electric heating via air distribution for WCs and adjacent lobbies;
- High efficiency LED lighting with intelligent controls throughout;
- Domestic hot water for showers on ground floor via an air source heat pump;
- Openable windows provided to allow for mixed mode operation and free cooling;
- Domestic hot water for upper floor via instantaneous direct electric to remove storage and distribution losses.

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3.0 LEGISLATION, POLICY AND DRIVERS

In this section we outline the relevant national and local legislation, policy, guidance.

First, we start with **Building Regulations** which are a UK statutory instrument which give minimum standards for design, construction and alteration of building sin the UK.

Then we look at **national targets and planning policy**. These set out UK and England wide policies which are then used by local councils to set **local planning policy**.

In addition to local planning policy, Manchester City has issued some **additional local sustainability objectives** which will likely shape future local planning policy.

We highlight the **projected carbon emissions intensity of UK electricity supply** and the role this can play in providing low carbon energy.

We then summarise some **industry guidance on Net Zero Carbon** before outlining our **proposed energy and carbon reduction strategy for Electric Park**.

3.1 Building Regulations

Buildings Regulations are minimum standards for design, construction and alteration of buildings. They are a UK Statutory Instrument and approval by Building Control or an approved inspector is required prior to construction and occupation.

Building Regulations cover all aspects of a building including structure (Part A), fire safety (Part B) and energy usage (Part L).

Approved documents published by the government set out ways to demonstrate compliance with Building Regulations.

Approved Document L2A describes how a new non-domestic building can show compliance with Part L of the Building Regulations

Approved Document L2A – Conservation of Fuel and Power
In summary Approved Document L2A provides the following:

- Minimum fabric standards
- Minimum energy efficiency standards (No-Domestic Compliance Guide)
- National Calculation Methodology (NCM) to calculate carbon emissions for Actual building and Notional Building
- Limits the calculated Building Emissions Rate (BER) to that of the Target Emissions Rate (TER)
- Limits on solar gains

The NCM uses a set of carbon emissions factors for different fuels. The emissions factor used for grid electricity is out of date and does not reflect the current – or future – performance of grid electricity.

Relevance to Electric Park

The Electric Park development is registered against Part L 2013 w. 2016 amendments.

3.2 National targets and planning policy

Climate Change Act 2008 (2050 Target Amendment)

- Introduces a target of a 100% reduction of greenhouse gas emissions (comparted to 1990 levels) in the UK by 2050

National Planning Policy Framework

- Sets out the Government's planning polices for England and how these should be applied
- New developments should help increase the use and supply of renewable and low carbon energy and heat
    - Low carbon technologies are those that can help reduce emissions (compared to conventional use fossil fuels)

Relevance to Electric Park

- *The Electric Park development has been designed to be fossil fuel free, allowing it's emissions to reduce as the UK Grid decarbonises*

3.3 Local planning policy

There are a number of energy related policies throughout Manchester City Council planning documents.

The policies are summarised as follows:

Manchester's LDF Core Strategy Development Plan Document (July 2012)
EN4 Reducing CO2 Emissions by Enabling Low and Zero Carbon Development

- All development must follow the Energy Hierarchy:
    - Reduce the need for energy through design features that provide passive heating, natural lighting and cooling
    - Reduce the need for energy through energy efficient features such as improved insulation and glazing
    - Meet residual requirements through the use of low or zero carbon energy generating technologies

EN6 Target Framework for CO2 reductions from low or zero carbon

- 10% improvement over Part L 2010 or compliance with current regs - whichever is greater
- Set out baseline info and scheme that complies with Part L 2010 -> Calculate regulated energy demand -> Apply appropriate emissions target -> Apply energy hierarchy -> Consider low-carbon and renewable tech -> Choose least cost option -> Look at offsetting of cost of renewables is prohibitive

Guide to Development in Manchester SPD and Planning Guidance (April 2007)

- Aim to reduce CO2 emission by at least 25% more than requirements of current Building Regs
- Minimise reliance on heating, cooling, lighting and ventilation energy using equipment
- Integrate energy efficient micro-generation and community heating schemes
- Maximise daylight and passive solar gain in winter, whilst avoiding excessive solar gain in summer
- Aim for at least 20% of final site energy demand to be met by on-site renewable energy technologies
- It may be possible to provide 50% or even 100% of energy from renewable sources

Additional local sustainability objectives
In addition to planning policy documents, there is the Manchester Climate Change Framework 2020-2025 which is the city's high-level strategy for tackling climate change and the Greater Manchester Spatial Framework which is the region's plan for Homes, Jobs and the Environment.

Manchester Climate Change Framework 2020-2025 (February 2020)

- Provide renewable energy generation inside the City where possible
- Reduce demand for gas
- Replace gas-based heating systems with renewable based heating technologies

Greater Manchester Spatial Framework Revised Draft (January 2019)

- Minimise energy demand
- Maximise energy efficiency
- Utilise renewables energy
- Utilise low carbon energy
- By 2028 new developments should be net zero carbon

Relevance to Electric Park

- *The Electric Park development has been designed with Manchester local planning requirements in mind. It achieves the required improvements over Part L 2010 and 2013. In addition, it eliminate reliance on natural gas and two building include significant PV generation arrays at roof level.*

3.4 Projected carbon emissions intensity of UK electricity supply

In the past the carbon emissions intensity of the UKs electricity supply has been at least double that of natural gas. This has now changed and currently the carbon emissions intensity of the UKs electricity is roughly equal to natural gas. In the near future the carbon emissions intensity of the national grid is projected to fall to less than 25% of natural gas (by 2030).

Figure **1** show the projected emissions intensity of the UKs electricity supply, and Table **2** shows these figures in comparison to gas and to the emissions intensity of the fuels used in the Building Regulations Part L.

The 2013 Building Regulations use an out of date figure for carbon intensity of the UKs electricity supply. Therefore the carbon emissions calculations associated with Part L of the Building Regulations do not provide a true indication of future performance.

The projected emissions of the UK's electricity supply shown in Figure **1** and Table **2** mean that by the government's definition, grid electricity will reduce carbon emissions compared to conventional use fossil fuels and thus be a low carbon technology.

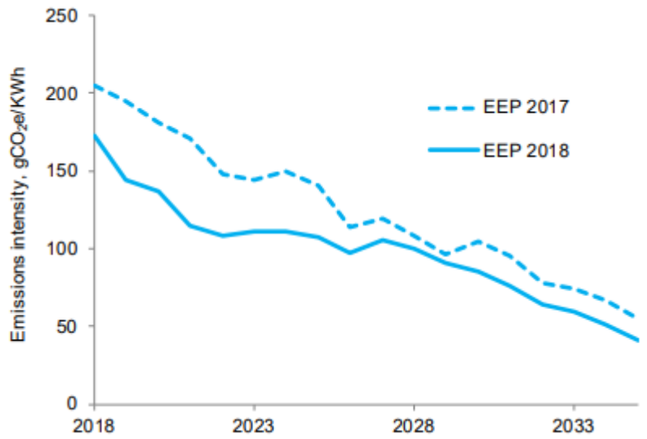

Figure 1 **Emissions intensity of the UKs electricity supply (From BEIS 2019)**

Table 2 **Comparison of carbon emissions factors**

	Grid electricity	Natural gas
Building Regulations 2013	519 gCO_2e/kWh	216 gCO_2e/kWh
BEIS 2018	200 gCO_2e/kWh	204 gCO_2e/kWh
BEIS 2030	41 gCO_2e/kWh	204 gCO_2e/kWh

Relevance to Electric Park

As an all electric building, the emissions of the Electric Park development will reduce over its life span.

3.5 Industry guidance on Net Zero Carbon

As mentioned previously with the Climate Change Act 2008 (2050 Target Amendment), the UK government has passed a law to require the UK to end its contribution to global warming by 2050. In response to this the UK Green Building Council (UKGBC) and the Royal Institute of British Architects (RIBA) have published guidance on how the built environment can help achieve this.

The guidance can be summarised as follows:

UK GBC Net Zero Carbon Buildings: A Framework Definition

- Reduce construction impacts
- Reduce operational energy use
    - Reduce energy demand and consumption
    - Calculate in use energy demand and display publicly
- Increase renewable energy supply
- Offset any remaining carbon emissions

RIBA 2030 Climate Challenge

- Reduce operational energy by 75% from CIBSE TM 46 benchmarks
- Operational energy targets:
    - RIBA 2025 target < 110 kWh/m2
    - RIBA 2030 target < 55 kWh/m2

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4.0 ENERGY STRATEGY

4.1 Summary

Briefly this section describes the performance and efficiencies of the fabric and building services.

4.2 Fabric

All buildings – A, B and C will have good levels of fabric performance which generally represent industry best practice as shown in Table **3**.

Table 3 **Proposed fabric properties**

Element	Notional building	Proposed values
Floor U-value	0.22 W/(m^2.K)	0.18 W/(m^2.K)
External Wall U-value	0.26 W/(m^2.K)	0.25 W/(m^2.K)
Roof U-value	0.18 W/(m^2.K)	0.18 W/(m^2.K)
Window U-value	1.6 W/(m^2.K)	1.6 W/(m^2.K)
Air permeability	10 m^3/(h.m^2)	5 m^3/(h.m^2)
Glass light transmission	-	0.7
Glass solar gain transmission	-	0.4

4.3 Heating and cooling

All buildings will have zero combustion on site to avoid increase in local air pollution. We will use a combination of grid electricity and solar PV to power the heating and cooling systems.

There is a requirement for local active cooling to ensure overheating can be avoided in all future climate scenarios. Therefore we propose a to use variable refrigerant flow (VRF) reversible heat pump heating and cooling systems. These systems offer very efficient performance when compared to a similar system used on the Notional Building.

We are proposing to use VRV/VRF system which allows for rejected heat from cooling one space to be used to heat another space if there are simultaneous requirements for heating and cooling. For example, in winter heat could be rejected from cooling south facing offices receiving solar gain and used to heat north facing offices which require heating.

- Efficient VRV/VRF system for simultaneous heating and cooling
  - Air source heat pump used to generate/reject heat;
  - Refrigerant used to move heat around the building to split units in each area;
  - Cooling SEER: 3.4 (including a 15% reduction to allow for the energy use of indoor units and branch controllers);
  - Heating ScoP: 5.1 (including a 15% reduction to allow for the energy use of indoor units and branch controllers).

4.4 Domestic hot water

The shower areas in each building, which have a high instantaneous hot water load, will have hot water heat pumps to meet the demand. WCs on each floor, where hot water demand is minimal will have their demand met by instantaneous direct electric hot water units.

This arrangement minimises distribution and storage losses, while generating hot water efficiently where it is at highest demand.

4.5 Ventilation

Ventilation for the buildings will be provided by small Mechanical Ventilation and Heat Recovery (MVHR) units distributed around the building perimeter. This is a non-standard approach to office ventilation which offers numerous advantages over the traditional centralised air handling unit system:

1. Improved control, each unit can separately reduce output based on local demand. This significantly improves turn-down capacity;
2. Reduced distribution losses, specific fan power requirements are dramatically reduced as pressure losses are lower;
3. Ease of cleaning and maintenance improves system performance over its lifetime;
4. The ventilation system is more adaptable, allowing it to be upgraded and adapted rather than scrapped;
5. A local system functions more effectively with a mixed mode system, units can turn off when windows are opened

The MVHR systems all have heat recovery efficiencies of above 80% and specific fan powers lower than 1.9 W/(l/s). Demand controlled ventilation in offices using CO_2 sensors.

4.6 Lighting

- LED luminaire with luminous efficacy of > 100 lm/W (compared with 60 lm/W for the Notional Building);
- Daylight dimming in office spaces;
- Presence detection in offices, circulation spaces, toilets and showers.

4.7 Renewable/low carbon energy generation

All buildings will use an efficient reversible heat pump system for heating and cooling. This will use less energy for heating than a conventional fossil fuel natural gas boiler and with the grid decarbonisation will also lower carbon emissions as well compared to a gas boiler.

5.0 RENEWABLE AND LOW CARBON ENERGY GENERATION FEASILBILTY

This section summarises our renewable energy feasibility study and gives reasons for selecting or omitting each technology.

5.1 Solar PV ✔

- Capture energy from sun, convert to electricity
- Simple operation and low maintenance
- Solar PV is proposed for the roofs of Buildings B and C to achieve building regulations compliance

5.2 Solar thermal ✘

- Uses solar collectors to transfers heat from the sun directly to water
- Generally used to generate domestic hot water
- Complex system with high level of operational maintenance
- Not proposed for building A, B and C because we already have VRV system to generate domestic hot water for showers
- Not proposed for Building B and C because it does not fit the simple operation and low embodied carbon strategy

5.3 Heat pumps ✔

- Use ambient air to extract heat from and reject heat to
- ASHP with be used on Buildings A, B and C to provide simultaneous heating and cooling to achieve Building Regulations compliance

5.4 Wind turbines ✘

- Two basic types – horizontal axis and vertical axis
- Efficiently of horizontal axis wind turbines reduces in turbulent air found around buildings
- Wind turbines can cause noise, vibration and flicker
- Generally not suited to an urban environment
- Wind turbines are not proposed for the Electric Park development

5.5 Biomass ✘

- Uses plant derived organic material to produce heat
- High maintenance
- Requires regular deliveries of fuel to site – not ideal for city location
- Combustion of biomass will lead to increase of localised air pollution

5.6 CHP ✘

- Generates both electricity and heat using natural gas
- Combustion of natural gas leads to onsite NOx emissions
- With projected electricity grid decarbonisation CHP no longer becomes and low carbon solution

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6.0 BUILDING REGULATIONS PART L COMPLIANCE

We have used *IES VE Compliance* software to model the Electric Park development in accordance with the National Calculation Methodology to show compliance with Part L of the Building Regulations.

We have used the performance and efficiencies of the fabric and building services as described in Section **4.0 Energy Strategy** and summarised in Table **4**.

The results of the Part L modelling are shown in **Error! Reference source not found.**.

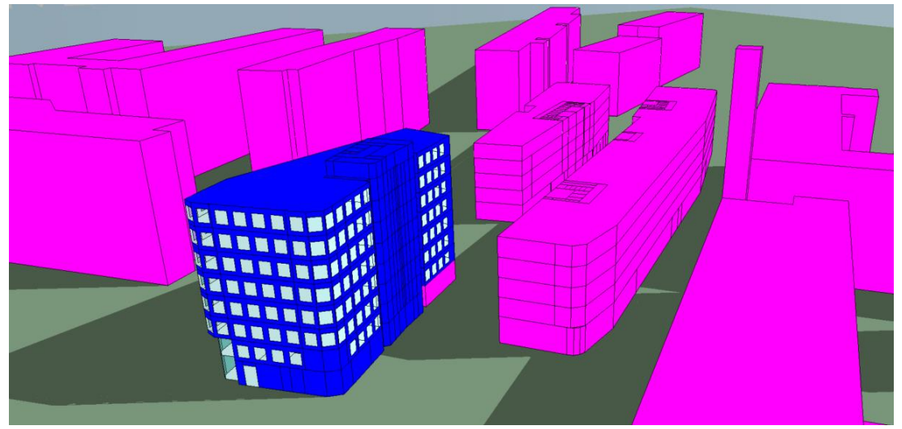
Table 4 **Summary of Part L Building Regulations compliance model assumptions**

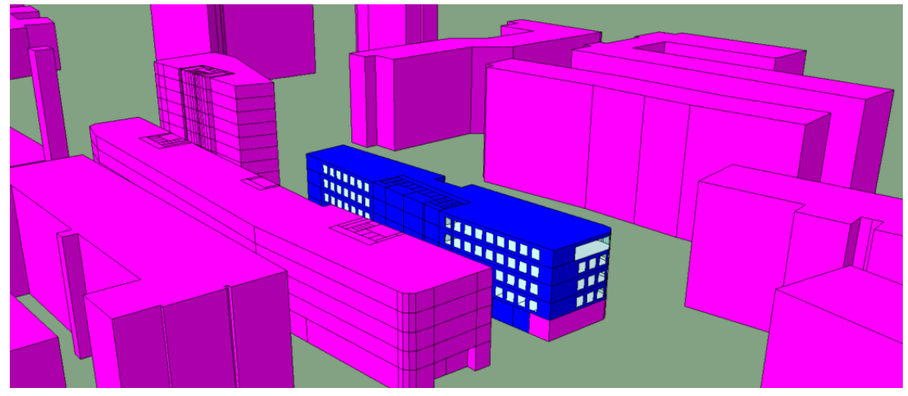
Floor U-value	0.18 W/(m^2.K)
Wall U-value	0.25 W/(m^2.K)
Roof U-value	0.15 W/(m^2.K)
Window U-value	1.6 W/(m^2.K)
Air permeability	5 m^3/(h.m^2)
Glass light transmission	0.7
Glass solar gain transmission	0.4
Heating SCoP	VRF heat pump, 3.4
Cooling SEER	VRF heat pump, 5.1
Ventilation	MVHR: SFP <1.90 W/l/s Demand control in offices using CO2 sensors
Heat recovery efficiency	>80%
Lighting efficacy	100 lm/W
Lighting control	Daylight dimming in offices Presence detection in WC and circulation spaces
Hot water	ASHP for ground floors Direct electric instantaneous for upper floors

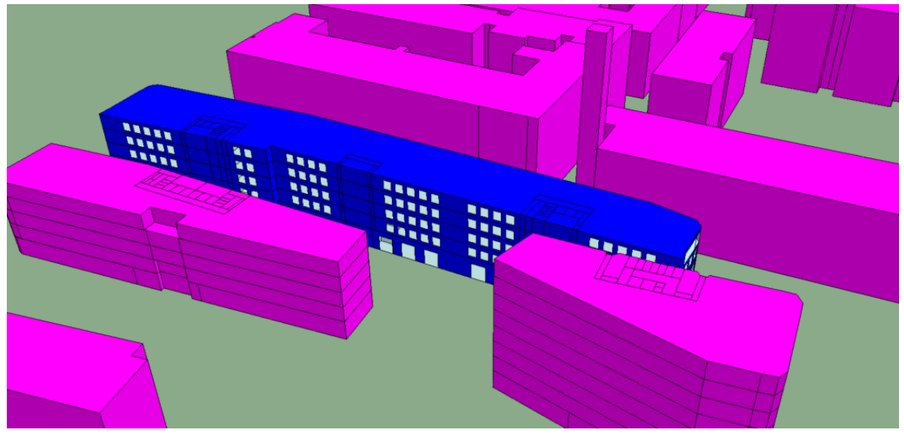
Building	Energy strategy	BER kg CO_2/m^2	TER kg CO_2/m^2	% improvement against Part L 2013	% improvement against Part L 2010	PV area
Building A	VRF & MVHR	11.0	14.6	**24.7%**	**28.9%**	-
Building B	VRF & MVHR	10.3	16.6	**38.0%**	**40.9%**	100 m^2
Building C	VRF & MVHR	10.1	16.4	**38.4%**	**49.2%**	100 m^2

Table 5 **Results of Part L modelling for Electric Park**

Figure 2 **Images of building A,B and C model from IES VE compliance for RIBA Design Stage 3 Building Regulations compliance calculation and thermal modelling**







7.0 APPENDIX - BRUKLS

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L 2010

Project name

Electric_Park - Building A

As designed

Date: Tue Aug 29 18:20:36 2023

Administrative information

Building Details

Address: Pollard St., Manchester, M4 6EQ

Certification tool

Calculation engine: Apache

Calculation engine version: 6.4.0.16

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 6.4.0.16

BRUKL compliance check version: v4.1.h.0

Certifier details

Name: J Risner

Telephone number: Phone

Address: 77 Dale St, Manchester, M1 2HG

Criterion 1: The calculated CO_2 emission rate for the building should not exceed the target

1.1	CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	14.2
1.2	Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	14.2
1.3	Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	10.1
1.4	Are emissions from the building less than or equal to the target?	BER =< TER
1.5	Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services should achieve reasonable overall standards of energy efficiency

2.a Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.24	0.25	PB000007:Surf[1]
Floor	0.25	0.19	0.3	PB0001D9:Surf[72]
Roof	0.25	0.16	0.16	PB0000C7:Surf[0]
Windows***, roof windows, and rooflights	2.2	1.4	1.4	PB000004:Surf[2]
Personnel doors	2.2	-	-	No personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No vehicle access doors in building
High usage entrance doors	3.5	-	-	No high usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

* There might be more than one surface where the maximum U-value occurs.
** 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.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	5

2.b Building services

The building services parameters listed below are expected to be checked by the BCO against guidance. No automatic checking is performed by the tool.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- GF Cycle Store & WCs - Xboxer XBC+ 25

Heating seasonal efficiency	**Cooling nominal efficiency**	**SFP [W/(l/s)]**	**HR seasonal efficiency**
3.4	3.25	-	0.8
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

2- GF Circulation & WC - MRXBOX-AB-ECO2

Heating seasonal efficiency	**Cooling nominal efficiency**	**SFP [W/(l/s)]**	**HR seasonal efficiency**
3.4	3.25	-	0.9
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

3- GF Reception - Xboxer XBC+ 25

Heating seasonal efficiency	**Cooling nominal efficiency**	**SFP [W/(l/s)]**	**HR seasonal efficiency**
3.4	3.25	-	0.83
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

4- Office WCs and Lobby - MRXBOX-AB-ECO4

Heating seasonal efficiency	**Cooling nominal efficiency**	**SFP [W/(l/s)]**	**HR seasonal efficiency**
1	-	0.61	0.93
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

5- Offices - Xboxer XBC+ 15

Heating seasonal efficiency	**Cooling nominal efficiency**	**SFP [W/(l/s)]**	**HR seasonal efficiency**
3.4	3.25	-	0.8
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

1- DHW (GF heat pump)

Heating seasonal efficiency	**Hot water storage loss factor [kWh/litre per day]**
2	0.011

Local mechanical ventilation and exhaust

Zone	**Supply/extract SFP [W/(l/s)]**	**HR seasonal efficiency**	**Exhaust SFP [W/(l/s)]**
EP_Building_A_CycleStore_00	1.9	-	-
EP_Building_A_AccWC_00	1.9	-	-
EP_Building_A_WC_00	1.9	-	-
EP_Building_A_WC_00	1.9	-	-
EP_Building_A_WC_00	1.9	-	-
EP_Building_A_WC_00	1.9	-	-
EP_Building_A_AccWC_00	1.9	-	-
EP_Building_A_Reception/Lobby_00	1.9	-	-
EP_Building_A_Workspace_02	1.9	-	-
EP_Building_A_Workspace_03	1.9	-	-
EP_Building_A_Workspace_04	1.9	-	-
EP_Building_A_Workspace_05	1.9	-	-
EP_Building_A_Workspace_06	1.9	-	-
EP_Building_A_Workspace_07	1.9	-	-
EP_Building_A_Workspace_01	1.9	-	-

Local mechanical ventilation and exhaust

Zone	Supply/extract SFP [W/(l/s)]	HR seasonal efficiency	Exhaust SFP [W/(l/s)]
EP_Building_A_Storage_RF	1.9	-	-
EP_Building_A_WC_RF	1.9	-	-

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
EP_Building_A_CycleStore_00	120	-
EP_Building_A_AccWC_00	40	-
EP_Building_A_WC_00	40	-
EP_Building_A_WC_00	40	-
EP_Building_A_WC_00	40	-
EP_Building_A_WC_00	40	-
EP_Building_A_Stairwell_00	40	-
EP_Building_A_Lobby_00	50	-
EP_Building_A_MEP_00	70	-
EP_Building_A_Lobby_00	20	-
EP_Building_A_Lobby_00	30	-
EP_Building_A_AccWC_00	40	-
EP_Building_A_Stairwell_00	40	-
EP_Building_A_Reception/Lobby_00	760	15
EP_Building_A_Stairwell_01	30	-
EP_Building_A_CleanerStore_01	10	-
EP_Building_A_WC_01	30	-
EP_Building_A_WC_01	30	-
EP_Building_A_WC_01	30	-
EP_Building_A_WC_01	30	-
EP_Building_A_WC_01	30	-
EP_Building_A_WC_01	30	-
EP_Building_A_Stairwell_01	40	-
EP_Building_A_Lobby_01	20	-
EP_Building_A_Lobby_01	40	-
EP_Building_A_Stairwell_02	30	-
EP_Building_A_CleanerStore_02	10	-
EP_Building_A_WC_02	30	-
EP_Building_A_WC_02	30	-
EP_Building_A_WC_02	30	-
EP_Building_A_WC_02	30	-
EP_Building_A_WC_02	30	-
EP_Building_A_WC_02	30	-
EP_Building_A_Stairwell_02	40	-
EP_Building_A_Lobby_02	20	-
EP_Building_A_Lobby_02	40	-
EP_Building_A_Workspace_02	3640	-
EP_Building_A_Stairwell_03	30	-
EP_Building_A_CleanerStore_03	10	-
EP_Building_A_WC_03	30	-
EP_Building_A_WC_03	30	-
EP_Building_A_WC_03	30	-

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
EP_Building_A_WC_03	30	-
EP_Building_A_WC_03	30	-
EP_Building_A_WC_03	30	-
EP_Building_A_Stairwell_03	40	-
EP_Building_A_Lobby_03	20	-
EP_Building_A_Lobby_03	40	-
EP_Building_A_Workspace_03	3640	-
EP_Building_A_Stairwell_04	30	-
EP_Building_A_CleanerStore_04	10	-
EP_Building_A_WC_04	30	-
EP_Building_A_WC_04	30	-
EP_Building_A_WC_04	30	-
EP_Building_A_WC_04	30	-
EP_Building_A_WC_04	30	-
EP_Building_A_WC_04	30	-
EP_Building_A_Stairwell_04	40	-
EP_Building_A_Lobby_04	20	-
EP_Building_A_Lobby_04	40	-
EP_Building_A_Workspace_04	3640	-
EP_Building_A_Stairwell_05	30	-
EP_Building_A_CleanerStore_05	10	-
EP_Building_A_WC_05	30	-
EP_Building_A_WC_05	30	-
EP_Building_A_WC_05	30	-
EP_Building_A_WC_05	30	-
EP_Building_A_WC_05	30	-
EP_Building_A_WC_05	30	-
EP_Building_A_Stairwell_05	40	-
EP_Building_A_Lobby_05	20	-
EP_Building_A_Lobby_05	40	-
EP_Building_A_Workspace_05	3640	-
EP_Building_A_Stairwell_06	30	-
EP_Building_A_CleanerStore_06	10	-
EP_Building_A_WC_06	30	-
EP_Building_A_WC_06	30	-
EP_Building_A_WC_06	30	-
EP_Building_A_WC_06	30	-
EP_Building_A_WC_06	30	-
EP_Building_A_WC_06	30	-
EP_Building_A_Stairwell_06	40	-
EP_Building_A_Lobby_06	20	-
EP_Building_A_Lobby_06	40	-
EP_Building_A_Workspace_06	3640	-
EP_Building_A_Stairwell_07	30	-
EP_Building_A_CleanerStore_07	10	-
EP_Building_A_WC_07	30	-
EP_Building_A_WC_07	30	-

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
EP_Building_A_WC_07	30	-
EP_Building_A_WC_07	30	-
EP_Building_A_WC_07	30	-
EP_Building_A_WC_07	30	-
EP_Building_A_Stairwell_07	40	-
EP_Building_A_Lobby_07	20	-
EP_Building_A_Lobby_07	40	-
EP_Building_A_Workspace_07	3640	-
EP_Building_A_Workspace_01	3600	-
EP_Building_A_Stairwell_RF	30	-
EP_Building_A_Stairwell_RF	30	-
EP_Building_A_Lobby_RF	20	-
EP_Building_A_Lobby_RF	40	-
EP_Building_A_Storage_RF	20	-
EP_Building_A_WC_RF	20	-

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
EP_Building_A_CycleStore_00	N/A	N/A
EP_Building_A_AccWC_00	N/A	N/A
EP_Building_A_WC_00	N/A	N/A
EP_Building_A_WC_00	N/A	N/A
EP_Building_A_WC_00	N/A	N/A
EP_Building_A_WC_00	N/A	N/A
EP_Building_A_Stairwell_00	N/A	N/A
EP_Building_A_Lobby_00	N/A	N/A
EP_Building_A_MEP_00	N/A	N/A
EP_Building_A_Lobby_00	N/A	N/A
EP_Building_A_Lobby_00	N/A	N/A
EP_Building_A_AccWC_00	N/A	N/A
EP_Building_A_Stairwell_00	N/A	N/A
EP_Building_A_Reception/Lobby_00	NO (-26.9%)	NO
EP_Building_A_Stairwell_01	N/A	N/A
EP_Building_A_Stairwell_01	NO (-100%)	NO
EP_Building_A_Stairwell_02	N/A	N/A
EP_Building_A_Stairwell_02	N/A	N/A
EP_Building_A_Workspace_02	NO (-46.5%)	NO
EP_Building_A_Stairwell_03	N/A	N/A
EP_Building_A_Stairwell_03	N/A	N/A
EP_Building_A_Workspace_03	NO (-43.8%)	NO
EP_Building_A_Stairwell_04	N/A	N/A
EP_Building_A_Stairwell_04	N/A	N/A
EP_Building_A_Workspace_04	NO (-40.7%)	NO
EP_Building_A_Stairwell_05	N/A	N/A
EP_Building_A_Stairwell_05	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
EP_Building_A_Workspace_05	NO (-38.6%)	NO
EP_Building_A_Stairwell_06	N/A	N/A
EP_Building_A_Stairwell_06	N/A	N/A
EP_Building_A_Workspace_06	NO (-37.1%)	NO
EP_Building_A_Stairwell_07	N/A	N/A
EP_Building_A_Stairwell_07	N/A	N/A
EP_Building_A_Workspace_07	NO (-35.8%)	NO
EP_Building_A_Workspace_01	NO (-52.3%)	NO
EP_Building_A_Stairwell_RF	N/A	N/A
EP_Building_A_Stairwell_RF	N/A	N/A
EP_Building_A_Lobby_RF	N/A	N/A
EP_Building_A_Lobby_RF	N/A	N/A
EP_Building_A_Storage_RF	N/A	N/A
EP_Building_A_WC_RF	N/A	N/A

Criterion 4: The performance of the building, as built, should be consistent with the BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of 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
Area [m^2]	6777.5	6777.5
External area [m^2]	5718.5	5718.1
Weather	MAN	MAN
Infiltration [m^3/hm^2@ 50Pa]	5	5
Average conductance [W/K]	2680.19	3690.93
Average U-value [W/m^2K]	0.47	0.65
Alpha value* [%]	10.42	10

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
100	**B1 Offices and Workshop businesses**
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Inst.: Hospitals and Care Homes
	C2 Residential Inst.: Residential schools
	C2 Residential Inst.: Universities and colleges
	C2A Secure Residential Inst.
	Residential spaces
	D1 Non-residential Inst.: Community/Day Centre
	D1 Non-residential Inst.: Libraries, Museums, and Galleries
	D1 Non-residential Inst.: Education
	D1 Non-residential Inst.: Primary Health Care Building
	D1 Non-residential Inst.: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others - Stand alone utility block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	2.5	5.27
Cooling	2.23	1.78
Auxiliary	3.98	3.43
Lighting	8.28	16.52
Hot water	2.63	2.61
Equipment*	35.9	35.9
TOTAL**	**19.61**	**29.61**

* Energy used by equipment does not count towards the total for calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Indicative Target
Heating + cooling demand [MJ/m^2]	58.18	61.19
Primary energy* [kWh/m^2]	57.27	79.96
Total emissions [kg/m^2]	10.1	14.2

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	82.3	0.4	6.9	0	0.5	3.33	3.81	3.4	5.1
	Notional	106	6.9	11.5	0.7	0.3	2.56	2.84	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	7.3	1.2	0.6	0.1	2	3.33	3.81	3.4	5.1
	Notional	17.8	5.8	1.9	0.6	1	2.56	2.84	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	33.1	23.6	2.8	1.7	3.4	3.33	3.81	3.4	5.1
	Notional	48.4	8.3	5.3	0.8	3.1	2.56	2.84	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	22.5	37.1	1.9	2.7	4.4	3.33	3.81	3.4	5.1
	Notional	36.1	21.7	3.9	2.1	3.4	2.56	2.84	----	----
[ST] Central heating using air distribution, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	13.4	0	4	0	2.4	0.93	0	1	0
	Notional	38.6	0	12.9	0	8.7	0.83	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

Key Features

The BCO can give particular attention to items with specifications that are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.05	PB000009:Surf[2]
Floor	0.2	0.18	PB000007:Surf[0]
Roof	0.15	0.16	PB0000C7:Surf[0]
Windows, roof windows, and rooflights	1.5	1.4	PB000004:Surf[2]
Personnel doors	1.5	-	No personnel doors in building
Vehicle access & similar large doors	1.5	-	No vehicle access doors in building
High usage entrance doors	1.5	-	No high usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L 2010

Project name

Electric Park - Building B

As designed

Date: Tue Aug 29 18:03:21 2023

Administrative information

Building Details

Address: Pollard St., Manchester, M4 7AT

Certification tool

Calculation engine: Apache

Calculation engine version: 6.4.0.16

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 6.4.0.16

BRUKL compliance check version: v4.1.h.0

Certifier details

Name: J Risner

Telephone number:

Address: 77 Dale St, Manchester, M1 2HG

Criterion 1: The calculated CO_2 emission rate for the building should not exceed the target

1.1	CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	15.9
1.2	Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	15.9
1.3	Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	9.4
1.4	Are emissions from the building less than or equal to the target?	BER =< TER
1.5	Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services should achieve reasonable overall standards of energy efficiency

2.a Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.25	0.33	PB000023:Surf[11]
Floor	0.25	0.23	0.3	PB000064:Surf[63]
Roof	0.25	0.18	0.18	PB00010F:Surf[0]
Windows***, roof windows, and rooflights	2.2	1.4	1.4	PB000001:Surf[1]
Personnel doors	2.2	-	-	No personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No vehicle access doors in building
High usage entrance doors	3.5	-	-	No high usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

* There might be more than one surface where the maximum U-value occurs.
** 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.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	5

2.b Building services

The building services parameters listed below are expected to be checked by the BCO against guidance. No automatic checking is performed by the tool.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- Offices - Xboxer XBC+ 15

Heating seasonal efficiency	**Cooling nominal efficiency**	**SFP [W/(l/s)]**	**HR seasonal efficiency**
3.4	3.25	-	0.8
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

2- GF Cycle Store & WCs - Xboxer XBC+ 25

Heating seasonal efficiency	**Cooling nominal efficiency**	**SFP [W/(l/s)]**	**HR seasonal efficiency**
3.4	3.25	-	0.8
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

3- Office WCs and Lobby - MRXBOX-AB-ECO2

Heating seasonal efficiency	**Cooling nominal efficiency**	**SFP [W/(l/s)]**	**HR seasonal efficiency**
1	-	0.61	0.93
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

1- Offices - Xboxer XBC+ 15

Heating seasonal efficiency	**Hot water storage loss factor [kWh/litre per day]**
3.4	-

2- DHW (GF heat pump)

Heating seasonal efficiency	**Hot water storage loss factor [kWh/litre per day]**
2	0.011

3- DHW (upper floors direct electric)

Heating seasonal efficiency	**Hot water storage loss factor [kWh/litre per day]**
1	-

Local mechanical ventilation and exhaust

Zone	**Supply/extract SFP [W/(l/s)]**	**HR seasonal efficiency**	**Exhaust SFP [W/(l/s)]**
EP_Building_B_Workspaces_00	1.9	-	-
EP_Building_B_CycleStore_00	1.9	-	-
EP_Building_B_WC_00	1.9	-	-
EP_Building_B_WC_00	1.9	-	-
EP_Building_B_WC_00	1.9	-	-
EP_Building_B_WC_00	1.9	-	-
EP_Building_B_WC_00	1.9	-	-
EP_Building_B_AccWC_00	1.9	-	-
EP_Building_B_Reception/Lobby_00	1.9	-	-
EP_Building_B_Workspace_02	1.9	-	-
EP_Building_B_Workspace_03	1.9	-	-
EP_Building_B_Workspace_04	1.9	-	-
EP_Building_B_Workspace_01	1.9	-	-

General lighting and display lighting

Zone	**General lighting [W]**	**Display lamps efficacy [lm/W]**
EP_Building_B_Workspaces_00	1820	-

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
EP_Building_B_Comms_00	90	-
EP_Building_B_Post/Security_00	180	-
EP_Building_B_Stairwell_00	50	-
EP_Building_B_Stairwell_00	50	-
EP_Building_B_Lobby_00	20	-
EP_Building_B_Lobby_00	20	-
EP_Building_B_CycleStore_00	130	-
EP_Building_B_WC_00	30	-
EP_Building_B_WC_00	30	-
EP_Building_B_WC_00	30	-
EP_Building_B_WC_00	40	-
EP_Building_B_WC_00	40	-
EP_Building_B_AccWC_00	50	-
EP_Building_B_Reception/Lobby_00	410	15
EP_Building_B_Stairwell_01	40	-
EP_Building_B_Stairwell_01	40	-
EP_Building_B_Lobby_01	20	-
EP_Building_B_Lobby_01	20	-
EP_Building_B_Lobby_01	90	-
EP_Building_B_Lobby_01	20	-
EP_Building_B_AccWC_01	30	-
EP_Building_B_WC_01	20	-
EP_Building_B_WC_01	20	-
EP_Building_B_WC_01	20	-
EP_Building_B_01	20	-
EP_Building_B_WC_01	20	-
EP_Building_B_WC_01	20	-
EP_Building_B_Lobby_01	20	-
EP_Building_B_Lobby_01	20	-
EP_Building_B_AccWC_01	30	-
EP_Building_B_WC_01	20	-
EP_Building_B_WC_01	20	-
EP_Building_B_WC_01	20	-
EP_Building_B_Workspace_02	5660	-
EP_Building_B_Stairwell_02	40	-
EP_Building_B_Stairwell_02	40	-
EP_Building_B_Lobby_02	20	-
EP_Building_B_Lobby_02	20	-
EP_Building_B_Lobby_02	90	-
EP_Building_B_Lobby_02	20	-
EP_Building_B_AccWC_02	30	-
EP_Building_B_WC_02	20	-
EP_Building_B_WC_02	20	-
EP_Building_B_WC_02	20	-
EP_Building_B_02	20	-
EP_Building_B_WC_02	20	-
EP_Building_B_WC_02	20	-

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
EP_Building_B_Lobby_02	20	-
EP_Building_B_Lobby_02	20	-
EP_Building_B_AccWC_02	30	-
EP_Building_B_WC_02	20	-
EP_Building_B_WC_02	20	-
EP_Building_B_WC_02	20	-
EP_Building_B_Workspace_03	5660	-
EP_Building_B_Stairwell_03	40	-
EP_Building_B_Stairwell_03	40	-
EP_Building_B_Lobby_03	20	-
EP_Building_B_Lobby_03	20	-
EP_Building_B_Lobby_03	90	-
EP_Building_B_Lobby_03	20	-
EP_Building_B_AccWC_03	30	-
EP_Building_B_WC_03	20	-
EP_Building_B_WC_03	20	-
EP_Building_B_WC_03	20	-
EP_Building_B_03	20	-
EP_Building_B_WC_03	20	-
EP_Building_B_WC_03	20	-
EP_Building_B_Lobby_03	20	-
EP_Building_B_Lobby_03	20	-
EP_Building_B_AccWC_03	30	-
EP_Building_B_WC_03	20	-
EP_Building_B_WC_03	20	-
EP_Building_B_WC_03	20	-
EP_Building_B_Stairwell_04	40	-
EP_Building_B_Stairwell_04	40	-
EP_Building_B_Lobby_04	20	-
EP_Building_B_Lobby_04	20	-
EP_Building_B_Lobby_04	90	-
EP_Building_B_Lobby_04	20	-
EP_Building_B_AccWC_04	30	-
EP_Building_B_WC_04	20	-
EP_Building_B_WC_04	20	-
EP_Building_B_WC_04	20	-
EP_Building_B_04	20	-
EP_Building_B_WC_04	20	-
EP_Building_B_WC_04	20	-
EP_Building_B_Lobby_04	20	-
EP_Building_B_Lobby_04	20	-
EP_Building_B_AccWC_04	30	-
EP_Building_B_WC_04	20	-
EP_Building_B_WC_04	20	-
EP_Building_B_WC_04	20	-
EP_Building_B_Workspace_04	5520	-
EP_Building_B_Workspace_01	5620	-

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
EP_Building_B_Workspaces_00	NO (-38.8%)	NO
EP_Building_B_Comms_00	NO (-32.9%)	NO
EP_Building_B_Post/Security_00	N/A	N/A
EP_Building_B_Stairwell_00	N/A	N/A
EP_Building_B_Stairwell_00	N/A	N/A
EP_Building_B_Lobby_00	N/A	N/A
EP_Building_B_Lobby_00	N/A	N/A
EP_Building_B_CycleStore_00	NO (-26.7%)	NO
EP_Building_B_WC_00	N/A	N/A
EP_Building_B_WC_00	N/A	N/A
EP_Building_B_WC_00	N/A	N/A
EP_Building_B_WC_00	N/A	N/A
EP_Building_B_WC_00	N/A	N/A
EP_Building_B_AccWC_00	N/A	N/A
EP_Building_B_Reception/Lobby_00	NO (-25.8%)	NO
EP_Building_B_Workspace_02	NO (-56%)	NO
EP_Building_B_Workspace_03	NO (-51.4%)	NO
EP_Building_B_Workspace_04	NO (-43.8%)	NO
EP_Building_B_Workspace_01	NO (-59.1%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of 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
Area [m^2]	6238.6	6238.6
External area [m^2]	6067.9	5988
Weather	MAN	MAN
Infiltration [m^3/hm^2@ 50Pa]	5	5
Average conductance [W/K]	2705.73	3526.34
Average U-value [W/m^2K]	0.45	0.59
Alpha value* [%]	10.26	10

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
100	**B1 Offices and Workshop businesses**
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Inst.: Hospitals and Care Homes
	C2 Residential Inst.: Residential schools
	C2 Residential Inst.: Universities and colleges
	C2A Secure Residential Inst.
	Residential spaces
	D1 Non-residential Inst.: Community/Day Centre
	D1 Non-residential Inst.: Libraries, Museums, and Galleries
	D1 Non-residential Inst.: Education
	D1 Non-residential Inst.: Primary Health Care Building
	D1 Non-residential Inst.: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others - Stand alone utility block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	3	5.19
Cooling	3.45	3.25
Auxiliary	3.99	3.14
Lighting	7.6	18.68
Hot water	2.61	2.57
Equipment*	37.2	37.2
TOTAL**	**20.65**	**32.83**

* Energy used by equipment does not count towards the total for calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	2.38	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Indicative Target
Heating + cooling demand [MJ/m^2]	80.47	88.2
Primary energy* [kWh/m^2]	60.29	90.04
Total emissions [kg/m^2]	9.4	15.9

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	36.5	54.5	3	4	4.3	3.33	3.81	3.4	5.1
	Notional	47.9	51.1	5.2	3.7	3.3	2.56	3.79	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	25.1	1.9	2.1	0.1	1.7	3.33	3.81	3.4	5.1
	Notional	26.2	2.3	2.8	0.2	1.2	2.56	3.79	----	----
[ST] Central heating using air distribution, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	35.3	0	10.5	0	2.7	0.93	0	1	0
	Notional	60.9	0	20.3	0	9	0.83	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

Key Features

The BCO can give particular attention to items with specifications that are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.25	PB000001:Surf[3]
Floor	0.2	0.2	PB000064:Surf[66]
Roof	0.15	0.18	PB00010F:Surf[0]
Windows, roof windows, and rooflights	1.5	1.4	PB000001:Surf[1]
Personnel doors	1.5	-	No personnel doors in building
Vehicle access & similar large doors	1.5	-	No vehicle access doors in building
High usage entrance doors	1.5	-	No high usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L 2010

Project name

Electric Park - Building C

As designed

Date: Tue Aug 29 18:56:49 2023

Administrative information

Building Details

Address: Pollard St, Manchester,

Certification tool

Calculation engine: Apache

Calculation engine version: 6.4.0.16

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 6.4.0.16

BRUKL compliance check version: v4.1.h.0

Certifier details

Name: J Risner

Telephone number:

Address: Dale st, Manchester, M1

Criterion 1: The calculated CO_2 emission rate for the building should not exceed the target

1.1	CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	17.9
1.2	Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	17.9
1.3	Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	9.1
1.4	Are emissions from the building less than or equal to the target?	BER =< TER
1.5	Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services should achieve reasonable overall standards of energy efficiency

2.a Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.25	0.25	PB000033:Surf[7]
Floor	0.25	0.21	0.22	PB000033:Surf[0]
Roof	0.25	0.18	0.18	PB000033:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.41	1.41	PB000033:Surf[2]
Personnel doors	2.2	-	-	No personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No vehicle access doors in building
High usage entrance doors	3.5	-	-	No high usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

* There might be more than one surface where the maximum U-value occurs.
** 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.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	5

2.b Building services

The building services parameters listed below are expected to be checked by the BCO against guidance. No automatic checking is performed by the tool.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- GF Reception - Xboxer XBC+ 25

Heating seasonal efficiency	**Cooling nominal efficiency**	**SFP [W/(l/s)]**	**HR seasonal efficiency**
3.4	3.25	-	0.83
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

2- Offices - Xboxer XBC+ 15

Heating seasonal efficiency	**Cooling nominal efficiency**	**SFP [W/(l/s)]**	**HR seasonal efficiency**
3.4	3.25	-	0.8
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

3- GF Cycle Store & WCs - Xboxer XBC+ 25

Heating seasonal efficiency	**Cooling nominal efficiency**	**SFP [W/(l/s)]**	**HR seasonal efficiency**
3.4	3.25	-	0.8
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

4- Office WCs and Lobby - MRXBOX-AB-ECO4

Heating seasonal efficiency	**Cooling nominal efficiency**	**SFP [W/(l/s)]**	**HR seasonal efficiency**
1	-	0.61	0.93
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

1- DHW (upper floors direct electric)

Heating seasonal efficiency	**Hot water storage loss factor [kWh/litre per day]**
1	-

Local mechanical ventilation and exhaust

Zone	**Supply/extract SFP [W/(l/s)]**	**HR seasonal efficiency**	**Exhaust SFP [W/(l/s)]**
EP_Building_C_Recpetion/Lobby/Auditorium_00	1.6	-	-
EP_Building_C_WC_00	1.9	-	-
EP_Building_C_WC_00	1.9	-	-
EP_Building_C_WC_00	1.9	-	-
EP_Building_C_WC_00	1.9	-	-
EP_Building_C_CycleStore_00	1.9	-	-
EP_Building_C_WC_00	1.9	-	-
EP_Building_C_WC_00	1.9	-	-
EP_Building_C_WC_00	1.9	-	-
EP_Building_C_WC_00	1.9	-	-
EP_Building_C_WC_00	1.9	-	-
EP_Building_C_Workspace_01	0.3	-	-
EP_Building_C_Workspace_02	0.3	-	-
EP_Building_C_Workspace_03	0.3	-	-
EP_Building_C_Workspace_04	0.3	-	-
EP_Building_C_Workspace_00	1.9	-	-

General lighting and display lighting

Zone	**General lighting [W]**	**Display lamps efficacy [lm/W]**
EP_Building_C_Recpetion/Lobby/Auditorium_00	1070	15

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
EP_Building_C_Stairwell_00	50	-
EP_Building_C_Store_00	10	-
EP_Building_C_Stairwell_00	50	-
EP_Building_C_Lobby_00	20	-
EP_Building_C_WC_00	50	-
EP_Building_C_WC_00	30	-
EP_Building_C_WC_00	30	-
EP_Building_C_WC_00	30	-
EP_Building_C_CycleStore_00	240	-
EP_Building_C_WC_00	40	-
EP_Building_C_WC_00	30	-
EP_Building_C_WC_00	30	-
EP_Building_C_WC_00	30	-
EP_Building_C_WC_00	30	-
EP_Building_C_Lobby_01	50	-
EP_Building_C_Lobby_01	30	-
EP_Building_C_WC_01	20	-
EP_Building_C_WC_01	20	-
EP_Building_C_WC_01	20	-
EP_Building_C_WC_01	20	-
EP_Building_C_WC_01	20	-
EP_Building_C_AccWC_01	30	-
EP_Building_C_Stairwell_01	40	-
EP_Building_C_Lobby_01	10	-
EP_Building_C_Stairwell_01	40	-
EP_Building_C_Lobby_01	20	-
EP_Building_C_Stairwell_01	40	-
EP_Building_C_Lobby_01	10	-
EP_Building_C_Workspace_01	11060	-
EP_Building_C_Lobby_01	50	-
EP_Building_C_Lobby_01	30	-
EP_Building_C_AccWC_01	30	-
EP_Building_C_WC_01	20	-
EP_Building_C_WC_01	20	-
EP_Building_C_WC_01	20	-
EP_Building_C_WC_01	20	-
EP_Building_C_WC_01	30	-
EP_Building_C_Lobby_02	50	-
EP_Building_C_Lobby_02	30	-
EP_Building_C_WC_02	20	-
EP_Building_C_WC_02	20	-
EP_Building_C_WC_02	20	-
EP_Building_C_WC_02	20	-
EP_Building_C_WC_02	20	-
EP_Building_C_AccWC_02	30	-
EP_Building_C_Stairwell_02	40	-
EP_Building_C_Lobby_02	10	-

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
EP_Building_C_Stairwell_02	40	-
EP_Building_C_Lobby_02	20	-
EP_Building_C_Stairwell_02	40	-
EP_Building_C_Lobby_02	10	-
EP_Building_C_Workspace_02	11060	-
EP_Building_C_Lobby_02	50	-
EP_Building_C_Lobby_02	30	-
EP_Building_C_AccWC_02	30	-
EP_Building_C_WC_02	20	-
EP_Building_C_WC_02	20	-
EP_Building_C_WC_02	20	-
EP_Building_C_WC_02	20	-
EP_Building_C_WC_02	30	-
EP_Building_C_Lobby_03	50	-
EP_Building_C_Lobby_03	30	-
EP_Building_C_WC_03	20	-
EP_Building_C_WC_03	20	-
EP_Building_C_WC_03	20	-
EP_Building_C_WC_03	20	-
EP_Building_C_WC_03	20	-
EP_Building_C_AccWC_03	30	-
EP_Building_C_Stairwell_03	40	-
EP_Building_C_Lobby_03	10	-
EP_Building_C_Stairwell_03	40	-
EP_Building_C_Lobby_03	20	-
EP_Building_C_Stairwell_03	40	-
EP_Building_C_Lobby_03	10	-
EP_Building_C_Workspace_03	11060	-
EP_Building_C_Lobby_03	50	-
EP_Building_C_Lobby_03	30	-
EP_Building_C_AccWC_03	30	-
EP_Building_C_WC_03	20	-
EP_Building_C_WC_03	20	-
EP_Building_C_WC_03	20	-
EP_Building_C_WC_01	20	-
EP_Building_C_WC_03	30	-
EP_Building_C_Lobby_04	50	-
EP_Building_C_Lobby_04	30	-
EP_Building_C_WC_04	20	-
EP_Building_C_WC_04	20	-
EP_Building_C_WC_04	20	-
EP_Building_C_WC_04	20	-
EP_Building_C_WC_04	20	-
EP_Building_C_AccWC_04	30	-
EP_Building_C_Stairwell_04	40	-
EP_Building_C_Lobby_04	10	-
EP_Building_C_Stairwell_04	40	-

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
EP_Building_C_Lobby_04	20	-
EP_Building_C_Stairwell_04	40	-
EP_Building_C_Lobby_04	10	-
EP_Building_C_Workspace_04	11060	-
EP_Building_C_Lobby_04	50	-
EP_Building_C_Lobby_04	30	-
EP_Building_C_AccWC_04	30	-
EP_Building_C_WC_04	20	-
EP_Building_C_WC_04	20	-
EP_Building_C_WC_04	20	-
EP_Building_C_WC_01	20	-
EP_Building_C_WC_04	30	-
EP_Building_C_Stairwell_00	40	-
EP_Building_C_Workspace_00	5690	-

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
EP_Building_C_Recpetion/Lobby/Auditorium_00	NO (-29.8%)	NO
EP_Building_C_Stairwell_00	N/A	N/A
EP_Building_C_Store_00	N/A	N/A
EP_Building_C_Stairwell_00	N/A	N/A
EP_Building_C_Lobby_00	N/A	N/A
EP_Building_C_WC_00	N/A	N/A
EP_Building_C_WC_00	N/A	N/A
EP_Building_C_WC_00	N/A	N/A
EP_Building_C_WC_00	N/A	N/A
EP_Building_C_CycleStore_00	NO (-87.1%)	NO
EP_Building_C_WC_00	N/A	N/A
EP_Building_C_WC_00	N/A	N/A
EP_Building_C_WC_00	N/A	N/A
EP_Building_C_WC_00	N/A	N/A
EP_Building_C_WC_00	N/A	N/A
EP_Building_C_Workspace_01	NO (-70.8%)	NO
EP_Building_C_Workspace_02	NO (-66.9%)	NO
EP_Building_C_Workspace_03	NO (-61.7%)	NO
EP_Building_C_Workspace_04	NO (-53.6%)	NO
EP_Building_C_Stairwell_00	NO (-37.8%)	NO
EP_Building_C_Workspace_00	NO (-61.2%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of 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
Area [m^2]	12198.8	12198.8
External area [m^2]	10957.5	11069.7
Weather	MAN	MAN
Infiltration [m^3/hm^2@ 50Pa]	5	5
Average conductance [W/K]	4304.96	5999.28
Average U-value [W/m^2K]	0.39	0.54
Alpha value* [%]	10.19	10

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
100	**B1 Offices and Workshop businesses**
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Inst.: Hospitals and Care Homes
	C2 Residential Inst.: Residential schools
	C2 Residential Inst.: Universities and colleges
	C2A Secure Residential Inst.
	Residential spaces
	D1 Non-residential Inst.: Community/Day Centre
	D1 Non-residential Inst.: Libraries, Museums, and Galleries
	D1 Non-residential Inst.: Education
	D1 Non-residential Inst.: Primary Health Care Building
	D1 Non-residential Inst.: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others - Stand alone utility block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	2.09	9.99
Cooling	3.41	2.77
Auxiliary	1.46	3.43
Lighting	8.93	17.87
Hot water	2.87	2.86
Equipment*	37.8	37.8
TOTAL**	**18.76**	**36.92**

* Energy used by equipment does not count towards the total for calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	1.19	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Indicative Target
Heating + cooling demand [MJ/m^2]	70.18	125.54
Primary energy* [kWh/m^2]	54.8	101.2
Total emissions [kg/m^2]	9.1	17.9

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using air distribution, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	14.6	0	4.3	0	2.6	0.93	0	1	0
	Notional	44.7	0	14.9	0	8.2	0.83	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	39.4	61.6	3.3	4.5	5.4	3.33	3.81	3.4	5.1
	Notional	97.9	40.1	10.6	2.9	3.1	2.56	3.79	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	19.9	0.1	1.7	0	1.8	3.33	3.81	3.4	5.1
	Notional	43.9	0.8	4.8	0.1	0.9	2.56	3.79	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	23.9	51	2	3.7	1.1	3.33	3.81	3.4	5.1
	Notional	93	41.6	10.1	3	3.3	2.56	3.79	----	----
[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

Key Features

The BCO can give particular attention to items with specifications that are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.16	PB000043:Surf[23]
Floor	0.2	0.1	PB00015C:Surf[87]
Roof	0.15	0.18	PB000033:Surf[1]
Windows, roof windows, and rooflights	1.5	1.41	PB000033:Surf[2]
Personnel doors	1.5	-	No personnel doors in building
Vehicle access & similar large doors	1.5	-	No vehicle access doors in building
High usage entrance doors	1.5	-	No high usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5