



Kier Mechanical & Electrical

Energy Statement & LZC Feasibility Report

for

**Plot 5000
Hatfield Business Park**

Ref: Energy/Rev- 1
Date: 24 March 2017

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REVISIONS

Issue	Description	Date
1	Planning Issue	24/03/17

Latest Amendments Identified **Red** in Document.

CONTENTS

1.0 INTRODUCTION

- 1.1 BREEAM 'Very Good' Rating
- 1.2 Building Regulations Part L2A – Criterion 1

2.0 BRIEF SCOPE OF DEVELOPMENT PROPOSALS

3.0 APPROACH & METHODOLOGY

- 3.1 Energy Calculations
- 3.2 Future Fit-out Allowances

4.0 ENERGY EFFICIENCY MEASURES

- 4.1 Passive Enhancement Measures (Be Lean: Use Less Energy)
- 4.2 Active Enhancement Measures (Be Clean: Supply Energy Efficiently)

5.0 RENEWABLE TECHNOLOGIES (Be green: use renewable energy)

- 5.1 Air Source Heat Pumps (ASHP)

6.0 ENERGY CALCULATION RESULTS

- 6.1 SBEM *TER/BER* Calculations
- 6.2 BREEAM Ene01
- 6.3 Draft EPC Ratings

7.0 CONCLUSION

APPENDICIES

APPENDIX 1 – Building Design Data

APPENDIX 2 – BRUKL Output Documents

APPENDIX 3 – Draft EPC Certificates

1.0 INTRODUCTION

This report has been prepared in connection with the proposed development of a warehouse and light production building with two storey offices, at first and second floor level, and associated service yard and car parking, all on a self-contained landscaped site at Plot 5000, Hatfield Business Park.

The report seeks to demonstrate compliance with the following and considers the feasibility of utilising Low and Zero Carbon (LZC) technologies to assist in achieving compliance:

- BREEAM 'Very Good' Rating
- Building Regulations Part L2A 2013 – Criterion 1

1.1 BREEAM 'Very Good' Rating

Analysis of the proposed building design and development is undertaken to identify opportunities for and encourage the adoption of passive design solutions, including free cooling.

In compliance with credit ENE04 a feasibility study has been carried out to establish the most appropriate on site or near site low or zero carbon (LZC) energy sources for the building or development, and is specified.

The use of LZC technologies can assist in achieving BREEAM credits under Ene01 'Reduction of CO₂ Emissions' and Ene04 'Low & Zero Carbon Technologies'

BREEAM Ene04 CN16 states *'The amount of energy or CO₂ emissions reduction is not specified in the criteria in this issue. However, it should not be a trivial amount. As a guide, the installation should contribute at least 5% of overall building energy demand and/or CO₂ emissions'*

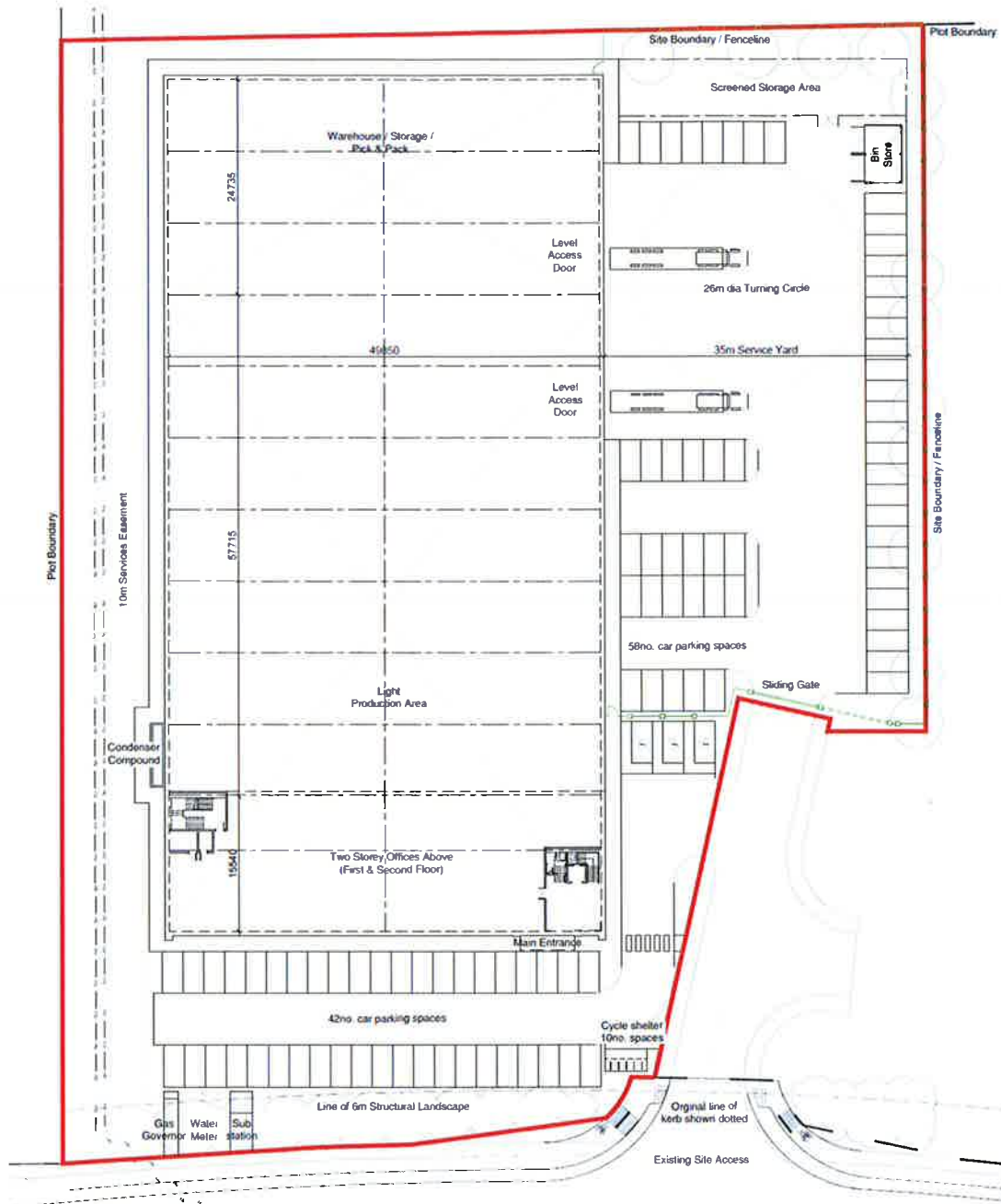
1.2 Building Regulations Part L2A – Criterion 1

To satisfy Criterion 1: the CO₂ Building Emission Rate (**BER**) for the buildings 'As Designed' must not be greater than the Target Emission Rate (**TER**) calculated as set out in the Approved Document.

The use of LZC technologies can assist in reducing a building's CO₂ emission rate (**BER**).

2.0 BRIEF SCOPE OF DEVELOPMENT PROPOSALS

The development comprises of a warehouse and light production building with two storey offices, at first and second floor level, and associated service yard and car parking, all on a self-contained landscaped site at Plot 5000, Hatfield Business Park.



Proposed Site Plan

This study is based on building fabric, form and orientation as detailed on AJA Architect's plan and elevation drawings accompanying the planning submission.

Services provisions i.e. space heating, hot water heating, ventilation and lighting are defined in Appendix 1.

3.0 APPROACH & METHODOLOGY

To achieve a BREEAM 'Very Good' rating and compliance with Building Regulations Part L2A 2013 – Criterion 1, the following energy hierarchy will be adopted:

1. Be lean: use less energy
2. Be clean: supply energy efficiently
3. Be green: use renewable energy

3.1 Energy Calculations

Energy calculations undertaken as part of this report are based on Level 5 Apache SBEM calculations (v7.0.7) using IES Virtual Environment Software as the interface tool and the building design data as detailed in Appendix 1.



IES Building Model – South Facade



IES Building Model - East Facade

3.2 **Future Fit-out Allowances**

Where services are not being installed as part of the developers works the following allowances have been made in the calculations for future fitting out in accordance with the requirements of Building Regulations Part L2A 2013:

- Heating & lighting to the Warehouse areas
- Warehouse undercroft to be fitted out as offices

Details of these allowances are highlighted green in Appendix 1.

4.0 **ENERGY EFFICIENCY MEASURES**

The following passive and active energy enhancement measures are proposed for the development in accordance with the adopted 'Energy Hierarchy' to maximise the energy efficiency of the buildings before incorporating renewable technologies.

4.1 **Passive Enhancement Measures (Be Lean: Use Less Energy)**

U-value of Walls has been improved from the minimum requirements of Part L2A 2013 of $0.35\text{W/m}^2\text{K}$ to $0.3\text{W/m}^2\text{K}$ to reduce the energy demands for heating.

U-value of Roofs has been improved from the minimum requirements of Part L2A 2013 of $0.25\text{W/m}^2\text{K}$ to $0.16\text{W/m}^2\text{K}$ to reduce the energy demands for heating.

U-value of Windows has been improved from the minimum requirements of Part L2A 2013 of $2.20\text{W/m}^2\text{K}$ to $1.80\text{W/m}^2\text{K}$ to reduce the energy demands for heating.

U-value of Roof-lights has been improved from the minimum requirements of Part L2A 2013 of $2.20\text{W/m}^2\text{K}$ to $1.80\text{W/m}^2\text{K}$ to reduce the energy demands for heating.

Roof-Light Areas are based on the optimum area for energy efficiency when balancing energy saving through the use of daylight lighting controls against the increase energy demands for heating and the requirements to limit solar overheating.

Air Permeability has been improved from the minimum requirements of Part L2A 2013 of $10\text{m}^3/\text{hr}/\text{m}^2$ to $4.0\text{m}^3/\text{hr}/\text{m}^2$ to reduce the energy demands for heating.

Solar Control Glazing has been specified to limit solar heat gains and to reduce demands for artificial cooling.

External Brise' Soleil has been specified to limit solar heat gains and to reduce demands for artificial cooling.

4.2 **Active Enhancement Measures (Be Clean: Supply Energy Efficiently)**

High Efficiency LED Lighting has been specified to reduce internal lighting energy use.

Warehouse Lighting has been specified with automatic PIR occupancy sensing and daylight switching controls to reduce lighting energy use.

Office Lighting has been specified with automatic PIR occupancy sensing and daylight dimming controls to reduce lighting energy use.

WC Lighting has been specified with automatic PIR occupancy sensing controls to reduce lighting energy use.

Power Factor Correction has been specified to improve electrical efficiencies by ensuring a power factor no worse than 0.95.

HVAC System Energy Metering and Out of Range Value Alarm has been specified to provide the end user with a better understanding of energy consumption.

Lighting System Energy Metering and Out of Range Value Alarm has been specified to provide the end user with a better understanding of energy consumption.

5.0 RENEWABLE TECHNOLOGIES (Be green: use renewable energy)

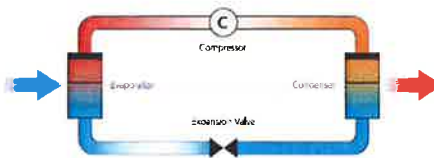
The table below identifies which renewable or LZC energy technologies are considered feasible for this development.

Technology	Feasible	Reason
Solar Water Heating	No	<ul style="list-style-type: none"> This is considered a feasible technology however the demand for hot water is a very small proportion of the building total energy demands and therefore the benefits are extremely limited.
PV Panels	No	<ul style="list-style-type: none"> The building has a lightweight inaccessible roof area which would be unsuitable for PV installations.
Air Source Heating	Yes	<ul style="list-style-type: none"> Air Source Heating is considered feasible for heating to the core and office areas.

Technology	Feasible	Reason
Biomass Heating	No	<ul style="list-style-type: none"> Not considered suitable for use in connection with the proposed heating systems in the office and warehouse areas. Air quality & pollution issues associated with the use of biomass. Fuel storage & re-filling requirements are considered difficult to accommodate on the proposed site.
Ground Source Heating	No	<ul style="list-style-type: none"> Detailed ground investigations would be required to determine the suitability and size of a ground source heating solution in this location. The cost of a closed-loop or open-loop borehole system is considered prohibitive for this development. There is insufficient area on-site for a horizontal 'slinky' type solution.
Combined Heat & Power (CHP)	No	<ul style="list-style-type: none"> Considered unfeasible due to the low, year round, base heating load required to make CHP a viable renewable solution.
Wind Turbines	No	<ul style="list-style-type: none"> Local wind speeds are below those generally recommended for wind turbines to be a viable renewable solution.

5.1 Air Source Heat Pumps (ASHP)

Split or Multi Split type air conditioning systems are one-to-one systems consisting of one evaporator (fan coil) unit connected to an external condensing unit. Both the indoor and outdoor units are connected through copper tubing and electrical cabling. The indoor part (evaporator) pulls heat out from the surrounding air while the outdoor condensing unit transfers the heat into the environment, this cycle can be reversed to deliver heat to the space. Refrigerant in the heat exchanger absorbs heat from the outside air and evaporates. Vapour is compressed, thereby increasing pressure and vapour temperature. Hot vapour is condensed in the 2nd heat exchanger where heat is rejected. The liquid refrigerant passes back through an expansion valve, to start the cycle again.



ASHP Cycle

Variable refrigerant flow (VRF) is an air-conditioning system configuration where there is one outdoor condensing unit and multiple indoor units. The term variable refrigerant flow refers to the ability of the system to control the amount of refrigerant flowing to the multiple evaporators (indoor units), enabling the use of many evaporators of differing capacities and configurations connected to a single condensing unit. The arrangement provides an individualized comfort control, and simultaneous heating and cooling in different zones.

Air source heat pumps can only be considered as a renewable technology when used in heating mode. Refer to Annex VI of Directive 2009/28/EC for more detail on accounting for energy from heat pumps.



ASHP Outdoor Units

5.1.1 Estimated Energy Savings & Payback Periods

For ASHP systems payback is achieved through comparing the energy offset by the heating function of the system against a notional gas boiler.

The table below illustrates the estimated energy savings in line with BREEAM Ene04:

System	Gas Boiler
Efficiency	91%
Building Energy Consumption (kWh)	438,812
System	Air Source Heat Pump
Efficiency	350%
Building Energy Consumption (kWh)	401,454
Annual Energy Savings (kWh)	37,358
Ene04 Percentage Saving Target (%)	5
Percentage Saving Actual (%)	9%

The table below illustrates the estimated simple payback period:

System	Gas Boiler
Efficiency	91%
Building Heating Energy Consumption (kWh)	227,203
Capital Cost (£)	20,000
Annual Energy Cost (£)	10224.13
System	Air Source Heat Pump
Efficiency	350%
Building Heating Energy Consumption (kWh)	189,911
Capital Cost (£)	50,000
Annual Energy Cost (£)	2658.75
Annual Energy Savings (£)	7565.38
Annual Feed In Tariff Payments (£)	0
Annual Export Tariff Payments (£)	0
Simple Payback Period (years)	6.6

1. Gas Price - p per kWh	4.5
2. Electricity Price - p per kWh	14

6.0 ENERGY CALCULATION RESULTS

6.1 SBEM TER/BER Calculations

The 'Target Emission Rate' (**TER**) and actual 'Building Emission Rate' (**BER**) calculated in accordance with the requirements of Building Regulations Part L2A (2013) are as follows.

Model	TER (kgCO ₂ /m ² /yr)	BER (kgCO ₂ /m ² /yr)	PASS / FAIL
Plot 5000	22.9	22.9	PASS

These results include the energy efficiency measures detailed in Section 4.0. Refer to Appendix 2 for copies of the BRUKL output documents.

6.2 BREEAM Ene01

The scheme is currently anticipated to achieve 3no. credits.

6.3 Draft EPC Ratings

Based on the results above the predicted EPC ratings are as follows:

Model	Asset Rating	EPC Rating
Plot 5000	26	B

Refer to Appendix 3 for copies of the draft EPC certificates.

7.0 CONCLUSION

The results tabulated above show that the calculated BER for Plot 5000 is an improvement on the TER thus demonstrating compliance with Building Regulations Part L2A (2013).

Any BREEAM credits achieved under Ene01 are to be advised by a BREEAM assessor to demonstrate achieving a 'Very Good' rating as detailed in the BREEAM pre-assessment report.

BREEAM Ene04 requires that at least 5% reduction in building energy use is achieved by the selected LZC technology. A 9% reduction in overall building energy can be achieved by utilising and ASHP system within the office space.

APPENDIX 1 – Building Design Data

Items in green denote allowances for future tenant fit-out installations.

Building Form & Orientation - Refer to AJA planning drawings

SBEM Building Type - B2-B7 General Industrial

SBEM Room Types

Core Spaces	-	Circulation area
Stairwell	-	Circulation area
WC	-	Toilet
Cleaners	-	Cupboard
Kitchenette	-	Office (tea)
Office	-	Office (open)
Reception	-	Reception
Riser	-	Cupboard
Internal Plantroom/Switchroom	-	Light plantroom
Warehouse	-	Industrial process area
Ground Floor Undercroft	-	Office (open)

U-Values

Wall (System)	-	0.3 W/m ² .K
Roof (System)	-	0.16 W/m ² .K
Ground	-	0.25 W/m ² .K
Window (Glazed Office)	-	1.8 W/m ² .K
Glazed Spandrel (Floor/Void)	-	0.5 W/m ² .K
Rooflight	-	1.8 W/m ² .K
Office Fire Exit Doors	-	1.8 W/m ² .K
Personnel Doors	-	2.2 W/m ² .K
Loading Bay Doors	-	1.5 W/m ² .K
Main Entrance Doors	-	1.8 W/m ² .K Roof

Glazing Type - Pilkington Suncool 66/33 – No Blinds

g-value	-	0.36
Light Transmittance	-	65%

Rooflights

Area	-	10%
g-value	-	0.55
Light Transmittance	-	58%

Air Permeability - 4.0m³/hr/m²

Future Warehouse Heating – S1

System Type	-	Flued, radiant tube
Fuel	-	Natural Gas
Efficiency	-	91%

VRF Heating & Cooling – S2 (including undercroft)

System Type	-	Multi-Split
Heating/Cooling Generator	-	Air Source Heat Pump
Fuel	-	Electric
Heating COP	-	3.5
Cooling EER/SEER	-	3.0/6.0

Electric Heating – S3

System Type	-	Room Heater
Heat Source	-	Element unfanned
Fuel	-	Electric
Seasonal Efficiency	-	100%

Core Area Heating – All Units

System Type	-	Central Heating using Radiators
Heat Source	-	LTHW Combination Boiler
Fuel	-	Natural Gas
Seasonal Efficiency	-	91%
Variable Speed Pump	-	No

Office Mechanical Ventilation – Units 2 - 6 (including undercroft)

System Type	-	Zonal Supply/Extract
Supply/Extract Specific Fan Power	-	1.8W//s
Heat Recovery Efficiency	-	70%
Demand Control	-	None

Toilet Extract Ventilation

System Type	-	Zonal Extract
Extract Air Flow Rate	-	10ach/hr
Extract Specific Fan Powers	-	0.5 W//s

Domestic Hot Water Systems

Generator Type	-	Instantaneous hot water
Fuel Type	-	Electricity
Generator Seasonal Efficiency	-	100%

Lighting Levels/Energy/Controls

Zone	IPD (W/m²/100lux)	Control	Method
Core Spaces	3	PIR	Auto On/Off
Stairwell	14.5	PIR	Auto On/Off
WC	4	PIR	Auto On/Off
Cleaners	3	PIR	Auto On/Off
Kitchenette	2.2	PIR	Auto On/Off
Office	1.5	PIR	Auto On/Off & Daylight Dimming Perimeter
Reception	3	PIR	Auto On/Off
Riser	15	PIR	Auto On/Off
Internal Plantroom/Switchroom	5.5	PIR	Auto On/Off
Warehouse	2	PIR	Auto On/Off & Daylight Switching
Ground Floor Undercroft	1.5	PIR	Auto On/Off & Daylight Dimming Perimeter

Lighting Controls Parasitic Power - 0.1W/m²

Electric Power Factor - >0.95

Energy Metering

Sub-Metering - All heating, cooling & lighting systems.
 Out of Range Monitoring - All heating, cooling & lighting systems.

APPENDIX 2 – BRUKL Output Documents

Project name

Plot 5000

As designed

Date: Wed Mar 22 09:42:00 2017

Administrative information

Building Details

Address: Hatfield Business Park, ,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.7

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.7

BRUKL compliance check version: v5.3.a.0

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name:

Telephone number:

Address: , ,

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	22.9
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	22.9
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	22.9
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	Surface where the maximum value occurs*
Wall**	0.35	0.3	0.3	0000000A:Surf[8]
Floor	0.25	0.25	0.25	0200000C:Surf[0]
Roof	0.25	0.16	0.16	02000002:Surf[2]
Windows***, roof windows, and rooflights	2.2	1.69	1.82	0000000A:Surf[0]
Personnel doors	2.2	2.2	2.2	02000002:Surf[5]
Vehicle access & similar large doors	1.5	1.5	1.5	02000002:Surf[3]
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

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

* 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	4

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

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- VRF Heating & Cooling Vent S2

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	3	0	0	0.7
Standard value	2.5*	3.2	N/A	N/A	0.5
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. For types <=12 kW output, refer to EN 14825 for limiting standards.					

2- VRF Heating & Cooling S2

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	3	0	0	-
Standard value	2.5*	0.7	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. For types <=12 kW output, refer to EN 14825 for limiting standards.					

3- Electric Heater S3

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	0.2	0	-
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- Warehouse Heating S1

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	1	0	-
Standard value	0.86	N/A	0.55	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- Electric Heater S3

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	-
Standard value	1	N/A

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
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 supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

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	1.9	1.6	0.5	1.1	0.5	1			
00.00.01 Reception	-	1.8	0	-	-	-	-	-	-	-	-	N/A
00.00.03 Dis WC/SHW	-	-	0.5	-	-	-	-	-	-	-	-	N/A
00.00.04 Undercroft P	-	1.8	0	-	-	-	-	-	-	-	-	N/A
00.00.05 Undercroft P	-	1.8	0	-	-	-	-	-	-	-	-	N/A
00.00.06 Undercroft I	-	1.8	0	-	-	-	-	-	-	-	-	N/A
00.00.07 Undercroft I	-	1.8	0	-	-	-	-	-	-	-	-	N/A
00.00.08 Undercroft P	-	1.8	0	-	-	-	-	-	-	-	-	N/A
00.02.02 Cleaners	-	-	0.5	-	-	-	-	-	-	-	-	N/A
00.01.03 Cleaners	-	-	0.5	-	-	-	-	-	-	-	-	N/A
00.01.05 WC	-	-	0.5	-	-	-	-	-	-	-	-	N/A
00.02.04 WC	-	-	0.5	-	-	-	-	-	-	-	-	N/A
00.01.06 Dis WC	-	-	0.5	-	-	-	-	-	-	-	-	N/A
00.02.05 Dis WC	-	-	0.5	-	-	-	-	-	-	-	-	N/A
00.01.08 WC	-	-	0.5	-	-	-	-	-	-	-	-	N/A
00.02.07 WC	-	-	0.5	-	-	-	-	-	-	-	-	N/A
00.01.09 Kitchenette	-	1.8	0	-	-	-	-	-	-	-	-	N/A
00.02.08 Kitchenette	-	1.8	0	-	-	-	-	-	-	-	-	N/A
00.02.10 Office P	-	1.8	0	-	-	-	-	-	-	-	-	N/A
00.01.11 Office P	-	1.8	0	-	-	-	-	-	-	-	-	N/A
00.02.11 Office P	-	1.8	0	-	-	-	-	-	-	-	-	N/A
00.01.12 Office P	-	1.8	0	-	-	-	-	-	-	-	-	N/A
00.01.13 Office I	-	1.8	0	-	-	-	-	-	-	-	-	N/A
00.02.12 Office I	-	1.8	0	-	-	-	-	-	-	-	-	N/A
00.02.13 Office P	-	1.8	0	-	-	-	-	-	-	-	-	N/A
00.01.14 Office P	-	1.8	0	-	-	-	-	-	-	-	-	N/A

Zone name	Luminous efficacy [lm/W]			General lighting [W]
	Luminaire	Lamp	Display lamp	
Standard value	60	60	22	
00.00.01 Reception	-	59	22	388
00.00.02 Stairwell	-	21	-	241
00.00.03 Dis WC/SHW	-	82	-	68
00.00.04 Undercroft P	99	-	-	1361
00.00.05 Undercroft P	103	-	-	216
00.00.06 Undercroft I	108	-	-	241
00.00.07 Undercroft I	97	-	-	2343
00.00.08 Undercroft P	112	-	-	132
00.00.09 Water Services	78	-	-	51
00.00.10 Main Switchboard	49	-	-	110
00.00.11 Stairwell	-	13	-	640
00.00.12 Warehouse	74	-	-	29222
00.01.01 Stairwell	-	15	-	713
00.02.01 Stairwell	-	22	-	713

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
00.01.02 Lobby		-	229	-	47
00.02.02 Cleaners		150	-	-	42
00.01.03 Cleaners		98	-	-	42
00.02.03 Lobby		-	301	-	20
00.01.04 Lobby		-	301	-	20
00.01.05 WC		-	52	-	222
00.02.04 WC		-	72	-	222
00.01.06 Dis WC		-	90	-	58
00.02.05 Dis WC		-	113	-	58
00.01.07 Lobby		-	301	-	21
00.02.06 Lobby		-	301	-	21
00.01.08 WC		-	60	-	157
00.02.07 WC		-	88	-	157
00.01.09 Kitchenette		144	-	-	75
00.02.08 Kitchenette		205	-	-	75
00.01.10 Office P		128	-	-	119
00.02.09 Office P		165	-	-	119
00.02.10 Office P		100	-	-	1391
00.01.11 Office P		99	-	-	1354
00.02.11 Office P		110	-	-	216
00.01.12 Office P		103	-	-	216
00.01.13 Office I		98	-	-	2145
00.02.12 Office I		100	-	-	2145
00.02.13 Office P		111	-	-	205
00.01.14 Office P		103	-	-	205
00.01.15 Riser		30	-	-	12
00.02.14 Riser		30	-	-	12
00.02.15 Riser		30	-	-	25
00.01.16 Riser		30	-	-	25
00.01.17 Lobby		-	132	-	47
00.02.16 Stairwell		-	16	-	850
00.01.18 Stairwell		-	13	-	713

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?
00.00.01 Reception	NO (-23.7%)	NO
00.00.02 Stairwell	NO (-56%)	NO
00.00.03 Dis WC/SHW	N/A	N/A
00.00.04 Undercroft P	NO (-8.4%)	NO
00.00.05 Undercroft P	NO (-34.2%)	NO
00.00.06 Undercroft I	NO (-63.4%)	NO
00.00.07 Undercroft I	NO (-84.4%)	NO
00.00.08 Undercroft P	NO (-33.2%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00.00.12 Warehouse	NO (-35%)	NO
00.01.01 Stairwell	NO (-35.9%)	NO
00.02.01 Stairwell	NO (-35.6%)	NO
00.01.02 Lobby	N/A	N/A
00.02.02 Cleaners	N/A	N/A
00.01.03 Cleaners	N/A	N/A
00.02.03 Lobby	N/A	N/A
00.01.04 Lobby	N/A	N/A
00.01.05 WC	N/A	N/A
00.02.04 WC	N/A	N/A
00.01.06 Dis WC	N/A	N/A
00.02.05 Dis WC	N/A	N/A
00.01.07 Lobby	N/A	N/A
00.02.06 Lobby	N/A	N/A
00.01.08 WC	N/A	N/A
00.02.07 WC	N/A	N/A
00.01.09 Kitchenette	N/A	N/A
00.02.08 Kitchenette	N/A	N/A
00.01.10 Office P	NO (-32.9%)	NO
00.02.09 Office P	NO (-27.9%)	NO
00.02.10 Office P	NO (-13.1%)	NO
00.01.11 Office P	NO (-9.9%)	NO
00.02.11 Office P	NO (-35.2%)	NO
00.01.12 Office P	NO (-34.6%)	NO
00.01.13 Office I	NO (-83%)	NO
00.02.12 Office I	NO (-79.2%)	NO
00.02.13 Office P	NO (-52.5%)	NO
00.01.14 Office P	NO (-55.9%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated 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?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m ²]	6635.6	6635.6
External area [m ²]	14188.4	14188.4
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	4	5
Average conductance [W/K]	4768.76	4604.53
Average U-value [W/m ² K]	0.34	0.32
Alpha value* [%]	10	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
	B1 Offices and Workshop businesses
100	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: 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/m²]

	Actual	Notional
Heating	28.62	30.43
Cooling	2.4	3.75
Auxiliary	3.31	1.35
Lighting	21.57	22.88
Hot water	4.61	4.56
Equipment*	36.76	36.76
TOTAL**	60.5	62.96

* 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/m²]

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

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	136.78	158.43
Primary energy* [kWh/m ²]	140.03	135.79
Total emissions [kg/m ²]	22.9	22.9

* 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 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	27.6	0	9.1	0	0	0.84	0	1	0
Notional	135.3	0	43.6	0	0	0.86	0	----	----
[ST] Flued radiant heater, [HS] Radiant heater, [HFT] Natural Gas, [CFT] Electricity									
Actual	116.2	0	42.1	0	0	0.77	0	0.91	0
Notional	171.9	0	55.4	0	0	0.86	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
Actual	177.1	189.5	14.3	11.7	0	3.43	4.48	3.5	6
Notional	168.2	165.2	18.3	12.1	0	2.56	3.79	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
Actual	62.9	105.5	5.1	6.5	10	3.43	4.48	3.5	6
Notional	48.2	144.2	5.2	10.6	4.1	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 Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.3	0000000A:Surf[8]
Floor	0.2	0.25	0200000C:Surf[0]
Roof	0.15	0.16	02000002:Surf[2]
Windows, roof windows, and rooflights	1.5	0.5	0000000A:Surf[9]
Personnel doors	1.5	2.2	02000002:Surf[5]
Vehicle access & similar large doors	1.5	1.5	02000002:Surf[3]
High usage entrance doors	1.5	-	No High usage entrance doors in building
U _{i-Typ} = Typical individual element U-values [W/(m ² K)]			
U _{i-Min} = Minimum individual element U-values [W/(m ² K)]			
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m ³ /(h.m ²) at 50 Pa	5	4

APPENDIX 3 – Draft EPC Certificates

Energy Performance Certificate

Non-Domestic Building



Plot 5000
Hatfield Business Park

Certificate Reference Number:
0000-0040-0030-9000-0803

This certificate shows the energy rating of this building. It indicates the energy efficiency of the building fabric and the heating, ventilation, cooling and lighting systems. The rating is compared to two benchmarks for this type of building: one appropriate for new buildings and one appropriate for existing buildings. There is more advice on how to interpret this information in the guidance document *Energy Performance Certificates for the construction, sale and let of non-dwellings* available on the Government's website at www.gov.uk/government/collections/energy-performance-certificates.

Energy Performance Asset Rating

More energy efficient



Net zero CO₂ emissions



26 This is how energy efficient the building is.

Less energy efficient

Technical information

Main heating fuel:	Natural Gas
Building environment:	Heating and Natural Ventilation
Total useful floor area (m ²):	6635.639
Building complexity (NOS level):	5
Building emission rate (kgCO ₂ /m ² per year):	22.93
Primary energy use (kWh/m ² per year):	140.03

Benchmarks

Buildings similar to this one could have ratings as follows:

26 If newly built

70 If typical of the existing stock

Administrative information

This is an Energy Performance Certificate as defined in the Energy Performance of Buildings Regulations 2012 as amended.

Assessment Software:	Virtual Environment v7.0.7 using calculation engine ApacheSim v7.0.7
Property Reference:	000000000000
Assessor Name:	
Assessor Number:	ABCD123456
Accreditation Scheme:	Information not available
Employer/Trading Name:	Trading Name
Employer/Trading Address:	Trading Address
Issue Date:	22 Mar 2017
Valid Until:	21 Mar 2027 (unless superseded by a later certificate)
Related Party Disclosure:	Not related to the owner

Recommendations for improving the energy performance of the building are contained in the associated Recommendation Report: 0040-0000-0408-0900-0004

About this document and the data in it

This document has been produced following an energy assessment undertaken by a qualified Energy Assessor, accredited by Information not available. You can obtain contact details of the Accreditation Scheme at Information not available.

A copy of this certificate has been lodged on a national register as a requirement under the Energy Performance of Buildings Regulations 2012 as amended. It will be made available via the online search function at www.ndepcregister.com. The certificate (including the building address) and other data about the building collected during the energy assessment but not shown on the certificate, for instance heating system data, will be made publicly available at www.opendatacommunities.org.

This certificate and other data about the building may be shared with other bodies (including government departments and enforcement agencies) for research, statistical and enforcement purposes. For further information about how data about the property are used, please visit www.ndepcregister.com. To opt out of having information about your building made publicly available, please visit www.ndepcregister.com/optout.

There is more information in the guidance document *Energy Performance Certificates for the construction, sale and let of non-dwellings* available on the Government website at: www.gov.uk/government/collections/energy-performance-certificates. It explains the content and use of this document and advises on how to identify the authenticity of a certificate and how to make a complaint.

Opportunity to benefit from a Green Deal on this property

The Green Deal can help you cut your energy bills by making energy efficiency improvements at no upfront costs. Use the Green Deal to find trusted advisors who will come to your property, recommend measures that are right for you and help you access a range of accredited installers. Responsibility for repayments stays with the property - whoever pays the energy bills benefits so they are responsible for the payments.

To find out how you could use Green Deal finance to improve your property please call 0300 123 1234.