C80 solutions
Straightforward Building Compliance
PART OF THE C80 GROUP

UNIT 1, 2 & 3,

WOMBELL LANE, BARNSLEY TRADE PARK,

BARNSLEY,

S70 3NS

ENERGY STATEMENT

FOR

CASEY DESIGNS

September 2024

Project no. QTE019384

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C80

REVISION	DATE	PREPARED BY	REVIEWED BY	COMMENTS
1	12/09/2024	MA	C80	For issue

The current report provides a brief overview of the wide range of opportunities for renewable energy and is not intended as detailed design advice. As such data and information should only be treated as INDICATIVE at this stage of the process. Further investigation can be undertaken when more accurate and detailed information is required on specific measures.

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1.0 Introduction

1.1 About C80 Solutions Ltd

C80 Solutions are independent Sustainability and Energy Consultants providing carbon reduction solutions to help the UK achieve its carbon emission reduction target of 100% by 2050 - as set out in the Government's Climate Change Act 2008.

Our range of affordable but comprehensive solutions for the construction industry are broken down into two sectors; i) Building Compliance and ii) Consultancy.

Building Compliance:

Our Building Compliance services include; Code for Sustainable Homes Assessments, SAP Calculations, On Construction Energy Performance Certificates, Water Efficiency Calculations, SBEM Calculations, Commercial EPCs, BREEAM assessments and Air Tightness Testing.

Consultancy:

Our experience and exposure to building compliance combined with previous experience and IEMA accredited training means we have built up a vast amount of knowledge which enables us to provide our clients with invaluable advice. Our Consultancy services include; Renewable Energy Feasibility Reports, Energy Statements for planning, Sustainability Statements and Building Compliance Advisory Reports.

1.2 Executive Summary

C80 Solutions have been instructed to prepare an Energy Statement for Casey Designs on a proposed development in Barnsley Trade Park. The development is a Commercial development made up of 3 Industrial Units and are simulated using SBEM and Design Builder Software. The buildings tested have a combined floor area of approximately 1690m² consisting of storage and distribution spaces.

The content of this report sets out the key measures and commitments the developer must make to meet the identified CO_2 reductions required

At least a 35% on site reduction in regulated carbon emissions beyond Part L 2021 of the Building Regulations should be considered.
A baseline model will be created to show the buildings current performance.
A Be Lean model will be created to achieve a 15% reduction using improved lighting amongst taking other passive measures.
A Be Green Model will be created to achieve the required 35% reduction from Part L 2021.

This report outlines and evidence that on-site carbon reductions have been maximised

Where net zero-carbon is not achieved the shortfall will be met by either a payment into the borough's carbon offset fund.

The floor plan of the proposed development can be seen in Figures 1& 2 below.

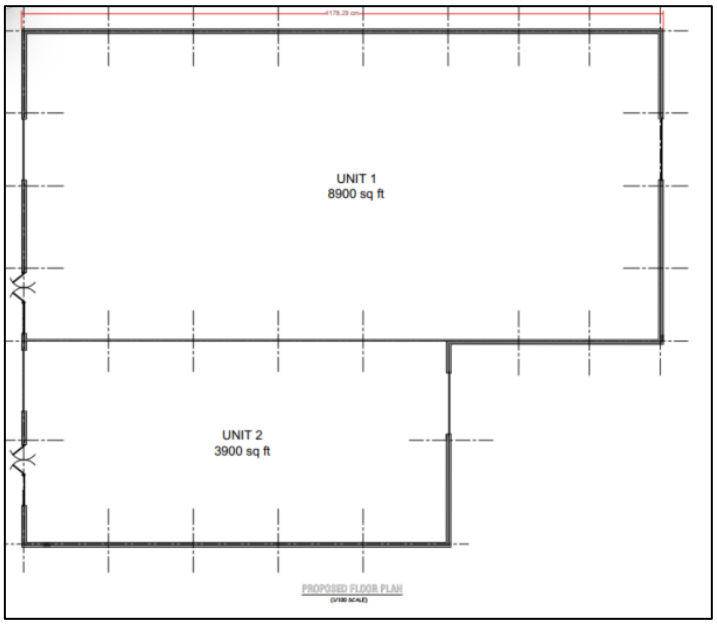

Figure 1; Proposed Unit 1 and 2 Floor Plan

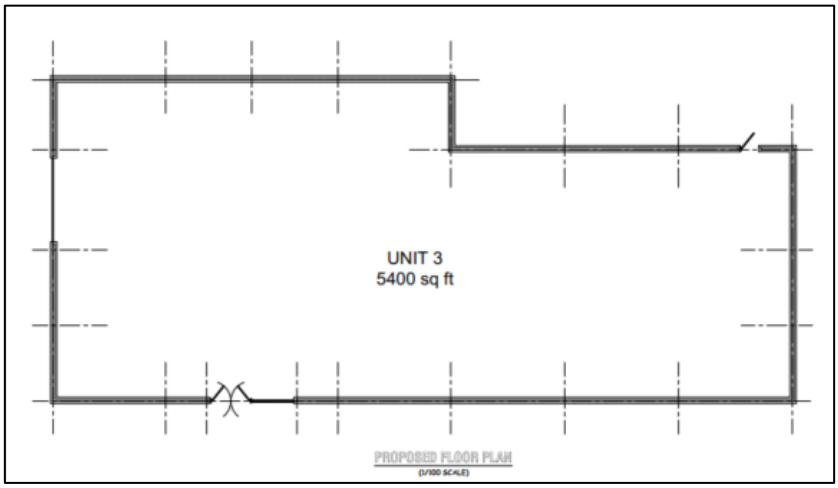

Figure 2; Proposed Unit 3 Floor Plan

1.3 Planning Policy

The following Energy/CO2 related planning policies are applicable to this development:

Table 3 – Local Validation Requirements (In Alphabetical Order)

Document type and details of when required	Guidance and details of further information	Policy background
8. Energy/Sustainability Statement including a whole life carbon assessment Required for: • Residential schemes of 10+ units • Non-residential schemes of 1,000m² + floorspace A Whole Life Carbon Assessment will be required for all major developments (10 dwellings or above and 1000m² or above for commercial developments or change of use developments)	An Energy/Sustainability Statement should demonstrate how the proposed development would minimise resource and energy consumption compared to the minimum required under current Building Regulations legislation and how it is located and designed to withstand the longer term impacts of climate change. It should also detail how the proposed development would incorporate decentralised, renewable or low carbon energy sources. All non-residential development will be expected, to achieve a minimum standard of BREEAM 'Very Good' (or any future national equivalent). This should be supported by preliminary assessments at the planning application stage. The whole life carbon assessment will be expected to follow the model set out in the RICS professional statement 'Whole Life Carbon Assessment for the Built Environment, 2017", which RICS members must act in accordance with. https://www.rics.org/globalassets/rics-website/media/news/whole-life-carbon-assessment-for-the--built-environment-november-2017.pdf The professional statement mandates a whole life approach to reducing carbon emissions and sets out specific mandatory principles and supporting guidance for the interpretation and implementation of European standard EN 15978 methodology, which is the European standard that specifies the calculation method, based on Life Cycle Assessment and other quantified environmental information, to assess the environmental performance of a building, and gives the means for the reporting and communication of the outcome of the assessment. The Energy/Sustainability Statement should demonstrate how carbon dioxide emissions have been minimised in the proposed development accordance with the following energy hierarchy: • Using less energy • Supply energy efficiently • Maximising use of renewable and low carbon energy generation systems. The energy statement must clearly outline the applicant's commitments in terms of operational CO2 savings and measures proposed to reduce energy demand and carbon dioxide emissions. • It should report estimated site-wide regulated CO2 emissions and reductions (broken down for the domestic and non-domestic elements of the development), expressed in tonnes per annum, after each stage of the energy hierarchy • investigate and commit to maximising the installation of renewable technologies on site demonstrated by tonnes of C02 provided by renewable technologies • include information on how the building's actual energy performance will be monitored post-construction/how the performance gap (the gap between the energy efficiency levels buildings are designed to achieve, and what they actually manage)	NPPF BMBC Local Plan policies CC2 and RE1 Sustainable Construction and Climate Change Adaptation SPD

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1.4 Methodology

The methodology that has been applied in this report is as follows:

1. Baseline - Prepare baseline energy calculations for the site, as this energy statement is for an existing development the methodology is different to that of a new build, based on a Part L 2021 compliant construction specification designed for the development to ascertain the BER of the development. The BER will be taken from the final proposed building specification i.e. the rate from the modelling results of the 'be green' stage of the energy hierarchy

2. From the baseline energy calculations, the Building energy demand for the development in kWh/year and the Building CO2 emissions in kgCO2/year for the site can be established.

3. Multiplying the site wide Building CO2 emissions figure by the required % will provide the CO2 reduction target required.

4. Be Lean - Apply energy efficient design principles (improved fabric specification, low energy lighting, ventilation, demand reduction measures etc.) to the calculations to reduce the energy demand and CO2 emissions of the site. Prepare energy calculations using the improved fabric specification.

5. From these improved calculations, the reduced energy demand for the development in kWh/year and the Building CO2 emissions in kgCO2/year for the site can be established.

6. Be Clean – Where there is the ability and feasibility to do so, following the heating hierarchy in London Plan Policy SI 3, apply the use of systems outlined in the policy within the calculation software to supply energy efficiently and cleanly to further reduce CO_2 emissions.

7. From these improved calculations, the reduced energy demand for the development in kWh/year and the Predicted CO2 emissions in kgCO2/year for the site can be established.

8. Be Green - Carry out a renewable energy feasibility study to ascertain which LZC technologies would be suitable for the development.

9. Apply LZC technologies within the calculations to reduce the energy demand and CO2 emissions of the site. Prepare further energy calculations adopting the use of LZC technology.

10. Calculate the reduction at each stage of the process showing the cumulative impact of each stage in reducing the CO_2 emissions and achieving the required emission percentage reduction.

2.0 Reducing Carbon Emissions

Reducing the need for energy usage in the building's design:

The first and most cost beneficial action is to reduce the amount of energy needed by the occupants of the development whilst still maintaining or even improving the comfort conditions. A lot can be achieved through passive design, improving the building's external fabric and following principles to reduce air infiltration.

An attempt to reduce the energy demand and CO2 emissions of the development by making the following fabric and energy efficiency improvements to the standard Part L 2021 building specification is recommended.

Energy reduction strategies include:

- Adopting enhanced fabric specifications
- Installing high efficiency ventilation and heat recovery systems
- Incorporating energy-efficient lighting
- Adopting principles of airtight construction
- Ensuring all new glazing units have a good thermal performance
- Passive Solar Design – Solar gain, solar shading, thermal mass
- Natural / Passive Ventilation strategy

3.0 Baseline - Predicted Annual Carbon Emissions

Baseline SBEM calculations were prepared for this development, to ascertain a starting point for the calculations. When determining the baseline, the notional building system type for the heating and hot water systems will be determined by the final proposed building specification; the associated performance values dictated by the notional efficiencies.

The Baseline calculations are derived from the BER building, the specification of which is outlined within the NCM modelling guide for buildings other than dwellings in England and Approved Document Part L of the Building Regulations.

3.1 Predicted Annual Energy Demand

Based on the specification of the TBER Baseline calculations, this would create a total predicted energy demand for the development of 106.62 **kWh/m²**. The breakdown of this predicted energy demand can be seen in table 1 below. The figures quoted have been derived from the Design Stage Calculations for the development.

			Space conditioning	Water Heating	Lighting, Pumps, Fans	Total Predicted Energy Requirement (kWh/m²)
Plot	No.	Units			Electric	
Unit 1		kWh/m²	30.07	0	3.99	34.06
Unit 2		kWh/m²	33.94	0	4.26	38.2
Unit 3		kWh/m²	30.32	0	4.04	34.36
Total			**94.33**	**0**	**12.29**	**106.62**

Table 1: Baseline Predicated Annual Energy Demand

3.2 Baseline calculation summary

The conducted baseline SBEM calculations have shown the proposed development using the expected systems will generate 16.94 **kgCO_2/m².annum**.

Plot	Units	Baseline emissions
Unit 1	Tonne/CO_2/yr	4.36
Unit 2	Tonne/CO_2/yr	2.13
Unit 3	Tonne/CO_2/yr	2.57

Table 2: Summary of CO_2 emissions

Aspect		Baseline Measure Passing BRUKL
Fabric	**External Walls**	0.26
	Communal Walls	-
	Insulated Joists/Rafters/Flat Roofs	0.18
	Ground/Exposed Floors	0.18
	Internal Floors	-
	Windows/Glazed doors (All)	1.6
	Solid Doors	-
	Vehicle Access doors	1.3
Infiltration	**Airtightness m3/(hr.m²)**	8
Ventilation	**Heating**	ASHP COP 4.5
	Hot Water	Same as HVAC
	Ventilation	N/A
	Controls	TTZC, Centralised. Variable Speed Pumps, optimum start stop and weather compensation
Lighting		140 Lm/cw Throughout
Renewables / LZC	**None**	N/A
Building Power Factor		>0.95

4.0 Be Lean – Use less energy

The table on the following page (Table 4) outlines the improvements to building fabric and energy efficient services utilized and targeted to try to achieve the reduction at the “Be Lean” phase. As with Baseline calculations, the final proposed system type should be assumed to provide the heating and hot water demand within the building with the cooling by electrical equipment (where required), the efficiencies of which determined by the notional system performance values.

If the final heating proposal is to be low carbon or renewable energy, the CO_2 emission improvements from these systems must be accounted for in the ‘be clean’ and ‘be green stages. This will allow CO_2 emission improvements from the proposed space conditioning equipment and hot water to be compared against the Part L 2021 baseline, for example through improvements in performance of building fabric.

Developments should look to achieve a percentage reduction of CO_2 emissions within the “Be Lean” section alone, non-domestic targeting a 15% improvement and domestic developments targeting a 10% improvement on building regulations from energy efficiency.

Table 3 below summarises the impact the “Be Lean” stage of the assessment has on the overall reductions after accounting for the improvements made to the design.

Plot	Units	Baseline	Be Lean
Unit 1	Tonne/CO_2/yr	4.36	3.381
Unit 2	Tonne/CO_2/yr	2.13	1.64
Unit 3	Tonne/CO_2/yr	2.57	1.988

Table 3: Summary of CO_2 emissions Inc. Be Lean

Aspect		Target Measures for Be Lean
Fabric	**External Walls**	0.16
	Communal Walls	-
	Insulated Joists/Rafters/Flat Roofs	0.16
	Ground/Exposed Floors	0.16
	Internal Floors	-
	Windows/Glazed doors (All)	0.75
	Solid Doors	-
	Vehicle Access doors	1.3
Infiltration	**Airtightness m3/(hr.m^2)**	3
Ventilation	**Heating**	ASHP COP 4.5
	Hot Water	Same as HVAC
	Ventilation	N/A
	Controls	TTZC, Centralised. Variable Speed Pumps, optimum start stop and weather compensation
Lighting		140 Lm/cw Throughout
Renewables / LZC	**None**	N/A
Building Power Factor		>0.95

Table 4: Be Lean construction specifications and Development Improvements

5.0 Be Clean – Use less energy

This section outlines which infrastructure and clean energy supply measures have been considered for the development to further reduce the regulated CO_2 emissions.

In proposed developments the heating infrastructure must be investigated to show that clean energy supply measures have been considered for the development to further reduce regulated CO2 emissions. Integrated infrastructure, including decentralised energy networks and on-site technologies, can yield positive results when attempting to achieve the target reduction in regulated CO2 emissions beyond the requirements of the Building Regulations Part L (2021).

Developments in Heat Network Priority Areas (HNPAs)[27] should have a communal[28] low-temperature heating system and should select a heat source in accordance with the following heating hierarchy:

a) connect to local existing or planned heat networks

b) use zero-emission or local secondary heat[29] sources (in conjunction with heat pump, if required)

c) use low-emission combined heat and power (only where there is a case for it to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network)

d) use ultra-low nitrogen oxides (NOx) gas boilers

(CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that they meet the requirements in Part B of London Plan Policy SI 1 Improving air quality)

The development is not within the vicinity of a potential heat network and there are no existing heat networks that the site could be connected to. The building does not fall within an 'Opportunity Area' which could allow for the implementation of a heat network, and as there are no definitive plans to extend the heat network into this area, at the current time, this has not been considered as an option for this development.

Following allowances for “Be Clean” and exploiting local energy resources (such as secondary heat) and looking at supplying energy efficiently and cleanly by connecting to district heating networks, Local heat networks, community heating systems etc. the following table summarises the improvement made from “Be Clean” measures, as there is not a District Network in the direct vicinity there are no improvements from Be Lean to Be Clean

Plot	Units	Baseline	Be Lean	Be Clean
Unit 1	Tonne/CO_2/yr	4.36	3.381	3.381
Unit 2	Tonne/CO_2/yr	2.13	1.64	1.64
Unit 3	Tonne/CO_2/yr	2.57	1.988	1.988

Table 5: Summary of CO_2 emissions Inc. Be Clean

6.0 Be Green - Feasibility Study and use of Renewable Technologies

This section will assess the technical viability of the following renewable energy technologies for the site to rule out unfeasible options:

- Mast mounted wind turbines
- Roof mounted wind turbines
- Solar PV (Photovoltaic) Panels
- Solar Thermal Panels
- ASHP (Air Source Heat Pump)
- GSHP (Ground Source Heat Pump)
- Biomass
- CHP

The following observations have been made regarding the technical feasibility of integrating renewable energy technologies into this development.

Renewable Technology	Feasible / Adopted	Reasons
Mast Mounted Wind Turbine	No	There is no sufficient open land for a mast mounted wind turbine to be installed on site.
		The site is situated in a densely populated area. Surrounding properties aren't far enough away to be unaffected by turbine noise, reflected light and shadow flicker.
		The site area is surrounded by buildings and other obstructions that could cause uneven and turbulent wind patterns. Turbulent air conditions may reduce lifespan of components.
		Currently the BWEA suggests a large wind turbine to be viable where wind speed is 7m/s or above. According to the NOABL database the average wind speeds for the site is: 4.7 m/s at 10m, 5.5 m/s at 25m and 6.0 m/s at 45m height for the property postcode (NW10). Therefore, the wind speeds are not sufficient for a mast mounted wind turbine to be viable.
Roof Mounted Wind Turbine	No	The site area is surrounded by buildings and other structures that could cause uneven and turbulent wind patterns. Turbulent air conditions may reduce lifespan of components.
		Roof mounted wind turbines are not yet a proven technology and a number of technical problems have been identified by manufacturers which are being investigated to rectify these issues. Vibration that can be transmitted to the building structure. Noise from a turbine may cause irritation to occupants of the dwelling and adjacent buildings. Noise may also adversely affect ventilation strategy.

Renewable Technology	Feasible / Adopted	Reasons
		Currently the BWEA suggests a large wind turbine to be viable where wind speed is 7m/s or above. According to the NOABL database the average wind speeds for the site is: 4.7 m/s at 10m, 5.5 m/s at 25m and 6.0 m/s at 45m height for the property postcode (NW10). Therefore, the wind speeds are not sufficient for a roof mounted wind turbine to be viable
Solar PV (Photovoltaic) Panels/Tiles	Yes	The proposed development has sufficient roof area for solar panels accommodation.
		Most of the roofs should be free from overshadowing for most of the day from other buildings, structures or trees.
		The site is located in the region with high level of global horizontal irradiation (1,000-1050 kWh/m2/year)
Solar Thermal Collectors	No	The proposed development has sufficient roof area that can accommodate solar thermal panels.
		Most of the roofs should be free from overshadowing for most of the day from other buildings, structures or trees.
		The site is located in the region with high level of global horizontal irradiation (1,000-1050 kWh/m2/year)
		Solar thermal collectors could be compatible with the planned heating system.
		Due to the building type, domestic hot water utilisation is expected to be medium
		In practical domestic solar hot water systems, the solar hot water system is usually run in conjunction with, rather than instead of, a backup conventional boiler and as a result the carbon intensity of the combined system is high relative to other renewables. Moreover, the high efficiency of modern condensing boilers, which can convert over 90% of means that the carbon intensity of these heat sources is relatively low at 200-300 gCO2/kWhth. As a result, domestic solar water heating systems are a relatively expensive way of mitigating carbon emissions when they replace heat from efficient modern boilers. For this reason they are not recommended.
ASHP (Air Source Heat Pump)	Yes	The proposed development is able to accommodate the space for a hot water cylinder.

Renewable Technology	Feasible / Adopted	Reasons
		The building is suitable for a low-grade heat distribution system (e.g. underfloor water system, oversized radiators).
		Condenser units can be noisy and also blow out colder air to the immediate environment causing nuisance to the immediate areas, this may need to be investigated
		There are reported performance issues with this technology. During the heating season the outside air temperature is often less than the ground temperature. This lower temperature has the effect of reducing the COP. For an air-to-water heat pump the standard specifies test conditions of a precise outdoor air temperature (source temperature). At external air temperatures lower than this, the COP will fall, as will the heating output of the heat pump. Depending on the application this reduction may be significant, such as during a cold winter morning when building pre-heat is needed. Therefore, it is recommended the system is sized appropriately.
GSHP (Ground Source Heat Pump)	No	It may not be possible to drill a limited number of vertical or horizontal boreholes for GSHP on the site.
		The development is being designed to accommodate a low-grade heat distribution system (e.g., underfloor water system, oversized radiators).
Biomass Boiler	No	It is unknown if an established fuel supply chain for the area.
		There is sufficient space for a delivery vehicle (vehicular access to fuel storage, turning circle etc)
		There is insufficient space on the proposed site for a wood-fuel boiler and associated auxiliary equipment.
		There isn't sufficient space for fuel storage to allow a reasonable number of deliveries.
		Biomass systems are management intensive (fuel sourcing, transport, storage) and require adequate expertise from users.
CHP	No	A CHP unit only generates economic and environmental savings when it is running at least 4,500 hours per year. This equates to an average heat demand of about 17 hours a day for five days a week throughout the year. The proposed development energy and heat demand profile does not match this requirement.
		CHP is typically utilized on buildings with high electricity and heating demand for most of the year such as local authority

Renewable Technology	Feasible / Adopted	Reasons
		buildings, leisure centres, universities, hotels, and district heating schemes where CHP is used to provide electricity, space and water heating.
		CHP should be considered wherever there is demand for electricity and an appropriate demand for heat in the near vicinity.

Table 6: Feasibility Study of Renewable Technologies

Based on the feasibility study in table 6 above, the following technologies have been identified as being feasible for the proposed development:

Renewable Technology	System Details
Solar Photovoltaic Panels Unit 1	10kWp
Solar Photovoltaic Panels Unit 2	3kWp
Solar Photovoltaic Panels Unit 3	4kWp
Heat Pump All Units	ASHP
DHW All units	Same as HVAC

Allowing for the aforementioned LZC/renewable technology within the calculations, the following table outlines the reduction in CO_2 emissions that this technology provides;

Plot	Units	Baseline	Be Lean	Be Clean	Be Green
Unit 1	Tonne/CO_2/yr	4.36	3.381	3.381	2.809
	% reduction	N/A	22.87%	N/A	35.32
Unit 2	TonnesCO_2/annum	2.13	1.646	1.646	1.363
	% reduction	N/A	22.95%	N/A	36.15
Unit 3	TonnesCO_2/annum	2.57	1.988	1.988	1.643
	% reduction	N/A	22.87%	N/A	36.15

Table 7: Summary of CO_2 emissions Inc. Be Green

7.0 Conclusion

It is proposed that the improvements listed within table 4 under the “Be Lean” section of this report are adopted for this development to reduce the carbon emissions of the proposed site.

“Be Lean” improvements should account for a reduction of 15% for a non-domestic development. The improvements within this section did not achieve any carbon reduction so all reduction is be attained from the improvements made by way of Introducing PV to the Be Green simulations.

The building has been assumed to have minimum Part L requirement U values and improvements would make little difference to the improvements at a large cost.

The guidance within the “Be Green” section should also be followed, this section showed that the most suitable LZC/renewable technologies for this development is PV Solar Panels According to calculation results, installation of these systems will reduce carbon emissions to 35% or beyond if desired.

Table 8 below shows the percentage reduction in CO_2 emissions for the development.

	Associated Total CO_2 Unit 1		Associated Total CO2 Unit 2		Associated Total CO2 Unit 3	
	KgCO2/m².annum	Tonne/CO_2.annum	KgCO2/m².annum	Tonne/CO_2.annum	KgCO2/m².annum	Tonne/CO_2.annum
Baseline	5.41	4.36	6.04	2.13	5.49	2.57
Be Lean	4.19	3.381	4.67	1.646	4.24	1.988
Be Clean	4.19	3.381	4.67	1.646	4.24	1.988
Be Green	3.48	2.809	3.86	1.363	3.51	1.643
Total Reduction to Be Green	1.93	1.551	2.18	0.767	1.98	0.927
Total % Carbon Reduction to Be Green	**35.32%**		**36.15%**		**36.15%**	

Table 8: Percentage Reduction in Carbon Emissions following all improvements

With the proposed improvements to building fabric, energy efficient services and accounting for the inclusion of the LZC and renewable technologies, the development can achieve:

35% to 36% reduction with the installation of 3kWp to 10kWp between the 3 units.

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Unit 1

As designed

Date: Wed Sep 11 13:12:35 2024

Administrative information

Building Details

Address: Wombell Lane, Barnsley Trade Park, Barnsley, S70 3NS

Certifier details

Name: Mantas Adomaitis

Telephone number: 01132588445

Address: Woodhead House Woodhead Rd Birstall, Leeds, WF17 9TD

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v7.2.0

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

Foundation area [m^2]: 807.2

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	5.42	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	5.41	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	56.85	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	56.72	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.26	0.26	Internal Space - Zone 1_W_5
Floors	0.18	0.18	0.18	Internal Space - Zone 1_S_3
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.18	0.18	Internal Space - Zone 1_R_4
Windows** and roof windows	1.6	1.6	1.6	Internal Space - Zone 1_G_9
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.3	1.3	Internal Space - Zone 1_D_10
Vehicle access & similar large doors	1.3	1.3	1.3	Internal Space - Zone 1_D_6
High usage entrance doors	3	-	-	No external high usage entrance doors

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

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

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

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

^ For fire doors, limiting U-value is 1.8 W/m^2K

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

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

Building services

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

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

1- ASHP

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	4.5	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- ASHP

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

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

General lighting and display lighting	**General luminaire**	**Display light source**	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
Internal Space - Zone 1	140	-	-

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

There are no zones in the building where the solar gain check is applicable.

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	807.2	807.2
External area [m^2]	2402.1	2402.1
Weather	LEE	LEE
Infiltration [m^3/hm^2@ 50Pa]	8	5
Average conductance [W/K]	541.97	423.08
Average U-value [W/m^2K]	0.23	0.18
Alpha value* [%]	9.52	38.2

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

Building Use

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

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

	Actual	Notional
Heating	30.07	31.08
Cooling	0	0
Auxiliary	2.63	1.25
Lighting	3.99	5.42
Hot water	0	0
Equipment*	0	0
TOTAL**	**36.69**	**37.75**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	443.82	311.36
Primary energy [kWh_{PE}/m^2]	56.73	56.85
Total emissions [kg/m^2]	5.41	5.42

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 water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	434.7	9.1	30.1	0	2.6	4.01	0	4.5	0
	Notional	295.4	16	31.1	0	1.2	2.64	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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Unit 2

As designed

Date: Wed Sep 11 13:27:14 2024

Administrative information

Building Details

Address: Wombell Lane, Barnsley Trade Park, Barnsley, S70 3NS

Certifier details

Name: Mantas Adomaitis

Telephone number: 01132588445

Address: Woodhead House Woodhead Rd Birstall, Leeds, WF17 9TD

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v7.2.0

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

Foundation area [m^2]: 352.38

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	6.47	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	6.04	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	67.76	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	63.18	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.26	0.26	Internal Space - Zone 1_W_5
Floors	0.18	0.18	0.18	Internal Space - Zone 1_S_3
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.18	0.18	Internal Space - Zone 1_R_4
Windows** and roof windows	1.6	1.6	1.6	Internal Space - Zone 1_G_10
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.3	1.3	Internal Space - Zone 1_D_11
Vehicle access & similar large doors	1.3	1.3	1.3	Internal Space - Zone 1_D_6
High usage entrance doors	3	-	-	No external high usage entrance doors

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

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

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

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

^ For fire doors, limiting U-value is 1.8 W/m^2K

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

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

Building services

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

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

1- ASHP

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	4.5	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- ASHP

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

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

General lighting and display lighting	**General luminaire**	**Display light source**	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
Internal Space - Zone 1	140	-	-

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

There are no zones in the building where the solar gain check is applicable.

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	352.4	352.4
External area [m^2]	1151	1151
Weather	LEE	LEE
Infiltration [m^3/hm^2@ 50Pa]	8	5
Average conductance [W/K]	289.86	227.76
Average U-value [W/m^2K]	0.25	0.2
Alpha value* [%]	11.99	48.61

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

Building Use

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

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

	Actual	Notional
Heating	33.94	37.98
Cooling	0	0
Auxiliary	2.63	1.25
Lighting	4.26	5.72
Hot water	0	0
Equipment*	0	0
TOTAL**	**40.83**	**44.95**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	501.1	375.21
Primary energy [kWh_{PE}/m^2]	63.18	67.76
Total emissions [kg/m^2]	6.04	6.47

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	490.5	10.6	33.9	0	2.6	4.01	0	4.5	0
	Notional	360.9	14.3	38	0	1.2	2.64	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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Unit 3

As designed

Date: Wed Sep 11 13:45:00 2024

Administrative information

Building Details

Address: Wombell Lane, Barnsley Trade Park, Barnsley, S70 3NS

Certifier details

Name: Mantas Adomaitis

Telephone number: 01132588445

Address: Woodhead House Woodhead Rd Birstall, Leeds, WF17 9TD

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v7.2.0

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

Foundation area [m^2]: 469.04

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	5.63	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	5.49	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	58.93	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	57.29	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.26	0.26	Internal Space - Zone 1_W_4
Floors	0.18	0.18	0.18	Internal Space - Zone 1_S_3
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.16	0.16	Internal Space - Zone 1_R_12
Windows** and roof windows	1.6	1.6	1.6	Internal Space - Zone 1_G_10
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.3	1.3	Internal Space - Zone 1_D_5
Vehicle access & similar large doors	1.3	1.3	1.3	Internal Space - Zone 1_D_8
High usage entrance doors	3	-	-	No external high usage entrance doors

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

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

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

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

^ For fire doors, limiting U-value is 1.8 W/m^2K

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

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

Building services

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

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

1- ASHP

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	4.5	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- ASHP

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

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

General lighting and display lighting	**General luminaire**	**Display light source**	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
Internal Space - Zone 1	140	-	-

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

There are no zones in the building where the solar gain check is applicable.

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	469	469
External area [m^2]	1602	1602
Weather	LEE	LEE
Infiltration [m^3/hm^2@ 50Pa]	8	5
Average conductance [W/K]	362.31	286.85
Average U-value [W/m^2K]	0.23	0.18
Alpha value* [%]	14.32	55.73

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

Building Use

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

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

	Actual	Notional
Heating	30.32	32.36
Cooling	0	0
Auxiliary	2.63	1.25
Lighting	4.04	5.47
Hot water	0	0
Equipment*	0	0
TOTAL**	**36.99**	**39.08**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	445.96	319.17
Primary energy [kWh_{PE}/m^2]	57.29	58.93
Total emissions [kg/m^2]	5.49	5.63

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 water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	438.3	7.7	30.3	0	2.6	4.01	0	4.5	0
	Notional	307.6	11.6	32.4	0	1.2	2.64	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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Unit 1

As designed

Date: Wed Sep 11 15:50:48 2024

Administrative information

Building Details

Address: Wombell Lane, Barnsley Trade Park, Barnsley, S70 3NS

Certifier details

Name: Mantas Adomaitis

Telephone number: 01132588445

Address: Woodhead House Woodhead Rd Birstall, Leeds, WF17 9TD

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v7.2.0

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

Foundation area [m^2]: 807.2

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	5.42	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	4.19	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	56.85	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	43.92	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.16	0.16	Internal Space - Zone 1_W_5
Floors	0.18	0.16	0.16	Internal Space - Zone 1_S_3
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.16	0.16	Internal Space - Zone 1_R_4
Windows** and roof windows	1.6	0.75	0.75	Internal Space - Zone 1_G_9
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.3	1.3	Internal Space - Zone 1_D_10
Vehicle access & similar large doors	1.3	1.3	1.3	Internal Space - Zone 1_D_6
High usage entrance doors	3	-	-	No external high usage entrance doors

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

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

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

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

^ For fire doors, limiting U-value is 1.8 W/m^2K

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

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

Building services

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

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

1- ASHP

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	4.5	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- ASHP

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

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

General lighting and display lighting	**General luminaire**	**Display light source**	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
Internal Space - Zone 1	140	-	-

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

There are no zones in the building where the solar gain check is applicable.

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	807.2	807.2
External area [m^2]	2402.1	2402.1
Weather	LEE	LEE
Infiltration [m^3/hm^2@ 50Pa]	3	5
Average conductance [W/K]	427.22	423.08
Average U-value [W/m^2K]	0.18	0.18
Alpha value* [%]	12.07	38.2

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

Building Use

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

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

	Actual	Notional
Heating	21.81	31.08
Cooling	0	0
Auxiliary	2.63	1.25
Lighting	3.99	5.42
Hot water	0	0
Equipment*	0	0
TOTAL**	**28.43**	**37.75**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	326.63	311.36
Primary energy [kWh_{PE}/m^2]	43.92	56.85
Total emissions [kg/m^2]	4.19	5.42

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 water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	315.3	11.4	21.8	0	2.6	4.01	0	4.5	0
	Notional	295.4	16	31.1	0	1.2	2.64	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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Unit 2

As designed

Date: Thu Sep 12 08:15:48 2024

Administrative information

Building Details

Address: Wombell Lane, Barnsley Trade Park, Barnsley, S70 3NS

Certifier details

Name: Mantas Adomaitis

Telephone number: 01132588445

Address: Woodhead House Woodhead Rd Birstall, Leeds, WF17 9TD

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v7.2.0

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

Foundation area [m^2]: 352.38

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	6.47	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	4.67	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	67.76	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	48.85	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.16	0.16	Internal Space - Zone 1_W_5
Floors	0.18	0.16	0.16	Internal Space - Zone 1_S_3
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.16	0.16	Internal Space - Zone 1_R_4
Windows** and roof windows	1.6	0.75	0.75	Internal Space - Zone 1_G_10
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.3	1.3	Internal Space - Zone 1_D_11
Vehicle access & similar large doors	1.3	1.3	1.3	Internal Space - Zone 1_D_6
High usage entrance doors	3	-	-	No external high usage entrance doors

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

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

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

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

^ For fire doors, limiting U-value is 1.8 W/m^2K

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

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

Building services

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

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

1- ASHP

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	4.5	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- ASHP

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

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

General lighting and display lighting	**General luminaire**	**Display light source**	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
Internal Space - Zone 1	140	-	-

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

There are no zones in the building where the solar gain check is applicable.

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	352.4	352.4
External area [m^2]	1151	1151
Weather	LEE	LEE
Infiltration [m^3/hm^2@ 50Pa]	3	5
Average conductance [W/K]	228.72	227.76
Average U-value [W/m^2K]	0.2	0.2
Alpha value* [%]	15.19	48.61

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

Building Use

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

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

	Actual	Notional
Heating	24.7	37.98
Cooling	0	0
Auxiliary	2.63	1.25
Lighting	4.26	5.72
Hot water	0	0
Equipment*	0	0
TOTAL**	**31.59**	**44.95**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	370.52	375.21
Primary energy [kWh_{PE}/m^2]	48.85	67.76
Total emissions [kg/m^2]	4.67	6.47

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	357	13.5	24.7	0	2.6	4.01	0	4.5	0
	Notional	360.9	14.3	38	0	1.2	2.64	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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Unit 3

As designed

Date: Thu Sep 12 08:44:23 2024

Administrative information

Building Details

Address: Wombell Lane, Barnsley Trade Park, Barnsley, S70 3NS

Certifier details

Name: Mantas Adomaitis

Telephone number: 01132588445

Address: Woodhead House Woodhead Rd Birstall, Leeds, WF17 9TD

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v7.2.0

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

Foundation area [m^2]: 469.04

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	5.63	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	4.24	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	58.93	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	44.32	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.16	0.16	Internal Space - Zone 1_W_4
Floors	0.18	0.16	0.16	Internal Space - Zone 1_S_3
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.16	0.16	Internal Space - Zone 1_R_12
Windows** and roof windows	1.6	0.75	0.75	Internal Space - Zone 1_G_10
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.3	1.3	Internal Space - Zone 1_D_5
Vehicle access & similar large doors	1.3	1.3	1.3	Internal Space - Zone 1_D_8
High usage entrance doors	3	-	-	No external high usage entrance doors

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

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

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

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

^ For fire doors, limiting U-value is 1.8 W/m^2K

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

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

Building services

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

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

1- ASHP

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	4.5	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- ASHP

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

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

General lighting and display lighting	**General luminaire**	**Display light source**	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
Internal Space - Zone 1	140	-	-

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

There are no zones in the building where the solar gain check is applicable.

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	469	469
External area [m^2]	1602	1602
Weather	LEE	LEE
Infiltration [m^3/hm^2@ 50Pa]	3	5
Average conductance [W/K]	283.99	286.85
Average U-value [W/m^2K]	0.18	0.18
Alpha value* [%]	18.27	55.73

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

Building Use

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

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

	Actual	Notional
Heating	21.97	32.36
Cooling	0	0
Auxiliary	2.63	1.25
Lighting	4.04	5.47
Hot water	0	0
Equipment*	0	0
TOTAL**	**28.64**	**39.08**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	327.25	319.17
Primary energy [kWh_{PE}/m^2]	44.32	58.93
Total emissions [kg/m^2]	4.24	5.63

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 water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	317.5	9.8	22	0	2.6	4.01	0	4.5	0
	Notional	307.6	11.6	32.4	0	1.2	2.64	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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Unit 1

As designed

Date: Wed Sep 11 15:56:07 2024

Administrative information

Building Details

Address: Wombell Lane, Barnsley Trade Park, Barnsley, S70 3NS

Certifier details

Name: Mantas Adomaitis

Telephone number: 01132588445

Address: Woodhead House Woodhead Rd Birstall, Leeds, WF17 9TD

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v7.2.0

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

Foundation area [m^2]: 807.2

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	5.42	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	3.48	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	56.85	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	35.78	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.16	0.16	Internal Space - Zone 1_W_5
Floors	0.18	0.16	0.16	Internal Space - Zone 1_S_3
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.16	0.16	Internal Space - Zone 1_R_4
Windows** and roof windows	1.6	0.75	0.75	Internal Space - Zone 1_G_9
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.3	1.3	Internal Space - Zone 1_D_10
Vehicle access & similar large doors	1.3	1.3	1.3	Internal Space - Zone 1_D_6
High usage entrance doors	3	-	-	No external high usage entrance doors

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

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

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

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

^ For fire doors, limiting U-value is 1.8 W/m^2K

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

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

Building services

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

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

1- ASHP

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	4.5	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- ASHP

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

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

General lighting and display lighting	**General luminaire**	**Display light source**	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
Internal Space - Zone 1	140	-	-

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

There are no zones in the building where the solar gain check is applicable.

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	807.2	807.2
External area [m^2]	2402.1	2402.1
Weather	LEE	LEE
Infiltration [m^3/hm^2@ 50Pa]	3	5
Average conductance [W/K]	427.22	423.08
Average U-value [W/m^2K]	0.18	0.18
Alpha value* [%]	12.07	38.2

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

Building Use

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

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

	Actual	Notional
Heating	21.81	31.08
Cooling	0	0
Auxiliary	2.63	1.25
Lighting	3.99	5.42
Hot water	0	0
Equipment*	0	0
TOTAL**	**28.43**	**37.75**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	5.56	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*5.56*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	326.63	311.36
Primary energy [kWh_{PE}/m^2]	35.78	56.85
Total emissions [kg/m^2]	3.48	5.42

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 water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	315.3	11.4	21.8	0	2.6	4.01	0	4.5	0
	Notional	295.4	16	31.1	0	1.2	2.64	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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Unit 2

As designed

Date: Thu Sep 12 08:21:51 2024

Administrative information

Building Details

Address: Wombell Lane, Barnsley Trade Park, Barnsley, S70 3NS

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v7.2.0

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

Certifier details

Name: Mantas Adomaitis

Telephone number: 01132588445

Address: Woodhead House Woodhead Rd Birstall, Leeds, WF17 9TD

Foundation area [m^2]: 352.38

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	6.47	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	3.86	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	67.76	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	39.53	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.16	0.16	Internal Space - Zone 1_W_5
Floors	0.18	0.16	0.16	Internal Space - Zone 1_S_3
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.16	0.16	Internal Space - Zone 1_R_4
Windows** and roof windows	1.6	0.75	0.75	Internal Space - Zone 1_G_10
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.3	1.3	Internal Space - Zone 1_D_11
Vehicle access & similar large doors	1.3	1.3	1.3	Internal Space - Zone 1_D_6
High usage entrance doors	3	-	-	No external high usage entrance doors

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

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

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

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

^ For fire doors, limiting U-value is 1.8 W/m^2K

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

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

Building services

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

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

1- ASHP

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	4.5	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- ASHP

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

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

General lighting and display lighting	**General luminaire**	**Display light source**	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
Internal Space - Zone 1	140	-	-

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

There are no zones in the building where the solar gain check is applicable.

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	352.4	352.4
External area [m^2]	1151	1151
Weather	LEE	LEE
Infiltration [m^3/hm^2@ 50Pa]	3	5
Average conductance [W/K]	228.72	227.76
Average U-value [W/m^2K]	0.2	0.2
Alpha value* [%]	15.19	48.61

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

Building Use

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

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

	Actual	Notional
Heating	24.7	37.98
Cooling	0	0
Auxiliary	2.63	1.25
Lighting	4.26	5.72
Hot water	0	0
Equipment*	0	0
TOTAL**	**31.59**	**44.95**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	6.37	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*6.37*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	370.52	375.21
Primary energy [kWh_{PE}/m^2]	39.53	67.76
Total emissions [kg/m^2]	3.86	6.47

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	357	13.5	24.7	0	2.6	4.01	0	4.5	0
	Notional	360.9	14.3	38	0	1.2	2.64	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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Unit 3

As designed

Date: Thu Sep 12 08:46:29 2024

Administrative information

Building Details

Address: Wombell Lane, Barnsley Trade Park, Barnsley, S70 3NS

Certifier details

Name: Mantas Adomaitis

Telephone number: 01132588445

Address: Woodhead House Woodhead Rd Birstall, Leeds, WF17 9TD

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v7.2.0

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

Foundation area [m^2]: 469.04

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	5.63	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	3.51	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	58.93	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	35.8	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.16	0.16	Internal Space - Zone 1_W_4
Floors	0.18	0.16	0.16	Internal Space - Zone 1_S_3
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.16	0.16	Internal Space - Zone 1_R_12
Windows** and roof windows	1.6	0.75	0.75	Internal Space - Zone 1_G_10
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.3	1.3	Internal Space - Zone 1_D_5
Vehicle access & similar large doors	1.3	1.3	1.3	Internal Space - Zone 1_D_8
High usage entrance doors	3	-	-	No external high usage entrance doors

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

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

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

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

^ For fire doors, limiting U-value is 1.8 W/m^2K

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

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

Building services

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

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

1- ASHP

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	4.5	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- ASHP

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

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

General lighting and display lighting	**General luminaire**	**Display light source**	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
Internal Space - Zone 1	140	-	-

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

There are no zones in the building where the solar gain check is applicable.

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	469	469
External area [m^2]	1602	1602
Weather	LEE	LEE
Infiltration [m^3/hm^2@ 50Pa]	3	5
Average conductance [W/K]	283.99	286.85
Average U-value [W/m^2K]	0.18	0.18
Alpha value* [%]	18.27	55.73

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

Building Use

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

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

	Actual	Notional
Heating	21.97	32.36
Cooling	0	0
Auxiliary	2.63	1.25
Lighting	4.04	5.47
Hot water	0	0
Equipment*	0	0
TOTAL**	**28.64**	**39.08**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	5.85	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*5.85*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	327.25	319.17
Primary energy [kWh_{PE}/m^2]	35.8	58.93
Total emissions [kg/m^2]	3.51	5.63

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 water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	317.5	9.8	22	0	2.6	4.01	0	4.5	0
	Notional	307.6	11.6	32.4	0	1.2	2.64	0	----	----

Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
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