Yonder
Engineering a better environment

Energy & Sustainability Strategy

Plot 2 Hoyland

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Engineering a better environment

Revision Record

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01	First draft	12th August 2021	RJG	NBE	RJG
02	Updated to BREEAM Excellent	19th August 2021	RJG	NBE	RJG

Disclaimer

This report has been prepared by Yonder Limited, with all reasonable skill, care and diligence within the terms of the contract with the client, and in line with our general terms and conditions of business.

We disclaim any responsibility to the client and others of any matters outside the scope above.

Whilst the simulations have been undertaken in good faith using reasonable skill and care, Yonder Limited can take no responsibility for differences between the computer simulations and the actual performance of the completed building due to the inherent complexity and variability of the physics in a building and its environment.

This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or part thereof, is made known. Any such party relies on the report at its own risk.

Executive Summary

The purpose of this report is to demonstrate the approach of this development to compliance with the Barnsley Local Plan. The following Energy & Sustainability Statement sets out the strategy for the proposed development to reduce predicted annual carbon emissions by 40%, with a fabric first approach, and achieves a BREEAM 2018 rating of Excellent 73.23%

In summary, the recommendation for this development, as the most technically and economically viable option is as follows;

- Passive design measures in the form of improved insulation levels and reduced air permeability have been applied to reduce the base energy demand of the building.
- Energy efficiency measures in the form of high efficiency heating, low energy fans, LED lighting, etc. have been applied to reduce the energy consumption of the building.
- Air source heat pumps supplying the office heating and solar panels servicing the hot water generation providing a 19.2% reduction in predicted annual carbon emissions.

This desktop study demonstrates a reduction in predicted annual carbon emissions of 19.2% due to low and zero carbon technologies, and a cumulative reduction in carbon emission of 49.5% when the fabric and system efficiency savings are taken into account, as detailed in the summary table below.

	Tonnes CO_2 per annum
Baseline Building	449
After Improved Fabric & System Efficiencies	281
Reduction in predicted carbon emissions	168
% reduction in predicted carbon emissions	37.5%
After low carbon technologies applied	227
Reduction in predicted carbon emissions	54
% reduction in predicted carbon emissions	19.2%
Total Cumulative Savings	222 at 49.5%

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Introduction

Yonder Limited have been commissioned to prepare an energy and sustainability statement to accompany the planning for the development of 2no. units at Hoyland Common Barnsley, M1 J36. The scheme includes the construction of a 2Nr warehouse providing 41,899 sq.m of B8 floorspace with ancillary office floorspace alongside associated loading bays, parking and landscaping.



This strategy details the options considered to minimise the carbon impact of this development, considering the local environment and site context. The development has focused on a fabric first approach consistent with design best practices to minimise the energy requirements of the building, has made use of energy efficient options where possible to further reduce energy use and finally has employed an appropriate combination of low and zero carbon technologies to minimise the carbon emissions of the development.

Policy and Planning Context

Barnsley Local Plan Adopted January 2019

Policy CC2 Sustainable Design and Construction

Development will be expected to minimise resource and energy consumption through the inclusion of sustainable design and construction features, where this is technically feasible and viable.

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 planning application stage.

Policy RE1 Low Carbon and Renewables Energy

Taking into account the energy hierarchy, new buildings and conversions should in the first instance be designed and constructed to be energy efficient in particular through using the principles of passive design, including high insulation levels, solar heating, natural lighting and ventilation, thermal mass and passive cooling. Thereafter, decentralised, renewable or low carbon energy sources should be considered for use in order to reduce carbon dioxide emissions.

The targets for this project are;

- Achieve a BREEAM 'Very Good' rating under the New Construction 2018 criteria.
- Incorporate energy efficiency measures to reduce the inherent energy demand and associated carbon dioxide (CO2) emissions of the development.
- Incorporate Low and Zero Carbon (LZC) technology solutions to reduce regulated CO2 emissions by more than 10%.

Energy Benchmarking

Annual energy consumption for the site has been calculated using IES-VE 2021, which is an approved energy modelling software by Communities and Local Government to produce Energy Performance Certificates (EPC) for non-domestic buildings and check compliance with the Part L of Building Regulations.

The building has been modelled to develop a base building in line with Part L2a (2016). This has been built using IES:VE software. The building modelling reflects the proposed geometry improvements of the building and has simple building services systems. This gives a baseline emissions rate upon which the effect of LZC Technologies is gauged.

Base Building Model

For this study, the energy consumption and carbon dioxide emissions for the proposed new build areas of the building have been estimated using a base building model. The base building model uses plant efficiencies and fabric data as per the National Calculation Methodology (NCM) guidelines. To check compliance against the Criterion 1 of Building Regulations Part L2A 2016, the carbon emissions rate of the base building (BER) is compared against the targeted carbon emission rate (TER).

The base building optimises the use of passive design measures to the building envelope with moderate detrimental impacts and takes benefit from the external climate. A compact enclosure with minimal fenestration best insulates against hot and cold conditions whereas an open format with maximum fenestration best receives natural light, heat and ventilation.

The selection of any passive design measures is usually project specific so good benchmarks are difficult to find. In general, passive design measures occasionally are facilitated by more complex control technologies. They do not necessarily increase the capital cost of a building as they reduce the sizing of capital equipment such as heating and cooling plant. They are also very cost effective in terms of reduced running costs, so in whole-life terms they tend to be good value for money.

The following passive design measures have been incorporated into the base model design to limit the new building areas baseline energy consumption.

- Optimized building shape / form orientation.
- Facade treatment / solar shading (where applicable).
- Thermal mass / thermal insulation.
- Passive solar heating.
- Measures to maximize natural daylighting.
- Natural ventilation.

Some key parameters of the base building models are listed below:

- The fabric construction u-values (minimum Part L 2013 Building Fabrics).
- Glazing specifications (minimum Part L 2013 Building Fabrics).
- Internal design conditions (20°C Winter, 23°C Summer).
- Requirements for heating and cooling (Demands of the building to meet comfort conditions).

- Ventilation loads (Demands of the building to meet the requirements of Building Regulations & CIBSE recommendations).
- Lighting levels (2W/m²/100lux throughout)-The lux level in each zone is set as per the NCM guidance.
- Internal power loading and requirements (software default/as per the NCM guidance).
- Provisional occupancy profiles (software default/as per NCM occupancy profile).

Baseline Building Carbon Emissions Summary

	Tonnes CO_2 per annum
Baseline Building	449

Energy Efficiency Measures

To allow for benchmarking of energy consumption and carbon dioxide emissions for the development the base building model was upgraded to incorporate the proposed energy efficiency measures to provide a proposed building model

The strategic approach to the design of the proposed building has been to reduce the demand for energy in the first instance, prior to the consideration of integrating LZC energy sources, since controlling demand is the most effective way of reducing carbon dioxide emissions.

The energy consumption of the proposed building will be reduced, from that of the baseline scheme, by the incorporation of energy efficiency measures in the design of the mechanical and electrical systems.

The following points outline the approaches and strategies that have been incorporated to improve energy efficiency:

- Low U-values for new external walls, glazing, roof and floors.
- High standards of airtightness (i.e. minimising air leakage and infiltration rates through gaps and openings), within the new build areas.
- Energy efficient lighting throughout.

Some of the parameters of the benchmark building used in this study are shown below:

- The new build fabric construction u-values (W/(m^{2}K)):
  - Wall 0.35 (including partition between warehouse and office)
  - Floor 0.08
  - Roof 0.23
  - Doors 2.20
  - Vehicle doors 1.50
- Glazing specifications: Windows 1.50 W/m^{2}K, utilising a g value of 0.4 and LT of 0.68
- Rooflight specifications: Rooflights 1.30 W/m^{2}K, utilising a g value of 0.55 and LT of 0.58
- Ventilation loads (Demands of the building to meet the requirements of Building Regulations & CIBSE recommendations).
- All lighting is to be energy efficient LED fittings, with PIR controls to all areas and daylight dimming to areas receiving natural light
- Heating and cooling to occupied zones is to be provided by VRF to occupied spaces
- Unoccupied zones have been assigned electric panel heaters
- Warehouse assumed unheated, but lit by high efficiency LED
- An Air permeability of 1.50 m^3/(h/m^2) has been used

Note: the assumed fit-out specification above has been applied to both units for the purpose of this assessment.

Predicted Carbon Emissions Saving Due to Fabric & System Efficiency

The table below shows the carbon emissions reduction achieved over the baseline model once the fabric improvements and systems efficiencies are applied.

A 20% reduction in predicted carbon emission is a achieved, a total of 20Tonnes CO_2.annum.

	Tonnes CO_2 per annum
Baseline Building	449
After Improved Fabric & System Efficiencies	281
Reduction in predicted carbon emissions	168
% reduction in predicted carbon emissions	37.5%

LZC Technologies

Summary of Technologies Appraisal

Table 1.1: LZC Recommendations

LZC Technology	Recommendation			Comments
	High	Medium	Low	
Wind Turbine			✓	Low annual CO_2 saving High capital cost Long payback period
Photovoltaics' (PV)			✓	Good annual CO_2 saving Medium capital cost Moderate payback period
Solar Water Heating			✓	Low annual CO_2 saving Medium capital cost Medium payback period
Biomass Heating			✓	Low annual CO_2 saving High capital cost Long payback period
Combined Heat & Power (CHP)			✓	Low CO_2 saving Moderate capital cost Moderate payback period
Heat Pump	✓			Good annual CO_2 saving Medium capital cost Short Payback period

The desktop feasibility study results as summarised in table 1.1 shows that there are a number of technologies that can provide annual CO_2 emission reductions.

A wind turbine potentially offers a 10% annual CO_2 emission reduction, but at a high capital cost. There is potential to export electrical energy generated by this technology back to the grid. However, this option has been discounted due to low CO2 reduction, the implications on space within the site, planning considerations and the cost of on-going maintenance.

Photovoltaics offer the potential to save over 10% in CO_2 emissions; whilst these systems come at high capital cost and long payback, they are easily incorporated into building of this type. This system is not recommended due to its high cost and long payback.

Solar Thermal offers the potential to save 10% in CO_2 emissions; for this type of building solar water heating is easily incorporated into the building,. This technology would be utilised for on-site generation only. The system has been discounted due to its high standing losses and back up plant required.

Biomass heating offers the potential to save 10% in CO_2 emissions. This technology would be utilised for on-site generation only. This option has been discounted due the low carbon annual CO_2 emission saving, low payback period, additional space requirement for the location of the boiler and fuels store, and a potential legacy issue for the supply of fuel for the end user. In addition, this option would require a backup heating source, increasing costs and payback periods.

Combined Heat and Power offers the potential to save 4.0% carbon emissions; whilst these systems come at a medium capital cost and moderate payback, they ca be incorporated into building of this type. The system has been discounted due to its low reduction in CO_2 emissions, this is due to the intermittent load of the building and small base demand of a residential development, this does not give enough running hours for a system to higher CO_2 emission reductions.

Heat pump heating offers the potential to save over 19% in CO_2 emissions; the system has been recommended to supply the office heating and hot water generation due it's low capital cost and ease of incorporation into the scheme

Predicted Energy Saving Due to Low and Zero Carbon Technologies

Heat pump heating to the offices and hot water generation is recommended as the most technically and economically viable option generating the following;

	Tonnes CO_2 per annum
After low carbon technologies applied	227
Reduction in predicted carbon emissions	54
% reduction in predicted carbon emissions	19.2%

Recommendations

In summary, the recommendation for this development, as the most technically and economically viable option is as follows;

- Passive design measures in the form of improved insulation levels and reduced air permeability have been applied to reduce the base energy demand of the building.
- Energy efficiency measures in the form of high efficiency direct acting heating, low energy fans, LED lighting, etc. have been applied to reduce the energy consumption of the building.
- Air source heat pumps suppling the office heating and thermodynamic heat pump panels servicing the hot water generation providing a 19.2% reduction in predicted annual carbon emissions.

This desktop study demonstrates a reduction in predicted annual carbon emissions of 19.2% due to low and zero carbon technologies, and a cumulative reduction in carbon emission of 49.5% when the fabric and system efficiency savings are taken into account, as detailed in the summary table below.

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BREEAM Assessment

Yonder have been appointed as BREEAM Assessors to undertake an initial pre-assessment of the proposed construction of the industrial development Plot 2 Hoyland, in order to predict the BREEAM score and rating that could potentially be achieved based upon initial information provided.

The development is currently expected to achieve a score of 73.23%, which equates to an Excellent rating.

The desired rating for the development is Excellent which requires a minimum score of 70%.

	Total	Weighting	Credit Value	Target
Man	18	11.00%	0.61%	9.78%
HW	10	8.00%	0.80%	6.40%
Ene	21	14.00%	0.67%	10.67%
Tra	12	11.50%	0.96%	6.71%
Wat	9	7.00%	0.78%	6.22%
Mat	14	17.50%	1.25%	8.75%
Wst	9	7.00%	0.78%	6.22%
LuE	13	15.00%	1.15%	9.23%
Pol	12	9.00%	0.75%	5.25%
Inn	10	10.00%	1.00%	4.00%
				73.23%

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