



Hough End Sports Village

Renewable and Sustainability Planning Report

February 2022

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Client Name: Hough End Sports Village

Document Reference: BSD13812/29.0

Project Number: BSD13812-100

Quality Assurance – Approval Status

This document has been prepared and checked in accordance with
Waterman Group's IMS (BS EN ISO 9001: 2008, BS EN ISO 14001: 2004)

Issue	Date	Prepared by	Checked by	Approved by
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1	10/02/22	Michael Merriman Mechanical Engineer	Nuala Maguire Associate Director	Tim Davies Director

Comments

Issue 1	Report reviewed and amended to define basis further
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Our Markets



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1. Introduction

This report outlines the renewable and sustainable energy design proposals for the new build extension building at the existing Hough End Sports Village. The report sets out the approach that has been taken with the design to meet the Local Planning Application requirements, minimising the energy use of the building through passive and active measures and incorporating renewable technologies to further reduce the carbon emissions from the building. The report also addressed the design steps taken to allow the building to adapt to climate change in future years.

1.1 Manchester City Council Core Planning Policies

The building has been assessed against the following Manchester City Council Core Planning Policies, and the following report outlines how each has been met, summarised below and in the following document text.

Policy ENE04

Policy EN 4 'Reducing CO2 Emissions by Enabling Low and Zero Carbon Development' states that the Council will seek to reduce fuel poverty and decouple growth in the economy, growth in CO2 emissions, and rising fossil fuel prices, through a number of actions. These include that all development must follow the principle of the Energy Hierarchy, being designed to reduce the need for energy through design features that provide passive heating, natural lighting and cooling to reduce the need for energy through energy efficient features such as improved insulation and glazing to meet residual energy requirements through the use of low or zero carbon energy generating technologies. Wherever possible new development and retrofit projects, including energy generation plant, must be located and designed in a manner that allows advantage to be taken of opportunities for low and zero carbon energy supplies.

Design Response:

The following report demonstrates how the scheme has been designed following the Energy Hierarchy approach, building from a fabric first, passive design philosophy onto active low energy systems and finally with the application of low and zero carbon renewable technologies.

Policy ENE06

Policy EN 6 'Target Framework for CO2 reductions from low or zero carbon energy supplies' states that applications for development over 1,000 sq m will be expected - as a minimum - to meet the target shown in Tables 12.1 or 12.2, unless this can be shown not to be viable. This should be demonstrated

through an Energy Statement submitted with the application, and such statements will be expected to set out the projected regulated energy demand and associated CO₂ emissions for all phases of the development.

The applicable table 12.2 (non-domestic buildings) is listed below

Non-domestic CO₂ emissions reduction targets	
Table 12.2	
Target	% Minimum requirement
Target 1: Network development area	CHP/district heating anchor or connection or where not feasible, a 15% increase on Part L 2010
Target 2: Electricity intense buildings (Applies to commercial uses with a high proportion of emissions from electricity use (>45 kg CO ₂ /m ²)	+10% increase on Part L 2010
Target 3: Micro generation area	+15% increase on Part L 2010

Design Response:

The following report demonstrates how the Building design, utilising the Energy Hierarchy approach, has reduced the overall energy use of the building and achieves a betterment of the Approved Document Part L2A. Whilst the Policy ENE06 references a 10% betterment of Part L2A 2010 (for an electric intensive building as the proposed building is), the assessment has been made against the more onerous Part L2A 2013 assessment criteria, and the included BRUKL document shows that a 10.3% betterment is being achieved, which will equate to a higher level of betterment on a 2010 Part L assessment. Therefore, the building has been demonstrated as bettering the ENE06 requirement.

Policy EN8

Policy EN 8 'Adaptation to Climate Change' states that all new development will be expected to be adaptable to climate change in terms of the design, layout, siting and function of both buildings and associated external spaces. In achieving developments which are adaptable to climate change developers should have regard to the following, although this is not an exhaustive list:

- Minimisation of flood risk by appropriate siting, drainage, and treatment of surface areas to ensure rain water permeability
- Reduction in urban heat island effect through the use of Green Infrastructure such as green roofs, green walls, increased tree cover and waterways
- The need to control overheating of buildings through passive design
- The opportunity to provide linked and diverse green space to enhance natural habitats which will assist species adaptation

Design Response:

The following report demonstrates how the building has been developed to address the required elements of Policy EN8, outlining the passive design measures such as solar shading, free cooling and daylight, fabric material choices and improved fabric performance. The report also addresses how the building can be modified simply in the future to maintain a comfortable environment, by adapting to changes in the external climate.

Appendix A Energy Target Explanation

In accordance with the guidelines of Appendix A of the Manchester Core Strategy, the building falls under the Target Area 2 classification due to the fact that it is a predominantly all-electric fit out. As such the target CO2 emission betterment is 10% on Building Regulation 2010 Part L2A.

Which Target applies to My Development?

Target Area 1 will apply if a development has at least three of the following - commercial offices, hotel, residential, apartments, public building, supermarket, or it is adjacent to an existing district heat network. If connection to an existing heat network, or installation of a new heat network is not considered feasible or viable then a development would be expected to follow Target Area 3.

Target Area 2 will apply where the predominant building type within a development will have an all-electric fit-out and will typically consist of retail or leisure units.

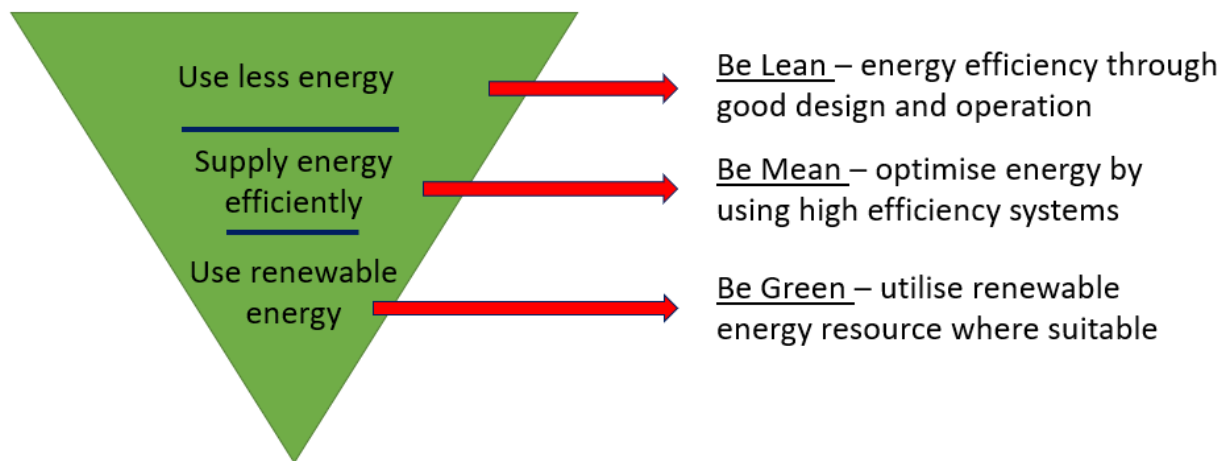
Target Area 3 will apply where the lower density or fragmented mix of uses means that building scale solutions tend to be the only viable options.

2. The Approach to Sustainability (ENE04)

This section outlines the project's approach to sustainable design and presents the design proposals for achieving an energy efficient building.

2.1 The Energy Hierarchy

The Energy Strategy for the proposed development has been progressed on the well-founded approach that is often referred to as a the “lean, mean, green” approach. The lean, mean, green strategy applies throughout the development and the specific solutions have been analysed and are summarised in the sections below.



2.2 Energy Conservation Measures to be Taken

The energy conservation measures (“Lean” Solutions) proposed for the building, include the following

- Improving thermal insulation. Wall, roof, floor & glazing provide ‘U’ values, significantly better than Building Regulation standards.

Proposed U-values:-

- External wall - 0.22 W/m²k
 - Roof – 0.15 W/m²k
 - Floor – 0.18 W/m²k
 - Window – 1.5 W/m²k
 - Door – 1.14 W/m²k
- Improving airtightness. Air tightness standards are significantly better than Building Regulations and will provide large energy savings to heating and cooling.
 - Proposed Air Permeability 5m³/hm²@50Pa
 - Optimising daylighting. Providing generous glazing to the function and café spaces to enhance daylighting

- Low water demand appliances. Careful specification of the sanitaryware to minimise water demand and hot water heating energy. This is a particular aim of the project to use the latest low water use showers as these account for a large portion of the building's energy needs.
- Improving services thermal insulation.
- Control of solar gains using high efficiency glazing
 - Proposed Glazing G-Value – 0.39
- Passive natural ventilation systems where possible, coupled with night cooling and thermal mass

2.3 Energy Measures to be Taken

The energy efficiency measures ("Mean" Solutions) for the building will include

- Lighting. Use of high efficacy LED lighting in all areas.
- Daylight dimming. Rooms with high daylight factors will be provided with automatic dimmable luminaires under photocell control.
- Lighting Control. Use of automatic lighting control provided where possible and in line with room use to ensure lights are on only when demand dictates – including presence detection and absence detection
- Heating, Ventilation System Controls. To ensure that the plant runs efficiently, and rooms are only conditioned when occupancy dictates.
- Heat recovery on ventilation plant to recover energy from exhaust air paths.
- Metering. Provision of meters to aid the energy management of energy including power, lighting and heating.
- Building Management System. Automatic controls that allow the energy in spaces, to be controlled and switched off when the room is not occupied, plant operation to be monitored and plant failure to be quick identified.

3. Proposals for LZC Technologies

A number of low and zero carbon technologies have been considered. A summary of technologies considered are included within Appendix 'A'. To maximise the betterment on Part L and comply with the planning sensitivities of the listed building, the following LZC technologies are proposed:

- Air Source Heat Pumps (ASHP) for heating for the building.
- Photovoltaic Cells

3.1 Air Source Heat Pumps

An ASHP system shall be utilised to provide heating within the new building. It is proposed that the air source heat pump condensers shall be located within an external plant compound on the rear plant deck area and externally adjacent to the building. Whilst the exact requirement will be set by the final design, it is anticipated that up to four heat pump units will be installed to serve the buildings heating requirements, split to serve the various systems installed.

3.2 Photovoltaic Cells

It is proposed that the building shall be served by an array of roof mounted photovoltaic (PV) cells. The PV cells would ideally be aligned to face due south to maximise the energy output, however due to the orientation of the building, this is not possible. Therefore, the area of PV cells has been increased to take account of a suboptimal orientation so that the installation still delivers the required annual electricity contribution to meet CO₂ reduction targets. The PV cells will feed directly into the building. Whilst the exact requirement will be set by the final design, it is anticipated that approximately 200m² of PV cells will be installed on the building.

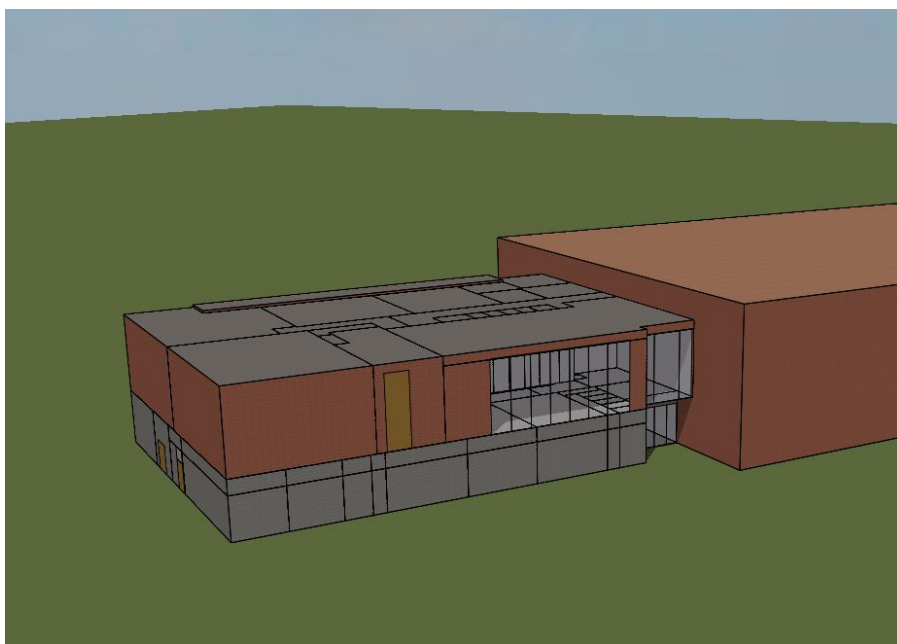
4. CO2 Emissions (ENE06)

The scheme has been modelled and the energy demand and carbon dioxide emission assessments have been carried out using the National Calculation Method outlined in the building regulations Part L2A 2013 BRUKL assessment.

The design of the building has achieved the required compliance of the BRUKL carbon emission providing Photovoltaic panels are installed and this is demonstrated within tables and by the initial planning stage BRUKL document for the scheme shown below.

Building	Target Emission Rate (kgCO ₂ /m ² .annum)	Building Emission Rate (kgCO ₂ /m ² .annum)	Part - L Improvement (%)
Hough End Sports Village	208.3	186.8	10.3

Building Model Views



BRUKL Output Document



Compliance with England Building Regulations Part L 2013

Project name

Hough End Sports Centre

As designed

Date: Tue Mar 23 21:11:16 2021

Administrative information

Building Details

Address: Manchester, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

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

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	208.3
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	208.3
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	186.8
Are emissions from the building less than or equal to the target?	BER ≤ TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.25	0.61	GR000045:Surf[4]
Floor	0.25	0.18	0.18	GR000001:Surf[0]
Roof	0.25	0.15	0.15	GR000040:Surf[0]
Windows***, roof windows, and rooflights	2.2	1.51	1.51	GR000001:Surf[2]
Personnel doors	2.2	2.2	2.2	GR000001:Surf[1]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)] U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)] U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)]				
* There might be more than one surface where the maximum U-value occurs.				
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.				
*** Display windows and similar glazing are excluded from the U-value check.				
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	5.09

5. Adaption to Climate Change (EN8)

The building has been developed to address the required elements of Policy EN8. This has been provided by a series of staged measures that have been applied to all elements of the building design, including such passive design measures such as solar shading, free cooling and daylight, enhanced fabric material choices, all of which are outlined below. The design has also addressed how the building can be modified simply in the future to maintain a comfortable environment, by adapting to changes in the external climate.

The main principals of passive design that have been applied to this proposed building, in order to provide good indoor environmental comfort (temperature, air quality, etc), as well meet the appropriate construction standards are set out below.

Temperature / Air Strategy:

- The building's south façade avoids the use of glazing to reduce solar gains to the spaces.
- West facing glass has been provided with passive solar shading, to reduce the potential risk of overheating during late summer afternoons and evenings.
- Non-temperature-sensitive spaces (such as the plant room) have been deliberately placed on the south façade, so that temperature sensitive spaces can be prioritised for location on the east and west façades.
- The building has been developed to maximise, where possible, the daylight potential to the spaces to maximise the ability to harness light and reduce the electrical energy consumption of the artificial lighting systems.
- The specification of the glazing system has been carefully appraised and selected to ensure that the benefit gained from the high levels of glazing is not lost due to a high solar load. This is particularly the case with the entrance and café atrium glazed façades. The requirements for solar control to meet the building energy targets, occupant comfort and Part L2A solar overheating requirements has been ensured by the selection of a glazing system that achieved a high light transmission rate whilst also achieving a low g-value and solar gain rate.
- With the provision of demand controlled ventilation to the building, the potential use of night cooling to pre-cool the building overnight can be implemented. This is best achieved by the mechanical vent systems operating at low speeds providing a controlled ingress of cool night air into the building.
- The winter draught free ventilation provision is catered for by the proposed use of hybrid natural / mechanical ventilation heat recovery units (MVHR) to blend the incoming cold air with the warmer air at high level in the function rooms, improving occupant comfort, making full use of the free heating and reducing overall heating loads.

Building fabric / form strategy:

- The building form is simple and has a low exposed surface area proportion to volume (has a good 'form factor'); this prevents excess heat loss.
- Building fabric insulation is appropriately specified and exceeds the current government standards.
- Good practice standards of design will be utilised to reduce thermal bridging and improve air tightness rating where possible.
- Building fabric apertures (windows / doors) will be deliberately set back from the outside face of the façade to the insulation 'thermal line' (reduced cold bridging in these key heat-loss risk areas)

- Locating the gym spaces to the eastern facade to make full use of natural pure daylight and reducing solar gains to this key area, allowing the free cooling elements of the ventilation system to function as efficiently as possible.

Future Adaptability of the Building:

The current predictions for future climate change indicate that, due to the effects of global warming already instigated by the previous years of uncontrolled greenhouse gas emissions, the global climate will increase in temperature by several degrees during this century, and the current experienced temperatures are recorded as currently already having risen by 1°C on average.

The impact this will have on the global climate, the local microclimate and therefore the proposed building itself cannot be definitively advised, however the general climate models all show that the local environment in which the building will reside will be warmer throughout the summer and the winter months and be liable to higher levels of intensive rainfall and storms.

Obviously, the predicted warmer winter conditions will benefit the building energy consumption by reducing the amount of energy required during peak period to warm the building. However, the warmer summer periods will mean that in order to maintain the current desired summertime maximum temperature levels, the building will potentially need to be modified in the future to maintain pace with the external climate.

It is envisaged that across the building lifetime, there are a number of areas where the building can be modified to achieve the desired adaption to ensure that the building can continue to be used and does not become obsolete. The below list of options is based on the current technology and system available on the market today, however it is envisaged that, as the climate changes and technology advances, newer systems, fabrics, construction techniques and live technologies such as nano-tech systems will be developed that will then provide further options for future development of the building. The important factor is for the buildings to be built today with the ability to incorporate the technology of tomorrow.

System	How can the system be incorporated into the building?	Can be included within the building (yes/no)
Relaxation of the current internal temperatures	As the external temperatures rise it is expected that the internal design temperatures will also rise as occupants become acclimatised to working within a warmer environment, therefore the building could be fully operational in a warmer environment without any further modifications due to natural changes in the occupant's comfort criteria.	Yes
Improvement of the façade performance	The existing building is proposed as a steel framed construction therefore the façade can be removed and replaced in future years with a newer and more technologically advanced, higher performing façade to provide sufficient extra benefit to offset the changes in climate	Yes

Improved ventilation	Along with the modifications to the external façade, the current ventilation provision can be increased at the same time to improve the level of natural and mechanical ventilation provision to the spaces and building to offset the changes in the climate.	Yes
Phase change materials	Additional thermal mass can be retrofitted into the building to improve the performance of the night cooling. Simple phase change material sheets or blocks can be installed around the building and rooms to increase the level of stored energy coolth that can then be released throughout the next day.	Yes
Limiting gains from lighting and equipment	Both installed lighting systems and equipment have both a limited lifespan and a continued development to reduce the energy consumed by their use. These developments will continue such that when these systems are due to be replaced in 15 to 20 years' time, the new installations will be more energy efficient and therefore will naturally aid in the efforts to combat the effects of the climate change.	Yes
Mixed mode ventilation	The effectiveness of the natural ventilation systems will decrease as the external temperatures rise, however there is the ability to start to introduce at this stage boost extract fans to assist the natural ventilation strategies as local systems in each room.	Yes

6. Conclusions

Preliminary calculations of the energy demand and carbon dioxide emissions have been carried out using the National Calculation Method outlined in the building regulations Part L2A 2013 BRUKL calculation software.

Energy efficient design techniques have been adopted to ensure that passive design measures are maximised in the first instance as follows

- Low U-values
- Low air permeability
- Passive measures including natural ventilation

Low energy lighting, energy efficient controls and high efficiency plant selection have been incorporated to reduce carbon dioxide emissions of the proposed development.

The use of low and zero carbon technologies also supplement the scheme with the proposed use of air source heat pumps and photovoltaic cells. The review looked at the possibilities for including further L2C technologies but these were discounted.

The result of this combined approach is that the design has been shown to achieve a 10.3% betterment of the Part L2A 2013 Building Regulation emissions, exceeding the requirements of Core Policy ENE06, whilst the design also meets the requirements set out for compliance of ENE04 and EN8.

Appendix A - Renewable Technologies Considered

The following table summarises the LZC technologies considered for this project.

Sustainable Design Option	Suitability for site	Reason for acceptance or rejection of option	Export of energy feasible?	Cost for Carbon Emission Reduction
Biomass boiler	No	Site location close to housing precludes this option	No	High
Ground source heat pumps	Yes	The space around the building means this system could be incorporated. Unreliability of ground conditions makes this option a risk over air source heat pumps.	No	High
Air source heat pumps	Yes	Suitable for site logistics and application	No	Medium
Bio-diesel Generator	No	Site location close to housing precludes this option	No	High
Solar water heating	Yes	Sufficient hot water demand within the building make this option viable. However, variable demand across the day/year will mean the option is not full utilised at key efficiency times	No	Medium
Photovoltaic cells	Yes	PV cells can be incorporated	Yes – can be linked to grid electricity	Medium
Combined heat and power plant	No	Insufficient base heat demand	No	Medium
Hydro-power	No	No local water courses	No	High



*Project Office