The Greenhead College

Energy & Sustainability Statement

Galliford Try

Job No:	1029739
Doc Ref:	GSF-CDL-XX-XX-RP-SY-70223
Revision:	B
Revision Date:	13 September 2021

Project title	The Greenhead College	**Job Number**
Report title	Energy & Sustainability Statement	1029739

Document Revision History

Revision Ref	Issue Date	Purpose of issue / description of revision
A	01 September 2021	Draft Issue for Comment
B	13 September 2021	Planning Issue

Document Validation (latest issue)

13/09/2021	13/09/2021	14/09/2021
X L. Villoria	X J. Todd	X S.Simpson
Principal author	Checked by	Verified by
Signed by: Villoria Garcia, Laura	Signed by: Todd, Jordan	Signed by: Simpson, Sophie

Executive Summary

This statement outlines the approach to sustainability for the proposed development of the new buildings at Greenhead College, Huddersfield. It is intended to meet the sustainability policies and objectives set out in the National Planning Policy Framework and the requirements for Kirklees Local Council.

Planning Policy LP24 within the Kirklees Local Plan states that proposals should promote good design by ensuring “high levels of sustainability”. In Policy LP26, the Local Plan also encourages the use of renewable energy, where appropriate.

Despite the local planning policy having no specific energy or sustainability targets, the development aims to include a range of measures to meet the ambitious Net Zero Carbon in Operation (NZCiO) targets, identified in the Technical Annex Sustainability of the Department for Education Specification for the scheme design. To achieve this, the design strategy follows a "Steps to low carbon" methodology:

- **Be Lean:** energy reduction through passive design measures and energy efficient systems.
- **Be Clean:** potential to connect to a district heating network or host a combined heat and power unit.
- **Be Green:** the inclusion of low and zero carbon technologies in the scheme

‘Be Lean’ passive and energy efficiency measures have formed an integral part of the design for the proposed development, and the energy strategy includes:

- The envelope of the buildings will be designed to perform significantly better than the Building Regulation standards with low U-values, g-values and low air leakage rates.
- Natural ventilation is prioritised wherever possible so that demand for active services is reduced.
- Energy efficient services employed in the development include high efficiency LED lighting coupled with occupancy and daylight controls to significantly reduce lighting energy use.
- Electrical and mechanical systems within the development will be tightly metered and controlled with a full Building Management System (BMS). This will enable energy use to be tracked and opportunities for efficiency improvements to be made.

In order to meet the NZCiO operational energy requirements, the design also considers the installation of PVs on the roof of the new Main Block.

The combination of the above measures results in a 53.3% reduction in site-wide regulated CO_2 emissions compared to the Part L2A 2013 Target Emission Rate (TER) and 29% reduction of the energy demand from on-site renewable sources[1].

The table and graph below summarises the key predicted carbon dioxide emissions associated with the proposed new main building.

Carbon Dioxide Emissions after each stage of the Energy Hierarchy	Carbon dioxide emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated*
Baseline: Part L 2013 of the Building Regulations	87	14.7
‘Be Lean' - After energy demand reduction	72	14.7
‘Be Clean' - After efficient plant	66	14.7
‘Be Green' - After renewable energy	41	14.7

Table 1 Carbon Dioxide Emissions after each stage of the Energy Hierarchy

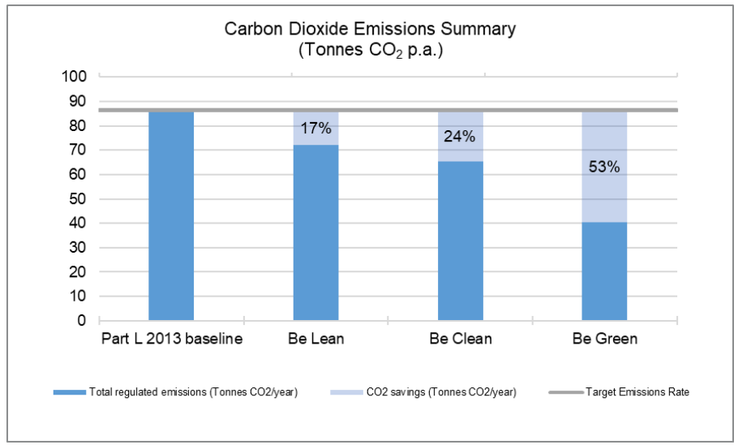


Figure 1 Carbon Dioxide Emissions after each stage of the Energy Hierarchy

Indicative SBEM and EPC output documents for the proposed main building are included in **Appendix C**.

Additionally, the development will incorporate the following sustainability measures and strategies:

- **Good daylight** will be achieved in occupied spaces through the balanced and considered use of glazing. External shading will be used where required to prevent excessive heat gain, whilst high performance glazing will reduce energy loss.
- Mixed-mode ventilation will be used in all teaching spaces and perimeter study areas to maintain **thermal comfort**. The ventilation units will be used to maintain a consistent supply of filtered fresh air to maintain good **indoor air quality**. Low VOC materials and finishes will minimise internal sources of pollutants.
- **Water efficient** fixtures and fittings will be specified to reduce water consumption below the levels required for national building regulations.
- **Metering and sub-metering** of energy and water consumption will enable ongoing, targeted reductions in consumption on site.
- All **timber** used in the project should be from a responsible or sustainable source, using certified FSC or PEFC sources.
- To ensure **responsible and sustainable procurement**, materials will be specified in line with a documented sustainable procurement plan. This will include the use of certification schemes such as ISO14001 and BES 6001.
- Materials that are **durable and resilient** will be specified to maximise their life-span and avoid the need for disposal and replacement.
- Appropriate and accessible **waste facilities** will be provided to encourage occupants to recycle waste effectively.
- The proposed servicing strategy for the provision of heating and hot water will be from electrical solutions eliminating the requirement for the use of fossil fuels which would be detrimental to local air quality.
- Responsible construction practices should be adopted to reduce resource use and the impact of noise, dust and pollution.

[1] Applicable to the ‘New Block’ only, where the ’Infill Block’ is not subject to a CO_2 emission calculation and no consequential improvements are required by planning.

Contents

1.0

Introduction

1.0 Introduction

This report has been prepared in support of a planning application for development at Greenhead College, Huddersfield, Kirklees, HD1 4ES.

The purpose of this report is to highlight the sustainability commitments of the development and to summarise the strategy in the context of the relevant energy and sustainability policies.

The principal objectives of the proposed development are to reduce the site's contribution to the causes of climate change by reducing the site's needs for energy, and minimising the emissions of CO_2 by providing some of the requirement through renewable means.

1.1 Existing Site

The site for the proposed redevelopment of the existing Greenhead College Campus located in Huddersfield is shown in the image below. The proposals consist of the creation of two new-build elements on the site; namely the 'New Block' (new-build) and 'New Infill Building' which will replace the 'Laingspan block' on the existing campus.

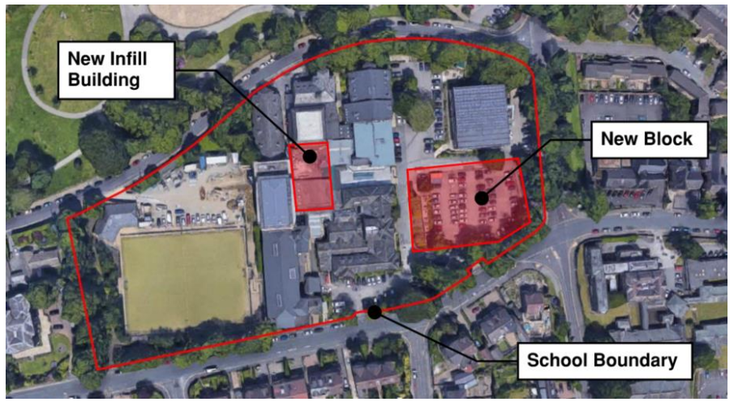


Figure 1-1: College Boundary

The college grounds have an area of approximately 2.5ha and lie between Greenhead Road (to the South) and Park Drive South (to the north), in central western Huddersfield within West Yorkshire. The area surrounding the college grounds is predominantly urban residential in nature.

The main site access is via Greenhead Road to the south. The A640 Trinity Street and A62 Castle Gate (part of Huddersfield's inner ring road) are busy roads located within 100m and 250m of the site boundary to the north and east respectively.

The college is on the southern perimeter of the Greenhead Park Conservation Area. Greenhead Park itself is a Grade II Registered Park & Garden.

The New Block site contains the existing main car park. This car park will be relocated to the western part of the college grounds.

The new Infill Building site currently comprises part of the existing Laingspan Block, and is contiguous to the Main Block, the Park Block and the Dawson Block. These are 3-storey buildings interconnected and ranging in age and condition.

1.2 Proposed Development

The proposed development comprises:

- The erection of a New Main Teaching Block on the existing car park to provide a total of 5,294m². The building will be 4 storeys high and include general classrooms, science laboratories, social & dining spaces and a kitchen;
- The demolition of the Laingspan Block and construction of a new Courtyard Infill Block to provide a total of 895m² including dining, social and fitness areas;
- Basic service upgrades to some of the existing buildings.

2.0 Policy

2.0 Policy

2.1 National Policy

The National Planning Policy Framework (NPPF) was published in July 2021 and states a clear presumption in favour of sustainable development. The NPPF supports the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change, and encourages the reuse of existing resources, including conversion of existing buildings, and encourages the use of renewable resources.

The NPPF, Section 14 outlines its climate change policies. To support the move to a low carbon future, new developments should be planned for in ways that:

- Avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and
- Can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.

The NPPF states that in determining planning applications, local planning authorities should expect new developments to:

- Comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and
- Take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

2.2 Local Policy – Kirklees Local Plan Strategy and Policies

The Kirklees Local Plan sets out policy requirements, adopted in February 2019, as follows:

Policy LP24 - Design

Proposals should promote good design by ensuring high levels of sustainability, to a degree proportionate to the proposal, through:

i. The re-use and adaptation of existing buildings, where practicable;
ii. design that promotes behavioural change, promoting walkable neighbourhoods and making walking and cycling more attractive;
iii. considering the use of innovative construction materials and techniques, including reclaimed and recycled materials;
iv. where practicable, minimising resource use in the building by orientating buildings to utilise passive solar design. This includes encouraging the incorporation of vegetation and tree planting to assist heating and cooling and considering the use of renewable energy;
v. providing charging points to encourage the use of electric and low emission vehicles;
vi. incorporating adequate facilities to allow occupiers to separate and store waste for recycling and recovery that are well designed and visually unobtrusive and allows for the convenient collection of waste;
vii. designing buildings that are resilient and resistant to flood risk, where such buildings are acceptable in accordance with flood risk policies and through incorporation of multi-functional green infrastructure where appropriate;
viii. designing places that are adaptable and able to respond to change, with consideration given to accommodating services and infrastructure, access to high quality public transport facilities and offer flexibility to meet changing requirements of the resident / user.

Policy LP26 – Renewable and low carbon energy

Renewable and low carbon energy proposals (excluding wind) will be supported and planning permission granted where the following criteria are met:

a. the proposal would not have an unacceptable impact on landscape character and visual appearance of the local area, including the urban environment;
b. the proposal would not have either individually or cumulatively an unacceptable impact on protected species, designated sites of importance for biodiversity or heritage assets;
c. the statutory protection of any area would not be compromised by the development;
d. any noise, odour, traffic or other impact of development is mitigated so as not to cause unacceptable detriment to local amenity;
e. any significant adverse effects of the proposal are mitigated by wider environmental, social and economic benefits.

Where the above criteria are met, the council encourages dialogue with local community groups promoting community renewable and low carbon energy schemes.

The creation of district heat networks is encouraged across Kirklees. Heat networks can be developed at different scales and all new developments should consider their potential. Proposals requiring a master plan should explore the potential of developing a heat network, or connecting to an existing network.

Policy LP47 – Healthy, active and safe lifestyles

Policy LP47 states that Healthy, active and safe lifestyles will be enabled by: increasing opportunities for walking, cycling and encouraging more sustainable travel choices; and supporting energy efficient design and location of development.

Climate Change Statement

The Council has also published 'Planning Applications Climate Change Guidance', dated June 2021. This provides guidance to facilitate the completion of a Climate Change Statement in support of a planning application.

Note:

- A copy of the Kirklees Climate Change Statement is included in Appendix A with project specific information included for information.
- Specific requirements of the Department for Education (DfE) are considered separately and discussed in Section 3 of this report.

3.0

Energy Strategy

3.0 Energy Strategy

3.1 Overview

The design of the proposed development has been developed to meet the NZCiO target outlined in the project brief[2]. The energy strategy follows our steps to net zero carbon methodology, which align with the industry recognised Energy Hierarchy, as follows:

- **Be Lean**: The design will consider the building form and fabric to provide a highly efficient envelope to drive down the energy demand from heating and cooling.
- **Be Clean**: The building services plant and equipment that we specify will be as efficient as possible to drive down energy consumption.
- **Be Green**: We will aim to reduce the requirement for renewables technologies as far as possible by being 'Lean' and 'Clean'. Renewable technologies are not required to pass building regulations nor are they required to satisfy any local planning requirement. They will be provided to comply with the Net Zero Carbon in Operation requirements of the Department for Education's (DfE) Technical Annex Sustainability.

To calculate carbon emissions and reductions, the design was assessed under 'Part L 2013: Conservation of Fuel and Power' of the UK Building Regulations, using the National Calculation Methodology (NCM). A detailed energy model was created using Government approved software Integrated Environmental Solutions: Virtual Environment (IES: VE) 2021, in line with CIBSE AM11. The model was revised for each of the steps of the Energy Hierarchy to establish expected performance and satisfaction of the policy requirements.

3.2 DfE Output Specification

In line with the government requirements, the DfE is committed to reducing carbon emissions to zero across their estate by 2050. To achieve this, the DfE has prepared a Technical Annex to the Output Specification - Sustainability Brief[3] - to specify the sustainability measures, technical standards and performance criteria for school & college buildings, which are above and beyond those described in the current version of the Output Specification (2017).

The aim is for new school & college buildings to achieve Net Zero Carbon in Operation, as defined by the standards within the Net Zero Carbon Buildings: A Framework Definition (UK GBC).

Section 4.5 of the Sustainability Brief outlines the energy targets and design criteria for new school & college buildings. This requirement will be analysed separately as part of an operational energy assessment utilising the TM54 methodology.

3.3 Passive Design – 'Be Lean'

3.3.1 Fabric Performance

The thermal insulation levels will be improved significantly beyond the minimum Building Regulation standards, thereby limiting the heat loss though the building's fabric. Both air permeability and the specification for the external walls, roof, and glazing will have an impact. These are provided in accordance with the Technical Annex Sustainability of the NZCiO and shown in the table below:

Detail	Target	Improvement over Part L
Ground floor average area weighted U-value	0.12 W/m^{2}K	52%
External wall average area weighted U-value	0.15 W/m^{2}K	57%
Roof average area weighted U-value	0.12 W/m^{2}K	52%
Window and roof light area weighted U-value (including frame)	1.20 W/m^{2}K	45%
Window g-value	0.40	-
Rooflight g-value	0.30	-
North Windows VLT	73%	-
Rooflight, South, East & West Windows VLT	69%	-
Air Permeability at 50Pa	3 m^3/hr/m^2	70%

Table 3-1 Building Fabric Thermal Performance values

3.3.2 Natural ventilation

All occupied spaces have been designed to maximise the natural ventilation availability via opening façade ventilation systems and louvres wherever possible.

The infill block social spaces will be naturally ventilated by the use of a mix of opening windows, motorised louvres, and penthouse ventilation turrets.

Openable windows will be provided to the staircases, and the doors between the staircases, and main circulation corridors will be normally held-open (to close in fire condition) providing natural ventilation to the internal corridors.

In some areas on the New Main Block North façade there will be a mixture of ventilation via louvres and windows. The windows are introduced to the North façade in order to maximise daylight whilst maintaining good ventilation.

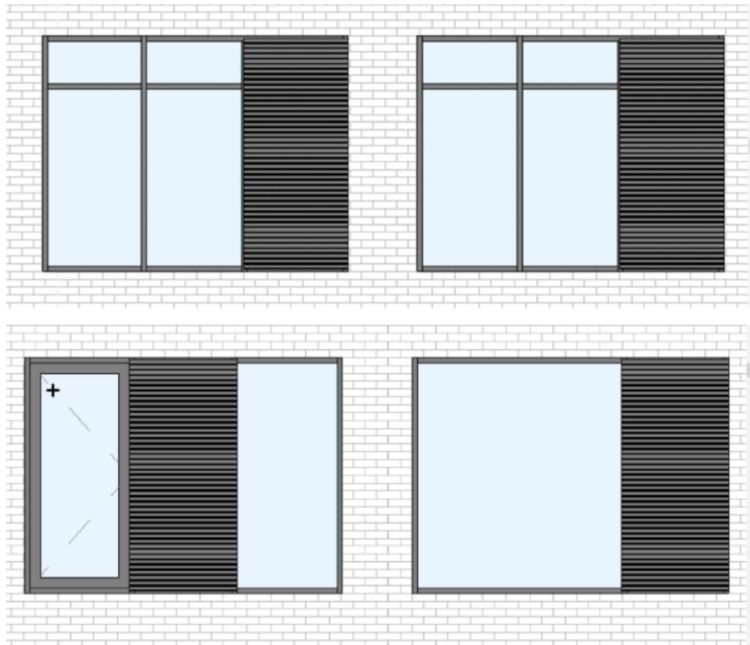


Figure 3-1 Typical combined louvre and window façade design (with occasional opening window where necessary) to some areas of the New Main Block

Louvered openings are a very efficient way of providing natural ventilation to occupied spaces, offering many benefits over the more traditional method of using openable glazed windows for natural ventilation.

Firstly, fixed windows allow much more daylight into a space providing a much brighter, more pleasant, and visually comfortable environment for occupants. This is because, for a window to be openable, a frame is required for both the structural opening and for the inner sections that open. In contrast, for a fixed window, only a structural frame is required. This means that the frame for the proposed buildings takes up a less percentage area of the overall window design.

In addition, louvres provide an effective free area for air movement into and out of the occupied space without any health and safety risks associated with openable windows.

Typically for schemes which use openable windows, ~130mm restrictors are frequently fitted. These are to prevent people accidentally falling out of the windows or walking into the windows when located at ground level. The external louvre design proposal protects a wide-open window offering secure natural ventilation. Furthermore, as the louvres are opaque, they do not give rise to increased solar gain which is often an issue with glazed windows.

[2] DfE, 2020. School-Specific Brief template Output Specification – Greenhead College. November 2020 – Laingspan / Intergrid Pilot Projects

[3] DfE, 2020. Technical Annex: Sustainability Brief. Version 5, December 2020.

3.3.3 Mixed-mode classroom ventilation

The general class, science-based teaching spaces and some social study areas in the New Main Block will use a mixed mode room ventilation approach. The ventilation will be provided by high-level perimeter ventilation units in conjunction with the façade ventilation system. In some cases, openable windows are also provided to enhance the passive ventilation rates where required.

Figure 3-2 Typical façade ventilation system (Ventsair by Monodraught)

The ventilation units will be used in occupied areas to supply adequate fresh air for staff and students throughout the year. The units will provide thermally comfortable conditions throughout the year. They mitigate against cold down draughts in winter and assist with maintaining comfort during warmer summer periods by providing additional air movement.

The ventilation units are barely audible in operation. The ventilation units also have a very low specific fan power (SFP) ensuring that they are very energy efficient. The fans will only operate for parts of the year when ventilation is required.

There will typically be two units installed in each general teaching space to ensure that sufficient fresh air will be supplied for all 32 occupants. Science based classrooms require 'boost' ventilation to 450 l/s (5 l/s/m^2) in accordance with Technical Annex 2F:Mechanical Services and Public Health Engineering which will typically be provided by three units in each laboratory space, each able to provide 180l/s in daytime boost mode.

In winter mode, the fresh external air enters the ventilation unit at the façade. The unit is fitted with both a heat recovery device and two low energy fans which mix the warm room air with the incoming cold air. In doing so, the unit supplies tempered fresh air into the space at a comfortable temperature, thus helping to avoid draughts.

A summary of the fixed building services inputs used for the 'Be Lean' scenario can be found in **Appendix B**.

3.4 Energy efficient systems – 'Be Clean'

3.4.1 Fixed Building Services

Once the fabric efficiency has been optimised as far as practical, the aim is to further reduce CO_2 emissions by selecting efficient mechanical, electrical and control systems. This will help to manage the energy used during the operation of the building.

HVAC Plant Efficiencies

The design team will specify all equipment and plant to perform better than the minimum requirements of the non-domestic building services compliance guide. This document provides guidance on the means of complying with the requirements of Part L2A of the Building Regulations for conventional space heating/cooling systems, hot water systems and ventilation systems.

The table below provides a summary of the inputs for the energy model. The project will aim to achieve these performance parameters going forward in alignment with NZCiO objectives.

System Parameter	Value
Heating – Heat Pump seasonal efficiency (SCOP)	3.7
DHW - Heat pump seasonal efficiency (SCOP)	2.5
DHW storage volume (total site)	2,000 litres
DHW storage losses	0.0047 kWh/l.day
Central AHU specific fan power	1.6 W/l/s
AHU heat recovery sensible efficiency	73%
DX cooling SEER	4.00
DX heating SCoP	3.50
All fans and pumps will be variable speed with multiple pressure sensors	

Table 3-2 Building Heating, Cooling, Ventilation and Domestic Hot Water efficiency targets

Low-energy Lighting

Installing efficient low energy light fittings internally and externally can significantly reduce a building's overall lighting load hence lowering its annual CO_2 emissions. The development will reduce the energy consumption by the specification of low energy, high efficacy, luminaires in all spaces.

The table below summarises the lighting system efficiency targets and automatic controls assumed for the energy modelling:

System Parameter	Value
Teaching areas lighting efficacy	110 lm/W
General lighting efficacy	110 lm/W
Occupancy control – teaching and office spaces	Manual On / Auto Off
Occupancy control – toilets and circulation areas	Auto On / Auto Off
Daylight dimming with back half or room sensor to all perimeter spaces	

Table 3-3 Building Lighting Strategy

Building Energy Management System (BEMS)

All consumption of electricity will be sub-metered across the building with links to the BMS. This will allow the recording and monitoring of energy use in the building, and provide more detailed information to help identify any problems, or areas where energy is being wasted.

3.4.2 Decentralised Energy Systems

The use of a Combined Heat and Power (CHP) or district heating solution for the development is not deemed viable at this stage due to the predicted associated energy load profile, and the lack of availability of existing heat networks in the area. Further detail is included in the following paragraphs, so the project will be proceeding on the basis of specifying air source heat pumps to meet space heating and domestic hot water requirements.

Combined Heat and Power

Combined Heat and Power (CHP), also known as cogeneration, is an energy system capable of producing both useful heat and electricity simultaneously in a single process. It allows for optimum use of the energy available from the fuel used.

The efficient use of CHP typically depends on finding a use for the heat generated by the process. Issues to consider include:

- If heat is not used, then the system is effectively just an electricity generator and electricity will be greener and cheaper if sourced from the national grid.
- If excess electricity is generated on site this can be exported (sold) back to the grid whereas excess heat needs to be rejected (wasted). Exported electricity can count towards reducing the site's CO_2 emissions.
- Exported electricity will typically not be financially attractive as exports tend to coincide with low demand periods on the national grid so the cost of producing the electricity on site can be more than the prices received for the exported electricity.

The proposed college development is characterised by a low base load heat demand; hence the use of CHP is not considered appropriate. Furthermore, flue gases from the gas-fired CHP can lead to a reduction in local air quality.

District Heating

A district heating or cooling scheme comprises of a network of insulated pipes used to deliver heat or cooling, normally in the form of hot or chilled water from the point of production to an end user.

The feasibility of connecting to an existing district network has been investigated. The proposed project is located where no district heating schemes are currently operating in the district, therefore the project cannot connect to an existing district heating scheme.

No information has been found regarding any future plans for a new district heating network within or nearby the site.

3.5 Low & Zero Carbon Technologies – 'Be Green'

Air Source Heat Pumps

Air source heat pumps exchange heat between the outside air and a building to provide space heating in winter and cooling in the summer months. The efficiency of these systems is inherently linked to the ambient air temperatures.

Heat pumps supply more energy than they consume, by extracting heat from their surroundings. Heat pump systems can supply as much as 4kW of heat output for just 1kW of electrical energy input.

For the proposed development, where rooms are required to be mechanically ventilated (e.g. Main Hall, Dining and Social Space in the New Main Teaching Block), a very high efficiency integral air-source heat pump air handling unit (AHU), will be used. This system (Central AHU) will feature a heat recovery system by which all heat from the exhaust air is recovered from the building, by a plate heat exchanger before the heat pumps temper the supply air to the building, extracting any remaining heat from the exhaust air-stream, hence, increasing the overall efficiency of the system.

Domestic hot water will be provided via separate air source heat pumps.

These heat pump systems will enable significant emissions savings over a conventional gas boiler heating system, particularly when factoring in the decarbonisation of the electrical grid. Heat pumps can achieve seasonal efficiencies of around 300% - 400% compared to a gas boiler which is limited to around 97%.

Photovoltaics (PV)

A new Photo-voltaic (PV) array will be provided to the roof of the main building. This array in conjunction with the existing PV array on the Rostron building will be sized to meet the requirements for the Sustainability TA requirements. The existing Rostron PV array was commissioned in March 2013 and was originally a 38.5kWp system. Allowing for a 10% loss of performance since 2013, this is currently assumed to be ~35kWp system. The total NZCiO requirement is ~60.5kWp. Therefore, the new PV array will be ~25.5kWp.

A summary of the fixed building services inputs used for the 'Be Green' scenario can be found in **Appendix B**.

Other Technologies

Other technologies were considered, however are not considered appropriate for the development. These include:

- **Wind Turbines:** The output from wind turbines is highly sensitive to wind speed. Hence it is essential that turbines should be sited away from obstructions, with a clear exposure, or fetch, for the prevailing wind. The urban nature of the site means these are not considered appropriate for this development.
- **Biomass:** Biomass in the form of logs, wood chips and wood pellets are classified as a renewable source of energy since the carbon dioxide emitted when the biomass is burned has been taken out of the atmosphere by the growing plants. Even allowing for emissions of carbon dioxide in planting, harvesting, processing, and transporting the fuel they will typically reduce net CO_2 emissions by over 90%. However, biomass boilers and their associated NOx emissions would be detrimental to local air quality and are therefore are not considered appropriate for this development.
- **Solar Thermal:** Solar thermal collectors utilise solar radiation to heat water for use in buildings. Solar collectors are typically designed to meet a development's base heat load, associated with its domestic hot water requirements. However, the complexities involving the integration of pipework as well as the limited available roof space (where most of the roof space will be utilised for the PVs) means that solar thermal collectors are not recommended for the development.

3.6 Proposed Energy Strategy

3.6.1 New Block – Predicted CO_2 Emissions (Part L)

	Carbon Dioxide Emissions for Non-Domestic Buildings (Tonnes CO_2 per annum)	
	Regulated	**Unregulated**
Baseline: Part L 2013 of the Building Regulations Compliant Development	87	14.7
After energy demand reduction	72	14.7
After efficient plant/lighting systems	66	14.7
After renewable energy	41	14.7

Table 3-4 CO_2 Emissions Summary (Part L)

	Regulated Non-Domestic Carbon Dioxide Savings	
	(Tonnes CO_2 per annum)	**(%)**
Savings from energy demand reduction	14.6	17%
Savings from efficient plant/lighting systems	6.5	7%
Savings from renewable energy	25.0	29%
Cumulative on-site savings	46.1	53%

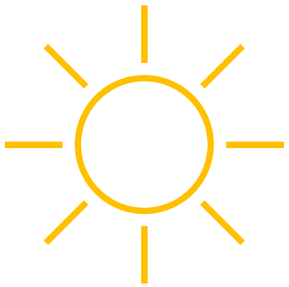
Table 3-5 CO_2 Emissions Savings (Part L)

4.0

Health & Wellbeing

4.0 Health & Wellbeing

4.1 Daylight



Good daylight is an important factor in moderating people's circadian rhythm, which enhances productivity and regulates the sleep cycle. It is also a key factor in reducing energy consumption from artificial lighting.

Daylight performance for the New Main Block and the Infill Building has been assessed against the criteria set out in Technical Annex 2E[4].The elevations have been established using a balanced approach to glazing to ensure that all windows within elevations are providing maximum daylight for bright and airy spaces, whilst simultaneously limiting heat gains entering the teaching areas during hot summer days. Solar gains are to be primarily limited through the specification of solar control glazing with a lower g-value of around 0.3-0.4 (depending on location).

Shallow floor plan depths enable occupants to have access to a view out, which is important in allowing the eyes to refocus after periods of deep focus.

Glare control measures such as blinds will allow occupants to regulate their own internal daylight conditions in line with their preferences.

4.2 Thermal Comfort

As climate change leads to rising summer temperatures, maintaining acceptable temperatures in occupied spaces is fundamental to creating productive, healthy & safe places for people to live and work. Maintaining good thermal comfort has been central to the project's shading, ventilation & cooling strategy.

Heat has been limited from entering the building through careful consideration of glazing. This must be balanced with a need for good daylight and utilisation of beneficial solar gain in winter. This requires careful consideration of the use of shading and solar control glass.

The specification of LED lighting equipment also reduces internal heat generation.

Adaptive thermal comfort calculations have been carried out for the New Main Block and Infill Building in accordance with the BB101[5] and CIBSE TM52 criteria.

4.3 Air Quality

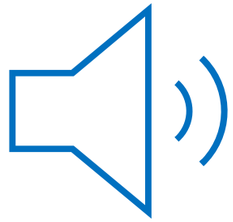
The development proposal will not include the installation of any combustion plant for the purposes of generating heat or hot water. This will be entirely electric, therefore will not create any adverse affect on the local air quality for the College and neighbouring properties.

To maintain good internal air quality, internal finishes will be specified which have low emissions of VOCs and other harmful pollutants, complying with BB101[5] and Technical Annex 2D[6] technical requirements.

An air quality assessment[7] (779108-66201561-SWE-ZZ-XX-RP-J-0004 C01) highlights that pollutant concentrations of NO_2 and particulate matter will not exceed, or approach the exceedance of, the respective long term or short-term Air Quality Objectives (AQOs).

Furthermore, it was determined as part of the review that local transport and industrial emissions pose a negligible risk across the site. As such, no mitigation measures are proposed with regards to protecting the future occupants of the site from adverse air quality impacts. Best practice mitigation measures in line with West Yorkshire's Air Quality TPG have been proposed for inclusion within the development proposals.

4.4 Acoustics



Acoustic comfort is important for occupant productivity, relaxation and rest. High noise levels which hinder this can have a range of adverse effects on people's mental and physical health. This is particularly important in schools.

This has been considered when developing the site's natural ventilation and HVAC strategy. For more details refer to the Noise Impact Assessment Report[8]. The results of the noise survey are summarised in the table below.

Period	$L_{Aeq,15\ mins}$	$L_{A90,15\ mins}$
Daytime (07:00 – 23:00 hours)	44 – 55	38 – 51
College hours (08:00 – 16:45 hours)	49 – 55	45 – 51
Night-time (23:00 –| 07:00 hours)	41 – 53	35 – 44

Table 4-1 Summary of measured noise levels

Based on an analysis of the measured noise levels as part of Apex Acoustics' measurements carried out on 15th March 2021, it was concluded that incident noise levels at southern and eastern facades proposed for the new teaching block due to road traffic on Greenhead Road and Park Avenue are predicted to be 50 – 55 dB LAeq,T.

The report concludes that, with the recommended mitigation measures identified in place, the calculated noise levels are below noise limits proposed to meet the identified requirements, and therefore comply with the aims of the NPPF and anticipated requirements of the Local Authority.

[4] DfE, 2020. *Output Specification, Technical Annex 2E: Daylight and Electric Lighting*. May 2020

[5] ESFA, 2018. *Building Bulletin 101: Guidelines on ventilation, thermal comfort and indoor air quality in schools*. Version 1, August 2018.

[6] DfE, 2020. *Output Specification, Technical Annex 2D: Internal Elements and Finishes*. November 2020 Update.

[7] Mace Limited,. *Air Quality Investigation Survey*. September 2021

[8] Apex Acoustics, 2021. *Greenhead College, Kirklees. Noise Impact Assessment*. Report No: NE8659-APX-ZZ-ZZ-RP-YA-0002. August 2021.

5.0

Water

5.0 Water

5.1 Flood Risk and Drainage

Please refer to Cundall's Flood Risk Assessment (FRA) report (NE8659-CCS-ZZ-XX-RT-D-0001) for full details. The below provides a summary of the key points from the analysis.

All forms of flood risk to and from the proposed development have been considered. These include tidal, fluvial, existing sewers, proposed drainage, overland, infrastructure failure and groundwater and have all been assessed as low risk.

The FRA has been prepared in accordance with the National Planning Policy Framework (NPPF). The proposed development is located in National Flood Zone 1 land; classified as having low risk of flooding from rivers or the sea. The site has no existing record of flooding incidents.

The development is deemed acceptable from a flood risk perspective. The vulnerability classification is compatible with the flood zone in accordance with government guidance.

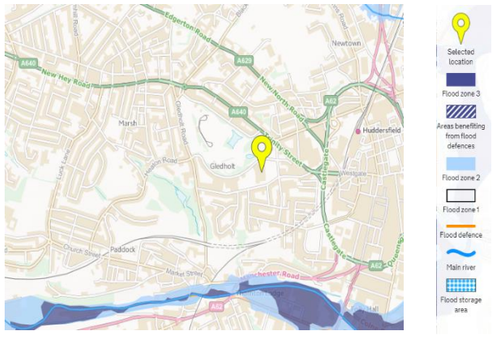


Figure 5-1 Flood risk to site (Source: flood map for planning)

In terms of drainage please refer to Cundall's Drainage Strategy Report (NE8659-CCS-ZZ-XX-RT-D-0002). This states that all new drainage for the development will be designed and installed in accordance with the following British Standards and codes of practice and building control documents:

BS EN 752 – Drain and Sewer Systems Outside Buildings; and • Building Regulations Part H – Drainage and waste disposal.

SuDS techniques selected for the site comprise of a green roof, permeable paving and geocellular storage.

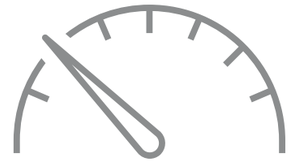
5.2 Water Efficiency

Water consumption in the UK has risen by 70% over the last 30 years. Trying to meet the increasing demand by locating new sources of water supply is both expensive and damaging to the environment. Therefore, the design team have focused on reducing the demand for water and managing the existing resources.

The following water saving measures are being considered for the new college buildings:

- ***Dual Flush Cisterns on WC's*** - It is proposed that these are used throughout the development in order to minimise water consumption.
- ***Flow Restrictors to Taps*** - Flow restrictors reduce the volume of water discharging from the tap. Spray taps have a similar effect and are recommended to reduce both hot and cold-water consumption.
- ***Low Flow Showers -*** The average shower uses 15 litres of water a minute, however by restricting the output of any showers in the development to a lower rate, a significant water saving can be achieved. Flow rates can be reduced to 6 litres/ minute without compromising on water pressure and hence will be considered as the design develops.

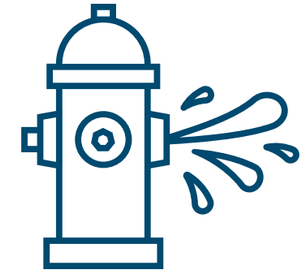
5.3 Water Monitoring



In 2017, approximately 5.3 billion cubic meters of water were abstracted for public water supply, making up over half of all water abstracted in the UK. To reduce this figure, accurate information on usage is required for management of a building's consumption.

Water meters will be specified on the main supply for the Main Block and Infill building and sub-metering will be provided for the Kitchen in the Main Block.

5.4 Leak Prevention and Detection



To minimise the risks of major water leaks occurring, a water leak detection system will be installed. The flow-rate of the incoming water meter will be monitored by a leak detection system, which will highlight when there is a significant rise in water consumption, indicating a major leak within the building.

The leak detection system can be standalone or can be integrated within the Building Management System (BMS). It will feature programmable thresholds to suit the specific consumption of the building and an audible alarm if those thresholds are exceeded. It will also be designed to avoid false alarms by normal operation of large water consuming plant.

6.0

Materials

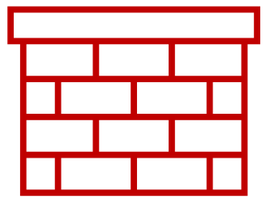
6.0 Materials

6.1 Responsible Sourcing & Procurement

All timber used for basic or finishing building elements in the scheme should be sourced from responsibly managed and sustainable forests or plantations using certified FSC or PEFC sources. Such timber products are the only truly renewable construction material in common use and the responsible management of forests for timber helps to lock in CO_2. By maximising the use of timber the embodied carbon impact of the development can be reduced.

The development recognises the importance of using locally sourced materials, which it will aim to consider throughout the design. Preference will be given to locally sourced materials wherever practical. Materials will be sourced from reasonable sources where possible, with reference being made to relevant industry standards including ISO 14001 and BES 6001.

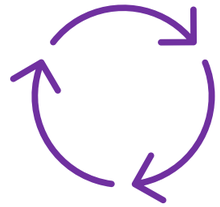
6.2 Durability and Resilience



In order to ensure the longevity of the materials used in the building construction and avoid the need for replacement, durability & protection measures will be specified where appropriate. This will prevent damage to vulnerable parts of the building, such as high pedestrian traffic areas, and areas with internal vehicle movement or which could be sensitive to external vehicular collision.

The building elements will also be designed to incorporate appropriate measures to limit material degradation due to environmental factors. This includes degradation due to factors such as temperature variation, water/moisture damage, pollutants etc.

6.3 Material Efficiency



Material use will be reduced or optimised through design, specification and construction techniques. Targets will be set and monitored throughout the construction process to achieve the objective. This is to reduce the environmental impact through optimising the use of materials during all stages of the project.

Please note that an embodied carbon calculation will be undertaken for the proposed development following receipt of the required information including a detailed cost plan.

6.4 Healthy Materials

VOCs are emitted by a wide array of products numbering in the thousands. Examples include paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials, furnishings, adhesives, Urea-formaldehyde foam insulation (UFFI), pressed wood products (hardwood plywood wall panelling, particleboard, fibreboard) and furniture made with these pressed wood products.

Volatile organic compounds (VOCs) are emitted as gases (commonly referred to as off-gassing) from certain solids or liquids such as construction materials and internal finishes and fittings. VOCs include a variety of chemicals, some of which are known to have short-term and long-term adverse health effects. Concentrations of many VOCs are consistently higher indoors (up to ten times higher) than outdoors.

'No' or 'low' VOC paints are available from most standard mainstream paint manufacturers. The 'eco-friendly' paints are made from organic plant sources and powdered milk-based products.

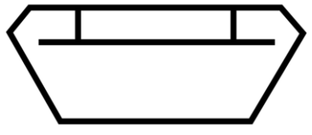
The design team will select internal finishes and fittings with low or no emissions of VOCs and comply with BB101 guidance and Technical Annex 2D requirements.

7.0

Waste

7.0 Waste

7.1 Construction Waste Management



During the construction phase, a large amount of waste material will be generated through construction, demolition and land clearing procedures. In building construction, the primary waste products (in typical descending proportions) are wood, asphalt/concrete/masonry, drywall, roofing, metals, and paper products.

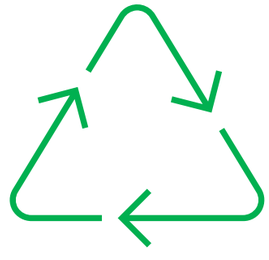
The contractor will be expected to monitor and report on their site activities to reduce the impact of the construction process.

This may include, for example:

- Monitoring, reporting and setting targets for CO_2 or energy usage arising from site activities;
- Monitoring, reporting and setting targets for CO_2 or energy usage arising from transport of materials to and from site;
- Monitoring, reporting and setting targets for water consumption arising from site activities;
- Monitoring construction waste on site, sorting and recycling construction waste where applicable;
- Adopting best practice policies in respect of air and water pollution arising from site activities;
- Operating Environmental Management Systems.

A Site Waste Management Plan will also be utilised by the Contractor.

7.2 Operational Waste



The detailed design phases will identify potential waste streams from the operational development. The development will have the facilities to handle the separation, storage and collection of common recyclable materials such as paper, glass, plastics and metals. These points will be easily accessible and clearly labelled to ensure that recycling is as simple as possible for students, staff and visitors to the site.

Storage of this waste will be clearly labelled and within easy reach of the buildings. Vehicular access will be provided to facilitate collections. Colour coding will be consistent throughout the College to ensure clarity for all users.

8.0

Conclusion

8.0 Conclusions

The Greenhead College redevelopment energy and sustainability approach is aligned with Kirklees Council's planning requirements and the DfE's sustainability requirements.

The energy strategy has been developed to meet the NZCiO target outlined in the project brief by following the energy hierarchy: Be Lean, Be Clean and Be Green.

- 'Be Lean' - **Energy demand** will be reduced by achieving a well-insulated envelope which is both airtight and thermal bridge free. High performance glazing provides a positive energy balance whilst mixed mode ventilation maintains good air quality with minimal heat loss.
- 'Be Clean' - **Energy efficient** building systems such as LED lighting and low-power fans and pumps will drive down regulated energy use. Robust quality control, commissioning and handover procedures on site will further drive down energy use. Combined heat & power was considered however this has been discounted due to a poor base load and a desire to avoid on-site combustion of fossil fuels. Connection to a district heating scheme was also considered however there are no suitable existing networks to connect into. The use of a lower temperature air source heat pump system throughout the building via multiple distribution systems (UFH, radiators and heating coils) will help to ensure an element of future-proofing for the development.
- 'Be Green' - The remaining energy demand will be met through l**ow and zero carbon** energy sources. The development's heating, cooling and hot water needs will be met through efficient air-source heat pumps, and a PV array will be provided on the roof of the main building.

Through the above measures, the development achieves the required carbon emissions reduction as outlined in Building regulations Part L2A while also achieving the NZCiO operational energy targets.

In line with Output Specifications and BB101 requirements, other sustainability measures include:

- **Good daylight** will be achieved in occupied spaces through the balanced and considered use of glazing. High performance glazing with solar control will reduce energy loss.
- Mixed-mode ventilation will be used in all teaching spaces and perimeter study areas to maintain **thermal comfort**. The ventilation units will be used to maintain a consistent supply of filtered fresh air to maintain good **indoor air quality**. Low VOC materials and finishes will minimise internal sources of pollutants.
- **Water efficient** fixtures and fittings will be specified to reduce water consumption below the levels required for national building regulations.
- **Metering and sub-metering** of consumption will enable ongoing, targeted reductions in energy and water usage on-site.
- All **timber** used in the project should be from a responsible or sustainable source, using certified FSC or PEFC sources.
- To ensure **responsible and sustainable procurement**, materials will be specified in line with a documented sustainable procurement plan. This will the include the use of certification schemes such as ISO14001 and BES 6001.
- Materials that are **durable and resilient** will be specified to maximise their life-span and avoid the need for disposal and replacement.
- Appropriate and accessible **waste facilities** will be provided to encourage occupants to recycle waste effectively.
- The proposed servicing strategy for the provision of heating and hot water will be from **electrical solutions** eliminating the requirement for the use of fossil fuels which would be detrimental to **local air quality.**
- Responsible **construction practices** should be adopted to reduce resource use and the impact of noise, dust and pollution.

9.0

Appendices

Appendix A Kirklees Council Climate Change Statement

Part 1: Applicant details

Name of applicant/agent	Galliford Try Building Ltd. c/o Avison Young (UK) Ltd.
Site Address	Greenhead College Greenhead Rd Huddersfield HD1 4ES
Description of Development	Part redevelopment of Greenhead College, including part demolition and making good, new 4 storey building and new 2 storey courtyard infill building, relocated car parking and revised site access arrangements, reconfiguration of sports provision, and associated landscaping.

Part 2: Climate Change Mitigation measures

Please respond to the following questions considering the measures set out in the Climate Change Guidance note:

Q1: What measures have been/will be taken to reduce the energy demand associated with your proposed development beyond the minimum required in Building Regulations? (See section 2)

Metering

Enhanced metering and sub metering to that required by Part L 2013 building regulations for monitoring and targeting purposes will be as standard. Sub-metering to allow areas of the building used for out of hour's activities to be metered. Sub-metering to separate teaching zones, kitchens, IT servers and external lighting will be employed to monitor usage and sub-metering to lighting/small power distribution panels to each area. A metering data collection system utilising the BEMS to ensure quality real time data is available to the proposed monitoring and targeting system the meters will be linked back to a central BMS panel within the energy centre so that all primary energy use on site can be monitored centrally.

Lighting

The selection of efficient luminaries will help reduce overall energy use. A mix of high efficiency LED lighting typically >90 lamp lumens per circuit watt will be provided.

All external lighting within the development will be provided by dedicated energy efficient LED fittings. All security light fittings will be designed for energy efficiency and will be adequately controlled such that all burglar security lights have a maximum wattage of 150W.

Heating & DHW

LTHW will be generated using high efficiency air-source heat pumps (ASHP's); with a SCOP of >3.0 will generate LTHW up to 50°C, but will be variable temperature, direct acting weather compensated, with flow and return temperature set-points modulated depending upon external air temperature.

Separate ASHP's generating LTHW at a higher temperature of 70°C will be provided to serve the Domestic Hot Water generator with a SCOP >2.0.

The ASHP heating system will provide the ability to zone individual areas to allow for out-of-hours use to avoid running the whole building all the time.

Ventilation

The building is designed to maximise natural ventilation to reduce the time required for mechanical ventilation and avoid the need for summer cooling.

Perimeter teaching spaces utilise a mixed mode ventilation approach with low energy fans providing ventilation in the winter and peak summer.

Areas served by solely mechanical ventilation will be served from a central AHU with high efficiency heat recovery capability.

Areas served with air conditioning will be high efficiency R32 split systems with cooling SEER > 3.5 and heating SCOP > 3.

Pumps

Pumps will provide variable volume fitted with variable speed drives.

Operation

Handover documentation will be provided in form of a logbook to CIBSE TM31 standard, providing users information on their energy efficient system. The contractor will work with the College to ensure that energy efficient white goods are specified for installation on the development.

Please refer to Cundall's Energy & Sustainability Strategy report (GSF-CDL-XX-XX-RP-SY-70223) for full details.

Q2: What measures have been/will be taken to limit the carbon consumed through the implementation and construction processes, e.g. by reusing existing on-site materials or sourcing materials locally? (See section 3)

The contractor will be expected to monitor and report on their site activities to reduce the impact of the construction process.

This may include, for example:

- Monitoring, reporting and setting targets for CO_2 or energy usage arising from site activities;
- Monitoring, reporting and setting targets for CO_2 or energy usage arising from transport of materials to and from site;
- Monitoring, reporting and setting targets for water consumption arising from site activities;
- Monitoring construction waste on site, sorting and recycling construction waste where applicable;

- Adopting best practice policies in respect of air and water pollution arising from site activities;
- Operating Environmental Management Systems.

A Site Waste Management Plan will also be utilised by the Contractor.

Q3: What measures have been/will be taken to utilise renewable or low carbon energy sources? (See section 4)

Net zero carbon (NZC) emission calculations have determined the amount of energy to be offset to achieve NZCiO, thus a Bauder bio–Solar PV array is proposed on this scheme located on the new main building roof to offset the annual energy usage.

The development will also be served by highly efficient air source heat pumps to provide heating and hot water.

Q4: What measures have been/will be taken to ensure the building design and layout has been optimised to energy efficiency beyond the minimum requirements in Part L of the Building Regulations? (See section 5)

The new college buildings have been modelled with various locations considered.

The orientation of the proposed 4 storey building has main elevations facing almost true north, east, south and west. To the east and south a high degree of vegetation and mature trees as well as the sloping ground provides good passive design principles. To the west, the proximity of the existing main building will also provide a degree of passive shading to the lower two levels of the building.

The internal layout utilises natural light with penetrating roof opening lightwells to central spaces, with ventilation openings to adjacent spaces allowing for natural ventilation via stack effect.

Teaching spaces on the top level contain roof openings to utilise natural ventilation.

Teaching spaces are predominantly on the perimeter to optimise the use of natural daylight and natural ventilation. To optimise energy efficiency, glazing size and performance is optimised on each orientation to allow maximum daylight without causing overheating or energy issues.

The thermal envelope of the building uses passive design strategies with a high performing façade to reduce energy consumption and increase thermal comfort, as follows;

Floor (U-Value)	0.12 W/m^{2}K
External Wall (U-Value)	0.15 W/m^{2}K
Roof (U-Value)	0.12 W/m^{2}K
Windows (U-Value)	1.1 – 1.3 W/m^{2}K
Air permeability @ 50 Pascals	3 m^3/h/m^2

Where artificial lighting is used, lighting controls will further reduce energy consumption utilising detecting control devices (PIR) and daylight sensors.

Q5: What measures have been/will be taken to reduce potential impacts of flooding associated with your proposed development? (See section 6)

In terms of drainage please refer to Cundall's Drainage Strategy Report (NE8659-CCS-ZZ-XX-RT-D-0002). This states that all new drainage for the development will be designed and installed in accordance with the following British Standards and codes of practice and building control documents:

BS EN 752 – Drain and Sewer Systems Outside Buildings; and Building Regulations Part H – Drainage and waste disposal.

SuDS techniques selected for the site comprise of a green roof, permeable paving and geocellular storage. The proposal is to restrict storm water flows to 149l/s for storms up to 1 in 100 year +30% climate change allowance.

Please also refer to Cundall's Flood Risk Assessment report (NE8659-CCS-ZZ-XX-RT-D-0001).

Q6: What measures have been/will be taken to reduce water stress associated with your proposed development? (e.g. Water retention and minimisation measures) (See sections 7 and 8)

Low flow fittings are utilised to reduce water consumption, showers should not exceed 6l/minute and low basins should not exceed 4l/minute.

Q7: What measures have been/will be taken to provide biodiversity net gains? (See section 8)

A solar green roof will be installed on the roof of the new building to increase biodiversity.

The planting strategy for the site includes the addition of proposed:

- Ornamental planting
- Wildflower planting
- Woodland Planting
- Trees

A summary of these measures are included on the Landscape Architects' planting strategy drawing (NE8659-OOB-ZZ-00-DR-L-0030).

As set out in the Ecological Impact Assessment report prepared by Brooks Ecological (ER-5303-01) the scheme will deliver a Biodiversity Net Gain when measured against the Defra Metric 3.0.

Q8: What measures have been/will be taken to reduce air pollution associated with your proposed development? (See section 9)

Heating will be primarily generated from ASHP, avoiding the use of gas fired boilers that increase local air pollution.

Gas isn't utilised in the catering areas, instead using electric induction hobs.

All kitchen exhaust air shall be ducted directly to roof level where it will be exhausted away from adjacent air intakes to mitigate risk of cross contamination of air streams. There will be no adverse impacts on the operational College or on nearby residential properties in terms of air quality or noise.

During the construction phase, Galliford Try will implement a Dust Management Plan to mitigate any adverse air quality impacts arising from building demolition / construction.

Appendix B Services Input

The tables below provide a summary of the fixed building services inputs used for the 'Be Lean' and 'Be Green' scenarios of the development.

System Detail	
Ventilation:	
Ventilation strategy 1 - Atrium and ancillary circulation, Dining Area, Main Hall, Reception, Control Room, IT Store, Science Prep and internal offices, staffworks and study areas	Central AHU
AHU SFP central (W/l/s)	1.6
Heat recovery type	Thermal Wheel
Heat recovery efficiency type	73%
Demand Control Ventilation	No
AHU leakage classification	Class L2
Ductwork leakage classification	Class A
Ventilation strategy 2 - General Classrooms, Science Laboratories, Social Spaces and Study Spaces	HVR
SFP(W/l/s)	0.1177
Heat recovery efficiency	42%
Ventilation strategy 3 - WCs, Hygiene Room and Cleaners' Stores	General Extract Only
WC Extract Flow Rates [ach]	10
Store Extract Flow Rates [ach]	6
Extract SFP [W/l/s]	0.5
Location	Remote from zone
Ventilation Strategy 4 -Kitchen spaces and serverys	Kitchen AHU
AHU SFP [W/l/s]	1.4
AHU HR Efficiency [%]	None
AHU Leakage Class	L2
Demand Control Ventilation	No
Ventilation Strategy 5 - Chemical Store and Server Room	Dedicated Extract Only
Server Room Extract Flow Rates [ach]	10
Chemical Store Extract Flow Rates [ach]	6
Extract SFP [W/l/s]	0.5
Location	Remote from zone
Ventilation Strategy 6 - Circulation, Stairwells and Kitchen Office	Natural Ventilation
Space Heating & Cooling:	
Space heating type 1 – Classrooms, Science, Social Spaces and Study Spaces	ASHP
Space heating emitters type 1	NVHR Units
Space heating fuel type 1	Electric
Space heating seasonal efficiency type 1 (%) (SCOP)	3.7
Space heating type 2 – Offices, Mezzanine Sixth Form Social Space, Study Area, Staff Workrooms, Reception, , Science Prep Rooms, Dining Area, Main Hall, WCs, Circulation, Student Services, Stairwells, Kitchen Office, Cleaning Stores and Hygiene Room	ASHP
Space heating emitters type 2	LTHW Radiators
Space heating fuel type 2	Electric
Space heating seasonal efficiency type 2 (%)	3.7
Space heating type 3 – 2003a Social Space (Sixth Form) and ancillary circulation	ASHP
Space heating emitters type 3	Underfloor Heating
Space heating fuel type 3	Electric
Space heating seasonal efficiency type 3 (%) (SCOP)	3.7
Space heating type 4 – Social Space 1B, Social Space 1C	Air Distribution – MVHR Heating Coil
Space heating seasonal efficiency type 4 (%) (SCOP)	3.7
Space heating type 5 – Kitchen and Servery Areas	Air Distribution – Kitchen AHU Heating Coil
Space heating seasonal efficiency type 5 (%) (SCOP)	3.7
Heating Strategy 6 - Control Room, Reprographics and Server Room	DX Units
Heating SCOP	3.50
Cooling SEER / EER	4.00 / 3.00
Domestic Hot Water (DHW):	
DHW heating type	ASHP
DHW heating fuel type	Electricity
DHW heating seasonal efficiency (%)	250
DHW heating estimated losses (kWh/l/day)	0.0047
Lighting:	
Luminaire efficacies (Lm/cW)	110
Lighting controls – Teaching spaces, study areas, social spaces, staff workrooms, offices, Atrium, Main Hall, Reprographics, General IT Store, Staff Workroom and Staff Workroom	Man on / man off
Lighting controls – WCs, Stores, Circulation, Reception, Stairwells, Control Room, Hygiene Room and Server Room	Auto on / auto off
Lighting controls – Plant Rooms, Kitchen areas and servers	Manual
Daylight dimming – perimeter teaching spaces, study areas and offices	Yes
Time Switch (photoelectric / occupancy)	Yes / Yes
Parasitic power (photoelectric / occupancy)	0.1 / 0.1
Other:	
Pump speed	Variable Speed - Multiple pressure sensors -
HVAC systems metering	Yes
HVAC systems out of range warning	Yes
Lighting systems metering	Yes
Lighting systems out of range warning	No
Power factor correction	>0.95
PV Area (m²)	336.3
PV Efficiency (%)	20.6

Appendix C Design BRUKL & Draft EPC

Design Stage BRUKL

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

New Block — As designed

Date: Wed Sep 01 11:47:21 2021

Administrative information

Building Details

Address: New Block, HUDDERSFIELD, HD1 4ES

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: Cundall
Telephone number: Phone
Address: Exchange Place, 1 Semple Street, Edinburgh, EH3 8BL

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	16.5
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	16.5
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	7.7
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	$U_{k\text{-}Limit}$	$U_{k\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.15	0.15	00000014:Surf[1]
Floor	0.25	0.12	0.12	00000014:Surf[14]
Roof	0.25	0.12	0.12	00000018:Surf[3]
Windows***, roof windows, and rooflights	2.2	1.17	1.2	00000003:Surf[1]
Personnel doors	2.2	2.09	2.2	00000014:Surf[0]
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

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

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	5176	5176
External area [m^2]	5680.7	5680.7
Weather	LEE	LEE
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	2200.48	2830.27
Average U-value [W/m^2K]	0.39	0.5
Alpha value* [%]	9.64	10

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

Building Use

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

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

	Actual	Notional
Heating	1.99	4
Cooling	0.32	0.19
Auxiliary	6.41	7.08
Lighting	8.88	17.79
Hot water	6.42	3.51
Equipment*	28.39	28.39
TOTAL**	**24.03**	**32.56**

* 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	9.17	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	26.02	39.4
Primary energy* [kWh/m^2]	73.76	97.47
Total emissions [kg/m^2]	7.7	16.5

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

Draft EPC

Energy Performance Certificate

HM Government

Non-Domestic Building

New Block
Greenhead College
Greenhead Road
HUDDERSFIELD
HD1 4ES

Certificate Reference Number:
8515-8505-9970-7269-8649

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

Energy Performance Asset Rating

More energy efficient

A+ Net zero CO_2 emissions

A 0-25
B 26-50
C 51-75
D 76-100
E 101-125
F 126-150
G Over 150

15 This is how energy efficient the building is.

Less energy efficient

Technical information

Main heating fuel:	Grid Supplied Electricity
Building environment:	Heating and Mechanical Ventilation
Total useful floor area (m^2):	5175.947
Building complexity:	Level 5
Building emission rate ($kgCO_2/m^2$ per year):	7.71
Primary energy use (kWh/m^2 per year):	73.76

Benchmarks

Buildings similar to this one could have ratings as follows:

32 If newly built

86 If typical of the existing stock

Cundall Johnston & Partners LLP
Exchange Place One 1 Semple Street Edinburgh EH3 8BL Scotland United Kingdom
Tel:+44 (0)131 524 3500
Asia Australia Europe MENA UK and Ireland
www.cundall.com

ONE PLANET LIVING | An initiative by Bioregional