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Energy Statement

Stanbridge Park, Staplefield

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I) TABLE OF REVISION

Revision	Originator	Approved	Date	Description
P01	V. Coldicott	J. Ong	22.02.2024	Draft
P01	V.Coldicott	J.Ong	12.03.2024	

II) TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

The following energy statement is specific to Stanbridge Park, Staplefield as part of the proposed redevelopment of Stanbridge Park in Staplefield, described in greater detail in section 2.0.

The energy strategy for the proposed development has been assessed using the Be Lean, Be Clean, Be Green energy hierarchy, that focuses on a fabric first approach, using clean energy sources and LZC technologies.

Following this approach has resulted in an energy efficient scheme. It is proposed that the scheme utilises Air Source Heat Pump (ASHP) technology for heating and Photovoltaic Panels (PV) for onsite electricity generation, which achieves a 62% reduction in carbon emissions from the baseline model.

Table 1: Carbon emissions at each stage of energy hierarchy

	CO_2 Emissions ($kgCO_2/m^2annum$)	Reduction in CO_2 Emissions ($kgCO_2/m^2annum$)	Reduction from Baseline	Part L 2021 compliant
Lean	6.84	-	-	Fail
Clean	6.84	-	0%	Fail
Green	2.58	-	62%	Pass

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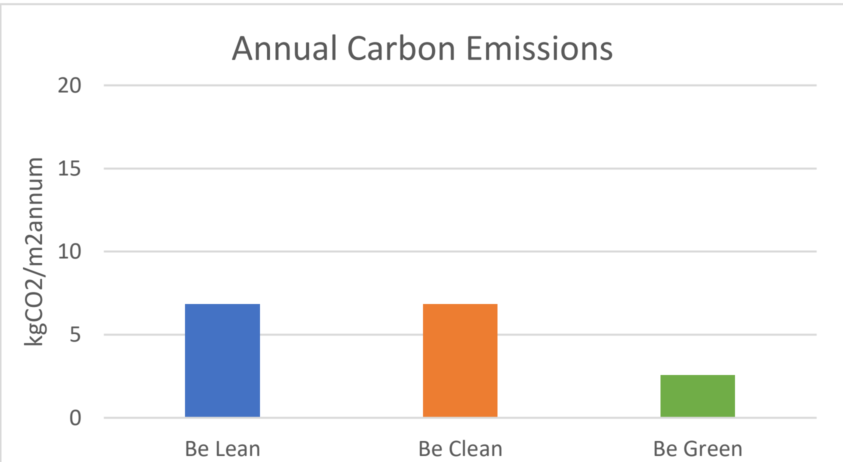

Figure 1 - Graph showing the modelled reduction of CO2 emissions for each stage

As the proposed Stanbridge Park exceeds the requirements of Building Regulations Part L 2021, which is already 27% more stringent than Part L 2013. Mid Sussex District Council Policy requires that the Building regulations targets are met as a minimum and consideration of exceeding these should be taken, ideally using a mix of renewable and low carbon technologies where appropriate. The TER for the chosen solution is 3.41

kg.CO_2/m^2.annum with an improvement of 24% over the Building Regulations demonstrated by a BER of 2.58 kg.CO_2/m^2.annum

2.0 INTRODUCTION

Delta Green have been appointed to provide an energy statement during the concept design stage for the proposed redevelopment of Stanbridge Park in Staplefield.

The Energy Statement demonstrates the performance of the building design against Part L 2021 building regulations and investigates the potential options to improve energy efficiency, through passive design or efficient services. It incorporates a Low and Zero Carbon technologies (LZC) feasibility study to determine the most appropriate heat source for the building and look at how LZC can be best incorporated into the scheme. It evaluates the performance of building design against the local and national planning goals and in doing so demonstrates compliance with the guidelines set out by Mid Sussex District Council.

2.1 BACKGROUND

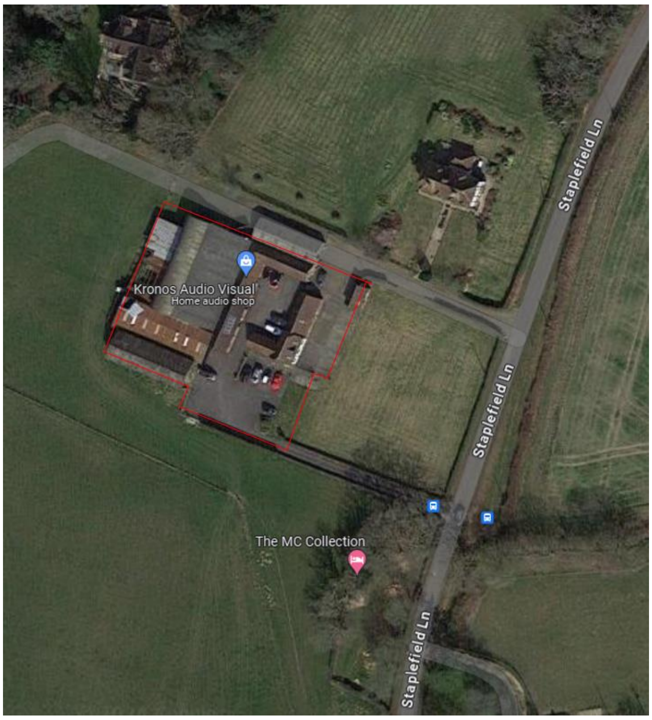

Figure 2: Location of Stanbridge Park, Staplefield

Stanbridge Park, Staplefield is a collection of former farm buildings, some of which are being developed as commercial units (Figure 2). This development is to construct a detached two storey office building in place of the existing agricultural building. The materials and design are in keeping with the rural setting, and the existing buildings. This report relates to the new development of the two storey office building, and the energy efficiency.

3.0 PLANNING POLICY

3.1 NATIONAL POLICY

The National Planning Policy Framework (NPPF), updated on 20th July 2021, sets out the government's planning policies for England and how these are expected to be applied and states that:

"The purpose of the planning system is to contribute to the achievement of sustainable development. At a very high level, the objective of sustainable development can be summarised as meeting the needs of the present without compromising the ability of future generations to meet their own needs.


Ministry of Housing, Communities & Local Government

National Planning Policy Framework

Consultation proposals

Achieving sustainable development means that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways:

1. *An economic objective*
2. *A social objective*
3. *An environmental objective*

*So that sustainable development is pursued in a positive way, at the heart of the Framework is "**a presumption in favour of sustainable development**."*

3.2 LOCAL POLICY –MID SUSSEX DISTRICT COUNCIL DISTRICTPLAN

The Mid Sussex District Plan is a significant document for the Council and residents of Mid Sussex and has been prepared in the context of the Localism Act and the National Planning Policy Framework. It will shape the future of Mid Sussex up to 2031, but providing a framework for new development, employment growth, infrastructure, and measures to ensure the protection of the countryside. The District Plan will also guide other planning documents, such as Neighbourhood Plans and Site Allocation Plans.

DP39: Sustainable Design and Construction

All development proposals must seek to improve the sustainability of development should, where appropriate and feasible according to the type and size of the development and location, incorporate the following measures:

- Minimise the energy use through the design and layout of the scheme including through the use of natural lighting and ventilation.
- Explore the opportunities for efficient energy supply through the use of communal heating networks where viable and feasible.
- Use renewable sources of energy.

- Maximise efficient use of resources including minimising waste and maximising recycling / reuse of materials through both construction and occupation.
- Limit water use to 110 litres/person/day in accordance with Policy DP42: Water Infrastructure and the Water Environment.
- Demonstrate how the risks associated with future climate change have been planned for as part of the layout of the scheme and design of its buildings to ensure its longer term resilience.

DP40: Renewable Energy Schemes

Strategic Objectives: 1) To promote development that makes the best use of resources and increases the sustainability of communities within Mid Sussex, and its ability to adapt to climate change.

Proposals for new renewable and low carbon energy projects (other than wind energy , including community-led schemes, will be permitted provided that any adverse local impacts can be made acceptable, with particular regard to:

• Landscape and visual impacts, including cumulative impacts, such as on the setting of the South Downs National Park and High Weald Area of Outstanding Natural Beauty, and the appearance of existing buildings;

• Ecology and biodiversity, including protected species, and designated and non-designated wildlife sites;

• Residential amenity including visual intrusion, air, dust, noise, odour, traffic generation, recreation and access.

3.3 BUILDING REGULATIONS PARL L

Building Regulations Part L 2021 came into effect in June 2022. These regulations have higher performance targets that result in an average 27% reduction in CO_2 emissions for non-domestic buildings over Part L 2013. By meeting the new requirements for Part L 2021 the building already demonstrates a significant reduction in carbon emissions over the previous requirements.

The proposed building design has been constructed within the IES Virtual Environment 2023 thermal modelling tool in order to assess the energy demand and thermal performance against Part L 2021 building regulations. IES VE complies with CIBSE AM11: Building Performance Modelling 2015 requirements. The assessment has been carried out using the Dynamic Simulation Method (DSM) calculation method and checked by an accredited non-domestic energy assessor.

4.0 ENERGY STRATEGY

4.1 CRITERIA

The energy strategy for the proposed development has been assessed using the Be Lean, Be Clean, Be Green criteria, which demonstrates improved fabric performance to reduce energy consumption, includes an investigation of networked heating systems and feasibility for low and zero carbon technologies (LZC).

"Be Lean" The first step focuses on passive design to reduce projected energy consumption, by improving insulation, reducing air leakage and maximising winter solar gain whilst ensuring shading naturally keeps the building cool in summer. Efficient building services are then applied to reduce energy consumption further. This includes adding energy efficient lighting with lighting controls to reduce the hours it is on, thermally efficient hot water storage and heat recovery for ventilation systems.

"Be Clean" The second stage is to supply energy efficiently by exploring options for connecting to heat networks or using a CHP to generate electricity whilst benefiting from the waste heat for heating or hot water.

"Be Green" Once other options have been maximised the final stage is to utilise Low and Zero Carbon technologies (LZC) to replace grid supplied electricity or fossil fuel consumption. Options explored include solar thermal panels, photovoltaic panels (PV), small scale wind turbines, ground source heat pumps (GSHP), air source heat pumps (ASHP) and biofuel boilers.

5.0 METHODOLOGY

5.1 THERMAL MODEL

The model has been created based on drawings and design information provided by LRA-R Architects on 30th January 2024. Images of the model showing each façade are shown in Figure 3, Figure 4 and Figure 5.

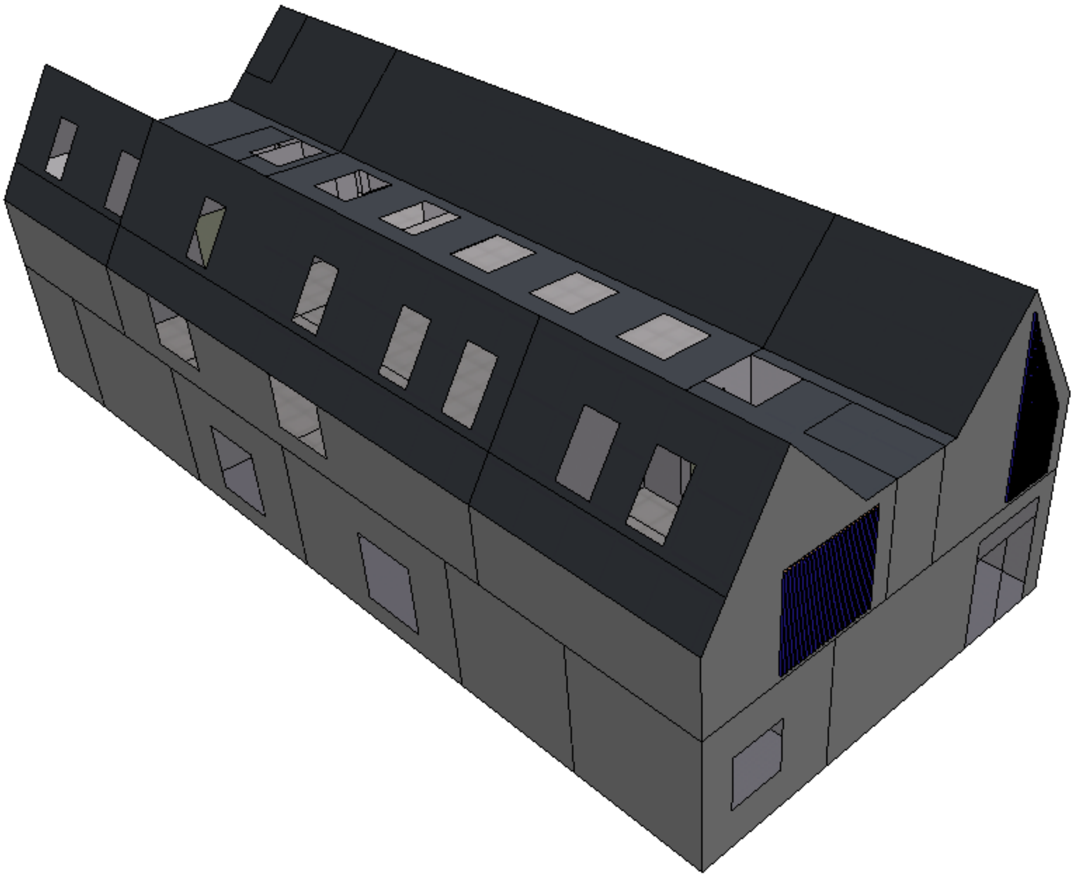

Figure 3: Northwest view of the model

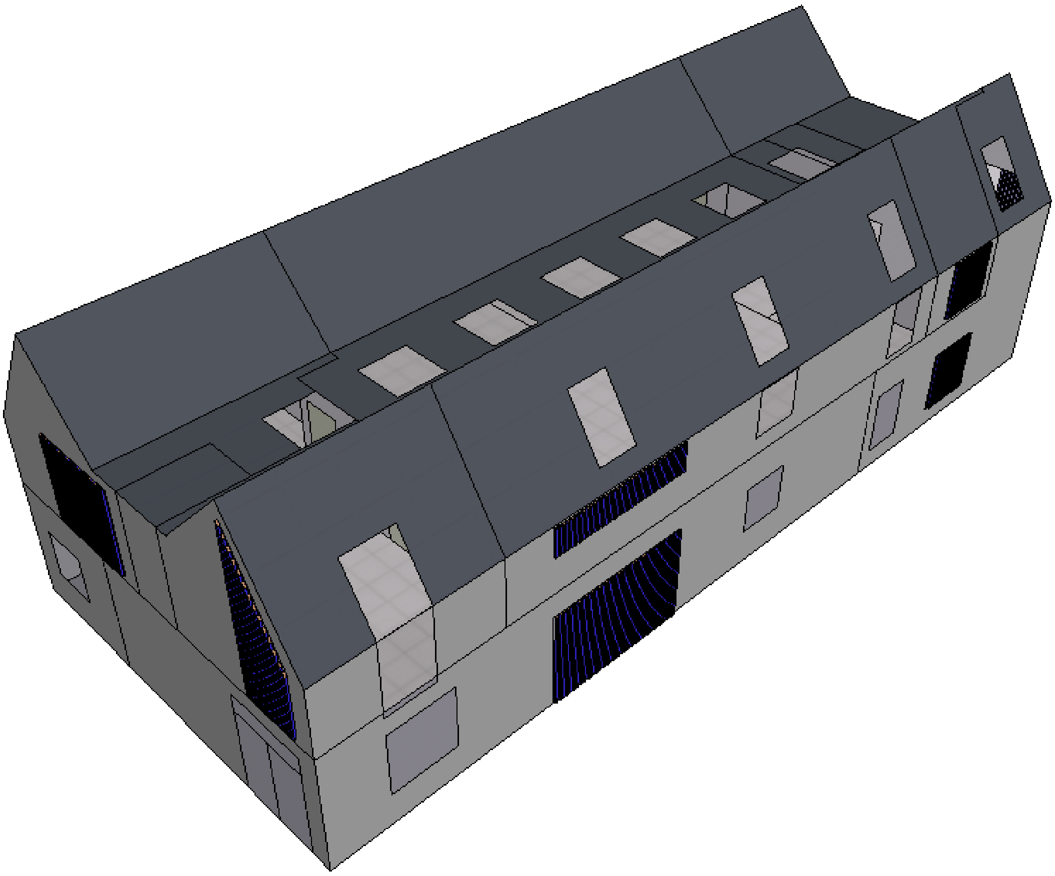

Figure 4: Southeast view of the model

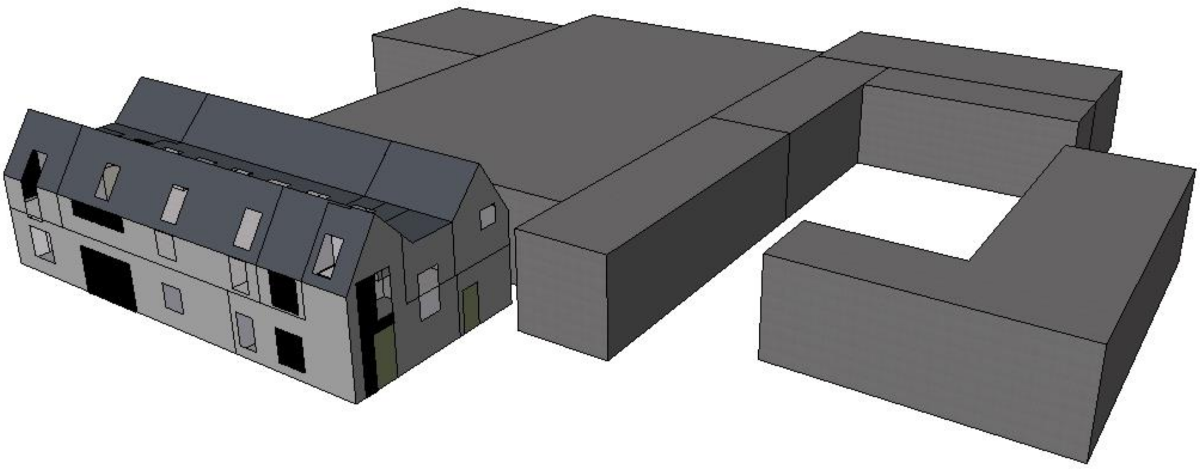

Figure 5: Southeast view of model with adjacent buildings

The blue areas represent slatted shade across some of the windows on the southern side of the building, as shown in Figure 6. This still allows daylight to penetrate but helps to reduce solar gain.

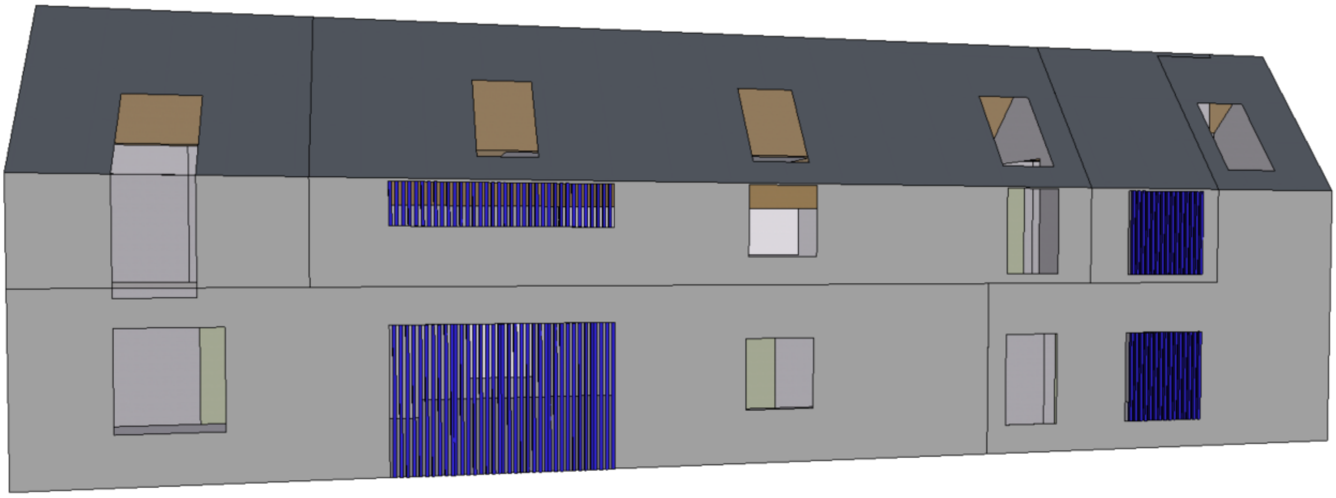

Figure 6: South view of model showing shade in front of windows

The NCM activities selected for the different rooms are shown in Figure 7 and Figure 8.

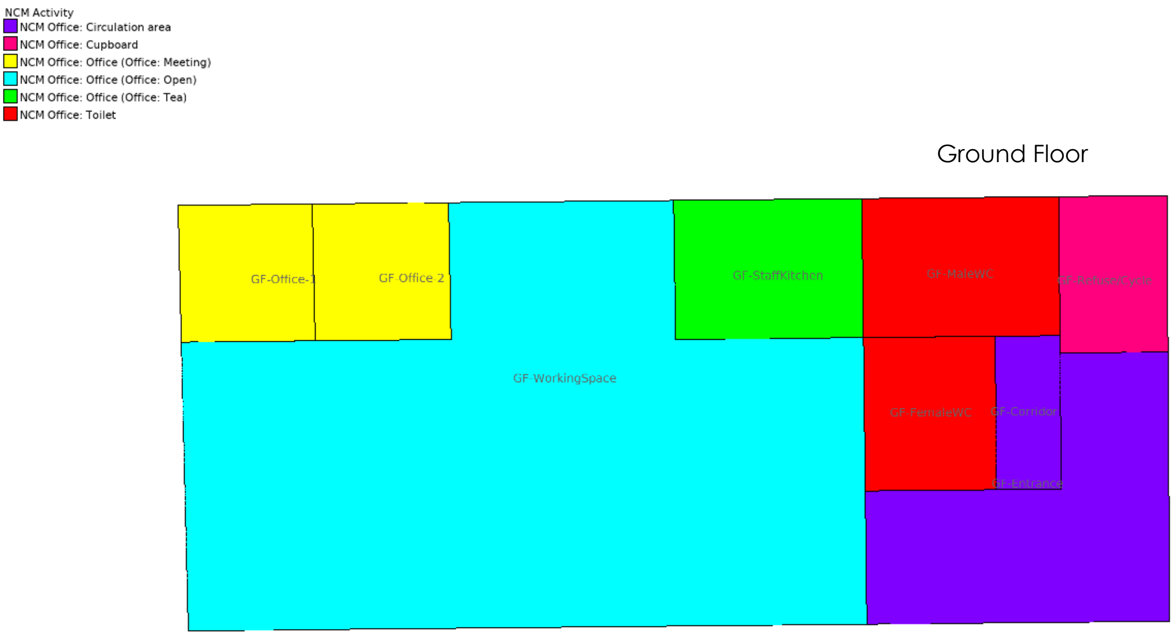

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Figure 7: Ground floor activities applied in the model

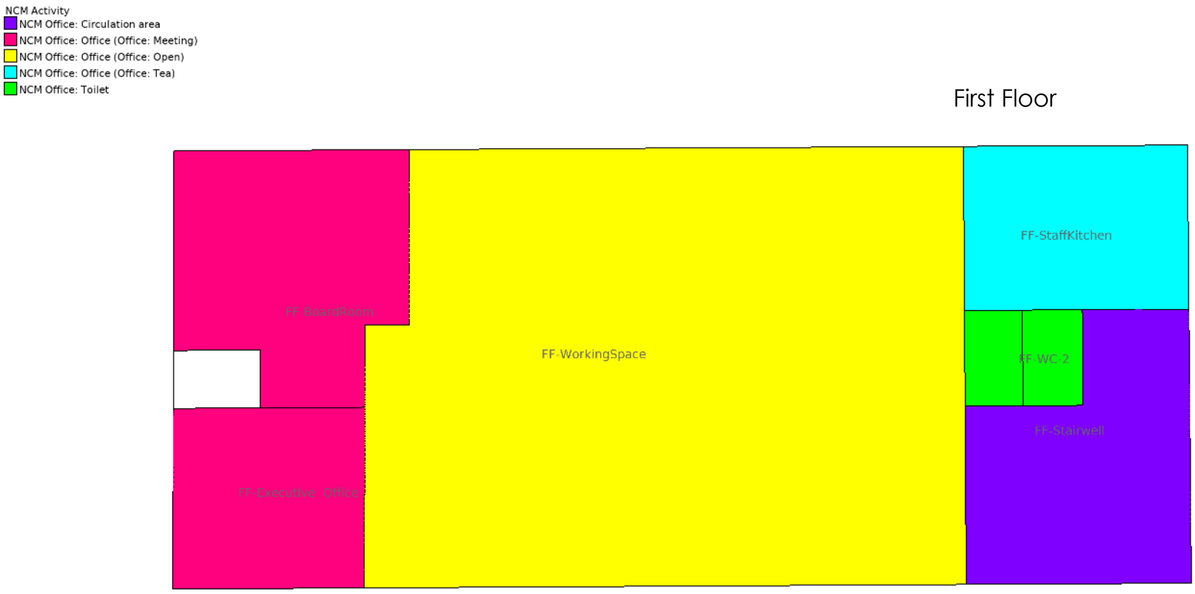

Figure 8: First floor activities applied in the model

5.2 CONSTRUCTIONS

The constructions applied in the building model are detailed in Table 2, along with the limiting factors within Part L 2021 Building Regulations. The building design is focused on a 'fabric first' approach and shows improvements to the thermal efficiency for all elements to reduce the heat loss as part of the passive design.

Table 2: U values of the building elements used in the model

Building Element	Target U value (W/m².K) / G value/frame factor	2021 Building Regulations limiting fabric parameters (W/m².K)
Ground Floor (concrete)	0.15	0.18
External walls (cladding lightweight)	0.18	0.26
Internal wall to cycle store	0.18	-
Internal floor to cycle store	0.15	-
Roof (pitched, composite lightweight)	0.15	0.18
Windows and glazed doors	1.4 / 0.40/ 20%	1.60
External Doors (non-glazed)	1.40	1.60
Roof Lights	2.00 / 0.55 / 15%	2.20

Air Permeability $m^3/hr.m^2$ @ 50Pa	5.0	8.0

The U values are demonstrated visually as they are applied to the building in Figure 9 and Figure 10.

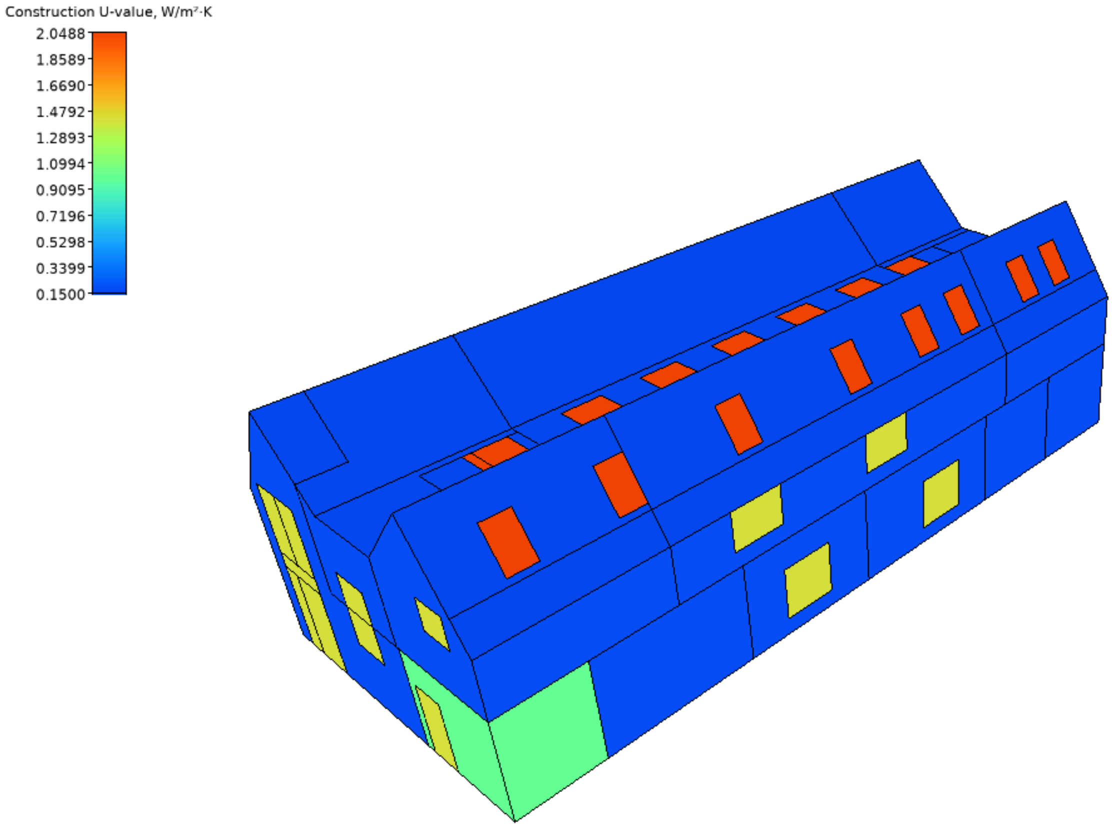

Figure 9: North view of U values applied in the model

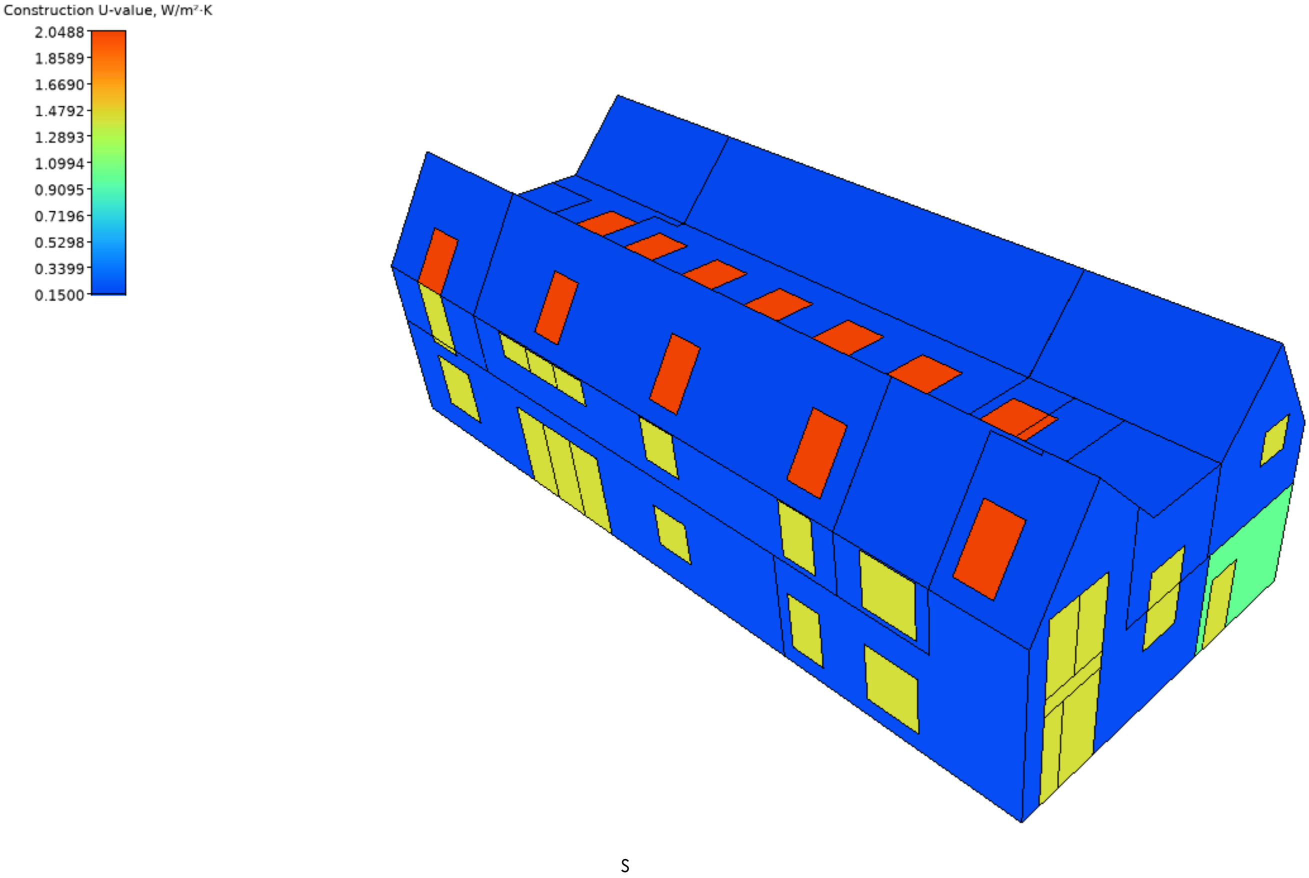

Figure 10: South view of U values applied in the model

5.3 BUILDING SERVICES

The services applied in the thermal model are detailed in Table 3.

Table 3: Services applied in the building model.

System	Specification
Heating	**Baseline model only** - Direct electric heating 100% efficient. **Be Green model** – ASHP to VRV split units with Coefficient of Performance (COP) of 3.5. to office areas. Direct electric heating 100% efficient to WCs
Cooling	VRV units provide cooling option with seasonal efficiency (SEER) of 5 and nominal efficiency (EER) of 3.5 to office areas
Domestic Hot Water	5 x 10L electric hot water heaters 100% efficient, 0.0047kWh/l/day heat losses.
Ventilation	Natural vent via openable windows throughout. GF Male Toilet extract 28 l/s, SFP 0.3 W/l/s GF Female Toilet extract 22 l/s SFP 0.3 W/l/s GF Staff Kitchen extract 30 l/s, SFP 0.3 W/l/s

System	Specification
	FF Staff Kitchen extract 30 l/s, SFP 0.3 W/l/s FF Toilet 1 & 2 extract 15 l/s, SFP 0.3 W/l/s
Lighting	GF & FF - All office and meeting areas –95 lm/ circuit W with absence detection and daylight dimming. GF & FF WC, GF & FF Kitchenette and GF & FF Circulation – 95 lm/ circuit W with presence detection.
Power Factor	< 0.9
Heating fuel sub-metering	No sub-metering with out-of-range alarms
Lighting system sub-metering	No sub-metering with out-of-range alarms

6.0 BE LEAN: USE LESS ENERGY

The first step of the Energy Hierarchy methodology is to improve the design of the building fabric and services to maximise passive design elements and improve the energy efficiency. The design for the building follows the 'fabric first' principles, focusing on improving the U values of fabric elements and ensuring the building is airtight, in order to reduce the heat loss.

In order to comply with Part L requirements the calculation compares a 'Notional building' against the energy performance of the 'Actual building'. The Target Emission Rate (TER) is based on the performance of the notional building modelled with standard occupancy and provides the baseline target. The Buildings Emissions Rate (BER) is based on the performance of the actual building with the same standardised occupancy. The BER must be lower than the TER to meet the requirements for Part L building regulations.

The baseline energy demand for the building and associated CO_2 emissions are shown in Table 4. These are the results of the building fabric with direct electric heating and hot water systems applied, before any LZC systems are added such as the ASHPs and PV panels.

Table 4: Baseline performance against the TER

	TER ($kgCO_2/m^2$Annum)	BER ($kgCO_2/m^2$Annum)	Result
Baseline (with direct electric heating and hot water)	3.02	6.84	Fail

7.0 BE CLEAN

7.1 COMBINED HEAT AND POWER (CHP)

Combined Heat and Power (CHP), uses a generator to produce electricity on site and the waste heat from this process can then be used to provide heat, hot water or even cooling through an absorption chiller. Utilising the waste heat makes this process more efficient than the grid electricity system, so can provide some carbon savings. However the demand for waste heat in summer is too low and inconsistent in this instance so CHP is therefore unsuitable.

Figure 11: Example of a CHP engine

7.2 HEAT NETWORKS

Where there is an existing district heating network that can provide heating, such as with waste heat from an incinerator, the building may be able to benefit from waste heat to provide heating to the building rather than installing a standalone heating system. Currently there are no heating networks nearby in Staplefield (please see Staplefield Town Council website). Therefore, this option is unsuitable for the Stanbridge Park.

Figure 12: Example of a local heat network

8.0 BE GREEN: USE RENEWABLE ENERGY

8.1 GROUND SOURCE HEAT PUMPS (GSHP)

The 2nd law of Thermodynamics observes that the flow of heat is naturally from a higher temperature area to a lower temperature area until equilibrium is achieved. Heat pumps use a series of compression and expansion cycles, changing the state of the refrigerant used, in order to pump heat against its natural flow, from a colder source into a warmer area. Pumping heat from one area to another is more efficient than directly generating heat from an electrical source or by burning a fossil fuel.

A Ground Source Heat Pump (GSHP) pumps heat from underground to a heat distribution system within the building. 2m below ground is generally a constant temperature of 11-12 degrees Celsius in the UK, even in winter. This can provide a constant heat source for a heat pump and because the temperature is not as cold as the external air temperature in winter, this is the most efficient source for a heat pump.

The site is restricted, bound by other buildings, pavements and roads and there is very limited potential to lay GSHP coils or boreholes. ASHP provides a more suitable efficient solution for the Stanbridge Park.

8.2 AIR SOURCE HEAT PUMPS (ASHP)

Air Source Heat Pumps (ASHP) extract heat from the outside air in a similar process to GSHP. They do not achieve the same efficiencies as GSHP, however they are still more efficient than direct electric heating down to an external air temperature around zero degrees.

Figure 13: Example of ASHP condenser units

Providing air source heat pumps to the building for the space heating would require external condenser units to be located adjacent to the building which could have space and noise implications, potentially requiring acoustic screening. However, assuming these issues are resolved, such a system would offer a high efficiency and low carbon 'off the shelf' solution that is relatively simple to install and maintain.

An air source heat pump system is a viable option for providing a low carbon heat source for the Stanbridge Park.

In this instance the hot water demand is anticipated to be low. For this level of demand, the ASHP system would not be the preferred option for supplying the hot water.

8.3 BIOMASS

Biomass provides an option for replacing fossil fuels within a boiler heating system for a renewable fuel source and can have a significant impact on the carbon emissions for the building. Biomass is commonly from a natural source such as waste timber, in the form of briquettes, wood chips or wood pellets. Unlike fossil fuels that were created millions of years ago and are extracted from deep below the ground, biomass is part of a renewable growing cycle. The plants absorb carbon dioxide during growth that match the carbon dioxide emitted when it is burnt. Even accounting for transporting the fuel, the overall carbon emissions are considered less than a tenth of emissions from gas. The ash created is not harmful and a good fertiliser for plants.

Figure 14: Wood pellets used in biomass boilers

A biomass boiler is similar to an oil boiler in that it tends to be larger than a gas or electric boiler and requires space for fuel storage. In addition, access will be required for fuel deliveries, which would be not be a problem in this location where there are frequent deliveries and good access. Depending on the fuel type selected, the system can require more checks from a caretaker than a standard gas or electric boiler system, so having a regular maintenance person on site is generally helpful.

The highly insulated Stanbridge Park has a relatively low heat demand and due to the cost of installation and low turn down ratios a biomass system has not been considered in this instance.

8.4 SOLAR THERMAL

Solar thermal systems use the energy from the sun to provide hot water. In conjunction with an efficient thermal store they can provide a free and renewable method to heat water for 70% of the year. The system uses a heat collector, generally mounted on the roof in which a fluid is heated by the sun and this then heats the water in a storage system. Generally a backup heat source is available alongside, to raise the temperature when there is insufficient sun or at night. Using an efficient thermal store allows the temperature of the water to be maintained for longer and reduce the need for supplementary heat.

Solar thermal requires a smaller area of roof space than a PV system generally does, because it is a lot more efficient than converting the sun's energy into electricity, so often these can both be accommodated in a design.

However, due to the low use of domestic hot water in this instance PV is preferred.

8.5 PHOTOVOLTAICS

Solar photovoltaic (PV) technology is a semi-conductor based technology that converts the energy in sunlight into electricity. Installing an array of PV panels on the roof can provide a renewable source of electricity to the building when the sun is shining. This site generated renewable energy will displace the grid supplied electricity consumption whether used on site or feeding back to the grid, hence reducing the carbon emissions for the building.

The roof of the Stanbridge Park is large enough to support PV panels, and these are planned to be applied in this instance.

8.6 WIND TURBINES

Wind turbines use the natural air movement to spin a blade which then turns a generator to create electricity. Coastal locations are ideal for wind turbines as they are often more exposed to a consistent wind source. Turbines work best with an unobstructed wind source and catch more powerful wind speeds the taller they are. However there is an option to install vertical turbines which cope better with the turbulence and lower wind speeds in built up areas.

The Stanbridge Park is located in the town and backs on to dwellings, so is not an ideal location for wind turbines due to the potential noise for residents. It does not have access to an unobstructed wind source so is not considered as a viable option.

9.0 BE GREEN: LZC ASSESSMENT RESULTS

The most viable option to add low and zero carbon technology to the proposed two storey office unit is to install PV panels to generate electricity and ASHP to provide heating.This will eliminate the burning of fossil fuels from the site and give a much more efficient system than using a gas boiler or direct electric heating.

For the 'Be Green' building model, the size, angle, and orientation of the PV was based on drawings and design information provided by LRA-R Architects received on 30th January 2024. An area of 41m^2 was used at an angle of 15 degrees, facing southwest.

With the addition of PV and ASHP the overall carbon emissions are significantly improved by 62% over the baseline. The TER for this solution is 3.41 kg.CO_2/m^2.annum with an improvement of 24% over the building regulations demonstrated by a BER of 2.58 kg.CO_2/m^2.annum

Table 5: Carbon emissions at each stage of energy hierarchy

	CO_2 Emissions (kgCO_2/m^{2}annum)	Reduction in CO_2 Emissions (kgCO_2/m^{2}annum)	Reduction from Baseline	Part L 2021 compliant
Lean	6.84	-	-	Fail
Clean	6.84	-	0%	Fail
Green	2.58	-	62%	Pass

10.0 CONCLUSION

The energy strategy for the proposed development has been assessed using the Energy Hierarchy of Be lean, Be Clean and Be Green. With a 'fabric first' approach, efficient systems and the use of PV and ASHP, the potential CO_2 emissions for the Stanbridge Park have been reduced by 62% - and have a 24% improvement above the current Building Regulations

The most viable options to add low and zero carbon technology to the Stanbridge Park is to install PV for renewable electricity generation and ASHP to provide efficient heating. .. This will also eliminate the burning of fossil fuels onsite. The reduction in carbon emissions is illustrated in Figure 15.

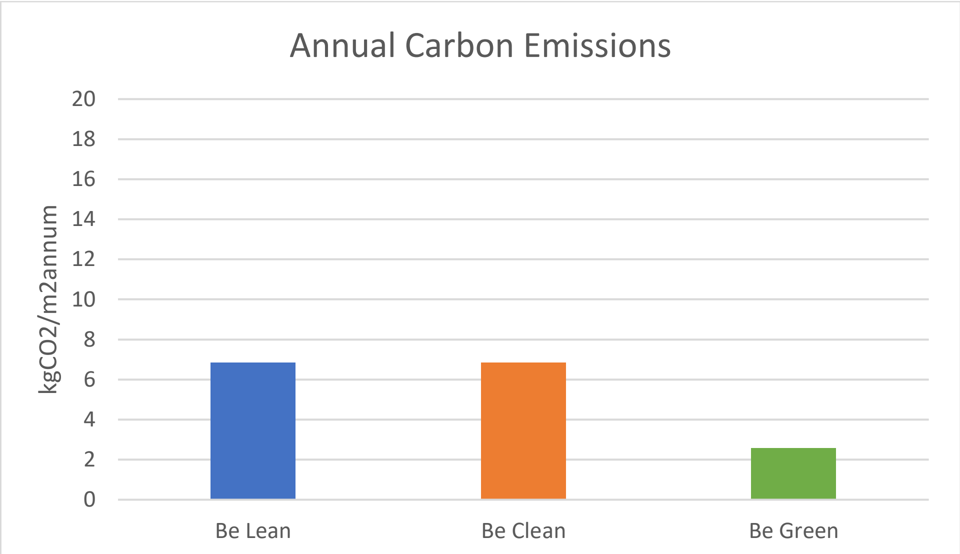

Figure 15: Graph showing the modelled CO_2 emissions for each stage

11.0 APPENDIX A – BASELINE MODEL

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Stanbridge Park

As designed

Date: Fri Feb 23 10:32:59 2024

Administrative information

Building Details

Address: Staplefield Lane, Staplefield, Haywayds Heath, RH17 6AS

Certifier details

Name: Delta Green Environmental Design

Telephone number: 01273 086186

Address: 2 Station Farm Barn, Station Road, Glynde, Lewes, BN8 6EU

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.0

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.25

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

Foundation area [m²]: 216.29

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

The building does not comply with England Building Regulations Part L 2021

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	3.01	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	6.84	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	29.67	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	71.67	
Do the building's emission and primary energy rates exceed the targets?	BER > TER	BPER > TPER

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

Fabric element	$U_{a-Limit}$	U_{a-Calc}	U_{i-Calc}	First surface with maximum value
Walls*	0.26	0.25	1.79	FF000000_W1_A1
Floors	0.18	0.11	0.15	GR000007_F
Pitched roofs	0.16	0.15	0.15	FF000000_C
Flat roofs	0.18	0.2	1.09	GF000000_C_A2
Windows** and roof windows	1.6	1.41	1.41	GF000001_W4_O0
Rooflights***	2.2	2.05	2.05	FR000004_C_O0
Personnel doors^	1.6	1.41	1.41	GF000000_W7_O1
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

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

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

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

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

Air permeability	Limiting standard	This building
m³/(h.m²) at 50 Pa	8	5

Building services

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

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

1- Electric heating

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

2- Split Systems

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	5	-	-	-
Standard value	N/A	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

1- SYST0004-DHW

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	1	0.003
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	**System type in the Approved Documents**
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	**SFP [W/(l/s)]**									**HR efficiency**	
ID of system type	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	**Zone**	**Standard**
GF-FemaleWC	0.3	-	-	-	-	-	-	-	-	-	N/A
GF-MaleWC	0.3	-	-	-	-	-	-	-	-	-	N/A
FF-WC-2	0.3	-	-	-	-	-	-	-	-	-	N/A
FF-WC-1	0.3	-	-	-	-	-	-	-	-	-	N/A
GF-Staff Kitchen	0.3	-	-	-	-	-	-	-	-	-	N/A
FF-Staff Kitchen	0.3	-	-	-	-	-	-	-	-	-	N/A

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

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
GF-MaleWC	95	-	-
FF-WC-2	95	-	-
FF-WC-1	95	-	-
GF-Corridor	95	-	-
GF-Office-1	95	-	-
GF-Office-2	95	-	-
GF-Staff Kitchen	95	-	-
GF-Co-working Space	95	-	-
FF-Executive Office	95	-	-
FF-BoardRoom	95	-	-
FF-Co-working pace	95	-	-
FF-Staff Kitchen	95	-	-
FF-Stairwell	95	-	-
GF-Entrance	95	-	-
GF-Refuse/Cycle	95	-	-

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
GF-Corridor	N/A	N/A
GF-Office-1	NO (-82.6%)	NO
GF-Office-2	N/A	N/A
GF-Staff Kitchen	NO (-72.1%)	NO
GF-Co-working Space	NO (-59.7%)	NO
FF-Executive Office	NO (-8.1%)	NO
FF-BoardRoom	YES (+5.1%)	NO
FF-Co-working pace	YES (+39.7%)	NO
FF-Staff Kitchen	NO (-48.9%)	NO
FF-Stairwell	NO (-54.9%)	NO
GF-Entrance	NO (-14.4%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	441.6	441.6
External area [m^2]	931.1	931.1
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	5	3
Average conductance [W/K]	309.43	307.94
Average U-value [W/m^{2}K]	0.33	0.33
Alpha value* [%]	28.63	24.14

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

Building Use

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

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

	Actual	Notional
Heating	29.4	20.58
Cooling	7.14	4.17
Auxiliary	0.34	0.45
Lighting	6.85	8.24
Hot water	2.66	2.27
Equipment*	35.06	35.06
TOTAL**	**46.38**	**35.7**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	16.35
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*16.35*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	200.82	171.53
Primary energy [kWh$_{PE}$/m^2]	71.67	29.67
Total emissions [kg/m^2]	6.84	3.01

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	77.9	41.6	27	0	2.7	0.8	0	1	0
	Notional	94.7	22.2	19.6	0	3.6	1.34	0	----	----
[ST] Split or multi-split system, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	101.4	100.4	30.2	7.9	0.2	0.93	3.55	1	5
	Notional	101.9	72.6	21.1	4.6	0.2	1.34	4.4	----	----
[ST] No Heating or Cooling										
	Actual	422.7	13.7	0	0	0	0	0	0	0
	Notional	227.2	2.7	0	0	0	0	0	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

12.0 APPENDIX B – BE GREEN: BUILDING REGULATIONS UK PART L (BRUKL)

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Stanbridge Park

As designed

Date: Fri Feb 23 10:09:23 2024

Administrative information

Building Details

Address: Staplefield Lane, Staplefield, Haywayds Heath, RH17 6AS

Certifier details

Name: Delta Green Environmental Design

Telephone number: 01273 086186

Address: 2 Station Farm Barn, Station Road, Glynde, Lewes, BN8 6EU

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.0

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.25

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

Foundation area [m²]: 216.29

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	3.41	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	2.58	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	36.04	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	26.4	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

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

Fabric element	$U_{a-Limit}$	U_{a-Calc}	U_{i-Calc}	First surface with maximum value
Walls*	0.26	0.25	1.79	FF000000_W1_A1
Floors	0.18	0.11	0.15	GR000007_F
Pitched roofs	0.16	0.15	0.15	FF000000_C
Flat roofs	0.18	0.2	1.09	GF000000_C_A2
Windows** and roof windows	1.6	1.41	1.41	GF000001_W4_O0
Rooflights***	2.2	2.05	2.05	FR000004_C_O0
Personnel doors^	1.6	1.41	1.41	GF000000_W7_O1
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

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

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

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

^ For fire doors, limiting U-value is 1.8 W/m²K

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

Air permeability	Limiting standard	This building
m³/(h.m²) at 50 Pa	8	5

Building services

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

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

1- Electric heating

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

2- Split Systems

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3	5	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- SYST0004-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.003
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
GF-FemaleWC	0.3	-	-	-	-	-	-	-	-	-	N/A
GF-MaleWC	0.3	-	-	-	-	-	-	-	-	-	N/A
FF-WC-2	0.3	-	-	-	-	-	-	-	-	-	N/A
FF-WC-1	0.3	-	-	-	-	-	-	-	-	-	N/A
GF-Staff Kitchen	0.3	-	-	-	-	-	-	-	-	-	N/A
FF-Staff Kitchen	0.3	-	-	-	-	-	-	-	-	-	N/A

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

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
GF-MaleWC	95	-	-
FF-WC-2	95	-	-
FF-WC-1	95	-	-
GF-Corridor	95	-	-
GF-Office-1	95	-	-
GF-Office-2	95	-	-
GF-Staff Kitchen	95	-	-
GF-Co-working Space	95	-	-
FF-Executive Office	95	-	-
FF-BoardRoom	95	-	-
FF-Co-working pace	95	-	-
FF-Staff Kitchen	95	-	-
FF-Stairwell	95	-	-
GF-Entrance	95	-	-
GF-Refuse/Cycle	95	-	-

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
GF-Corridor	N/A	N/A
GF-Office-1	NO (-82.6%)	NO
GF-Office-2	N/A	N/A
GF-Staff Kitchen	NO (-72.1%)	NO
GF-Co-working Space	NO (-59.7%)	NO
FF-Executive Office	NO (-8.1%)	NO
FF-BoardRoom	YES (+5.1%)	NO
FF-Co-working pace	YES (+39.7%)	NO
FF-Staff Kitchen	NO (-48.9%)	NO
FF-Stairwell	NO (-54.9%)	NO
GF-Entrance	NO (-14.4%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m²]	441.6	441.6
External area [m²]	931.1	931.1
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	5	3
Average conductance [W/K]	309.43	307.94
Average U-value [W/m²K]	0.33	0.33
Alpha value* [%]	28.63	24.14

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

Building Use

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	11.07	11.13
Cooling	7.14	4.17
Auxiliary	0.34	0.45
Lighting	6.85	8.24
Hot water	2.66	2.27
Equipment*	35.06	35.06
TOTAL**	**28.06**	**26.25**

* 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/m²]

	Actual	Notional
Photovoltaic systems	11.24	2.17
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*11.24*	*2.17*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	200.82	171.53
Primary energy [kWh_{PE}/m^2]	26.4	36.04
Total emissions [kg/m²]	2.58	3.41

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	77.9	41.6	27	0	2.7	0.8	0	1	0
	Notional	94.7	22.2	19.6	0	3.6	1.34	0	----	----
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	101.4	100.4	10.1	7.9	0.2	2.8	3.55	3	5
	Notional	101.9	72.6	10.7	4.6	0.2	2.64	4.4	----	----
[ST] No Heating or Cooling										
	Actual	422.7	13.7	0	0	0	0	0	0	0
	Notional	227.2	2.7	0	0	0	0	0	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type