Building Services
Consulting Engineers

BREEAM ENE04 : LOW/ZERO CARBON REPORT

AT

HASKINS FOREST LODGE GARDEN CENTRE
FARNHAM ROAD
HOLT POUND
GU10 4LD

FOR

BIRDWORLD LTD & HASKINS GARDEN CENTRES LTD

JANUARY 2024

DOCUMENT REVISION RECORD

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 EXECUTIVE SUMMARY

This report assesses the feasibility of incorporating Low or Zero Carbon (LZC) technologies into the proposed new garden centre in Farnham. Its purpose is to guide the project team's decision-making regarding the selection of LZC technologies and to ensure that all crucial considerations are addressed. The primary drivers for opting for LZC technologies are compliance with Part L regulations, adherence to Planning Policy and achieving an overall BREEAM Excellent rating.

To identify the most suitable LZC technology capable of meeting the project's requirements, a dynamic thermal model was executed. This model provides insights into the development's energy consumption, carbon emissions, and potential areas for savings. The outcomes of this analysis guided the selection of LZC technology.

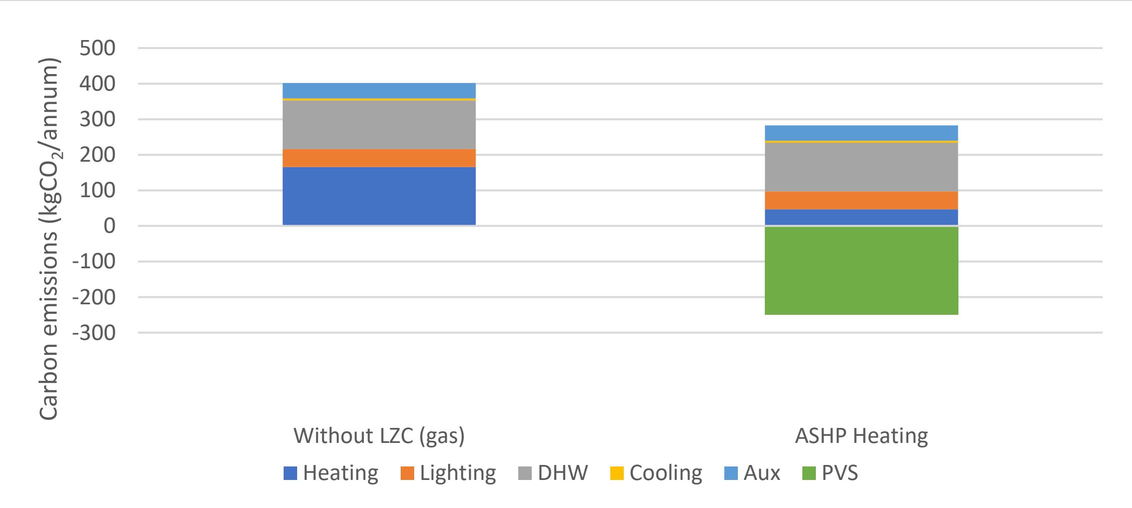
The report concludes that Air Source Heat Pumps, coupled with a substantial array of roof-mounted solar photovoltaic panels, are the most fitting LZC technologies for integration into the proposed development. Other renewable energy technologies, including wind turbines, biomass boilers, and ground-source heat pumps, were deemed impractical due to factors such as the development's location, spatial constraints, financial limitations, and technology payback period.

The table below summarises CO_2 emissions for the development with and without Low or Zero Carbon (LZC) technologies. Without LZC technologies, total carbon emissions are 67,487 $kgCO_2$/annum. With LZC technologies, emissions decrease to 7,980 $kgCO_2$/annum, saving 59,504 $kgCO_2$/annum emphasising the reduction of development's carbon footprint.

Table 1. Carbon Dioxide Emissions ($kgCO_2$/annum)

Use Type	**Carbon dioxide emissions ($kgCO_2$) / annum**	
	Gas (heating source)	**ASHP (heating source) + PVS**
Heating	34789	7358
Lighting	7102	7102
DHW	18960	18960
Cooling	644	644
Aux	5991	5991
Photovoltaic System	0	-32076
Total	**67487**	**7980**

Figure 1. Carbon Emissions ($kgCO_2$/annum)



2 INTRODUCTION

This report assesses the feasibility of incorporating Low or Zero Carbon (LZC) technologies into the proposed new garden centre in Farnham. Its purpose is to guide the project team's decision-making regarding the selection of LZC technologies and to ensure that all crucial considerations are addressed. The primary drivers for opting for LZC technologies are compliance with Part L regulations, adherence to Planning Policy and achieving an overall BREEAM Excellent rating.

Figure 2. Proposed Garden Centre Site Plan

The proposal encompasses the redevelopment of the current Haskins, Forst Lodge Garden Centre, positioned three miles southwest of Farnham, directly off the A325. The objective is to deliver a markedly improved customer experience through the establishment of a new, sustainable, and modern building.

3 FUNDING AND FINANCIAL INCENTIVES

Several funding and financial initiatives around renewable technology aim to support the transition to a low-carbon economy.

Bio-energy Capital Grants Scheme

The Department of Energy and Climate Change (DECC) runs the Bio-energy Capital Grants Scheme. It supports biomass-fuelled heat and combined heat and power projects in the English industrial, community and commercial sectors. The scheme is part of the UK Environmental Transformation Fund, which encourages understanding lower-carbon technologies among individuals and businesses.

Green Investment Bank (GIB)

The GIB was established in 2012 to invest in renewable energy projects and technologies. It provided capital to various projects, such as offshore wind farms, biomass plants, and energy efficiency initiatives.

Clean Growth Strategy

The government's Clean Growth Strategy plans to tackle climate change and drive economic growth through low-carbon technology. It includes a range of financial and policy measures, such as funding for research and development, support for energy efficiency measures, and financing for low-carbon infrastructure projects.

Enhanced Capital Alliance (ECA)

The Enhanced Capital Alliance (ECA) is a Government-sponsored scheme to help manage climate change, providing businesses with enhanced tax relief for investments in equipment that meet published energy-saving criteria. In the first year, the total cost of investments can be written off against the taxable profits of the period in which the investment is made. The scheme covers various products, including lighting, heat pumps and boiler equipment.

Competitiveness and Innovation Framework Programmes (CIP)

CIP is an EU initiative targeting small businesses that support and promote innovation to increase EU firms' competitiveness in the worldwide market. It specifically aims to encourage eco-innovation, particularly the increased use of renewable energies and energy efficiency. This is achieved through improving access to finance for green projects and connecting environmentally friendly companies to pool resources and share best practice schemes.

4 BREEAM CRITERIA

The proposed development at Haskins Garden Centre, is subject to a BREEAM New Construction assessment. This report pertains exclusively to ENE 04 low-carbon design, specifically addressing low and zero-carbon technologies, with a focus on earning a single credit.

4.1 Low and Zero-Carbon Technologies

One credit - Low zero carbon feasibility study

1. A feasibility study has been carried out by the completion of the Concept Design stage (RIBA Stage 2 or equivalent) by an energy specialist to establish the most appropriate recognised local (onsite or near-site) low or zero carbon (LZC) energy source(s) for the building/development.

The LZC study should cover, as a minimum:

- Energy generated from LZC energy source per year Carbon dioxide savings from LZC energy source per year.
- Life cycle cost of the potential specification, accounting for payback Local planning criteria, including land use and noise.
- Feasibility of exporting heat or electricity from the system Any available grants.
- All technologies appropriate to the site and energy demand of the development Reasons for excluding other technologies.
- Energy storage.

2. A local LZC technology/technologies has/have been specified for the building/development in line with the recommendations of this feasibility study. This supply method results in a meaningful reduction in regulated carbon dioxide (CO_2) emissions.

5 ASSESSMENT METHODOLOGY

An initial estimate of the energy consumption and associated CO_2 emissions of the proposed garden centre has been undertaken to help inform the assessment of LZC technology options. An IESVE dynamic thermal model has been developed, and the Part L National Calculation Methodology (Level 5 NCM) has been adopted.

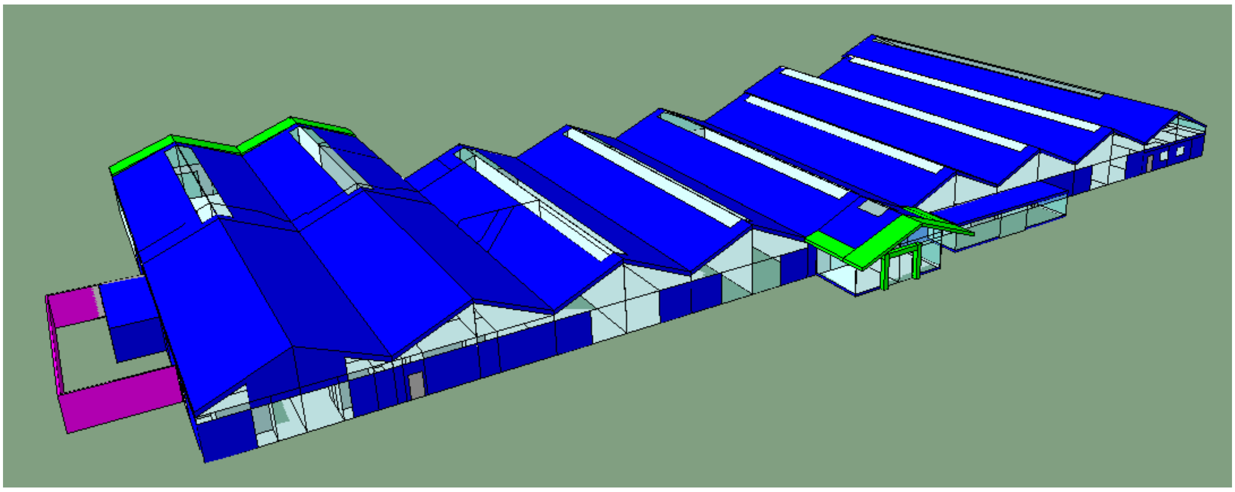
The Integrated Environmental Solution's Virtual Environment software suite (IES-VE[2]) Version 2023.2.0.0 was used to estimate the carbon savings from installing the chosen LZC energy systems.

Using climatic data, building geometry, layout, occupancy, fabric information, and HVAC/renewable energy, system usage informs a detailed mathematical simulation known as dynamic simulation modelling (DSM). This simulation captures the heat transfer process into and through the building and its thermal capacity.

This thermal simulation, ApacheSim within the IES software suite, calculates the regulated energy consumption and associated carbon emissions.

An Energy Specialist[1] undertook the dynamic simulation modelling.

Figure 3. IES Model Image



The following annual energy/ CO_2 performance simulations have been completed to compare the performance of the proposed 'Actual' design scenario against the development without LZC technologies.

- Proposed Design: without LZC technology (93% gas-fired boiler assumed for heating)
- Proposed Design: with ASHP technology for heating and inclusion of photovoltaic panels

5.1 Carbon Dioxide Emission Factors

The carbon dioxide emissions associated with energy consumption are calculated using the CO_2 emissions factors shown below.

Table 2. Carbon Dioxide Emissions Associated with Grid Supplied Energy

Fuel	Emission Factor (kgCO_2/kWh)
Grid Supplied (or Displaced) Electricity	0.111 – 0.163
Natural Gas	0.21

[1] Energy Specialist: An individual who has acquired substantial expertise or a recognised qualification for undertaking assessments, designs and installations of low or zero-carbon solutions in the commercial buildings sector and is not professionally connected to a single low or zero-carbon technology or manufacturer.

[2] IES-VE is CLG-approved software

6 LZC TECHNOLOGIES

The section below analyses the estimated energy returns for the different renewable sources available within the development context. The renewable energy feasibility study has omitted the consideration of micro-hydro as there are no records of watercourses crossing the site.

6.1 Solar Thermal for Domestic Hot Water

Figure 4. Typical Solar Thermal Collector

Plate solar collectors are widely used for a Domestic Hot Water (DHW) installation and have a highly transparent, virtually unbreakable polycarbonate cover, which has been treated to ensure long life. Behind this is the solar absorber, which is made of a metal sheet covered with a black chromium oxide selective layer. The solar-heated water flows through a heat exchanger, warming the water stored in the hot water cylinder. The hot water in the cylinder can then be used for domestic use as usual, with the boiler providing backup heating.

The design and installation of the hot water systems primarily employ local, non-low storage 'point of use' electric hot water heaters. This approach has been chosen to minimise standing losses typically associated with centralised systems. The commercial kitchen is expected to experience a significant and fluctuating demand for hot water, particularly during peak operating hours. Consequently, this technology has been ruled out from consideration.

Technology Considered Non-Viable /
Technology not to be incorporated into scheme.

Table 3. Solar Thermal - Summary

Lane Use	Roof-mounted, no extra land required
Planning Requirements	According to PPS 22
Noise	N/A
Energy Export	N/A
Financial Driver	Renewable heat incentive

6.2 Wind Turbines

Figure 5. Typical Wind Turbine

Wind turbines use the wind to produce energy/electricity and can be used in rural or urban surroundings. However, the output rate relies on the average wind flow rate, so high-speed uninterrupted currents are the most suitable.

The manufacturer determines a turbine's cut-in and cut-out speeds to protect the turbine from damage. The cut-in rate is the point at which the turbine starts generating electricity from turning. The cut-out point is more critical and signifies how fast the turbine can go before wind speeds get so quickly that it risks damage from further operation. Most turbines have a rated peak speed at which they'll return the optimal amount of power. Wind speeds both lower and higher than this speed is likely to produce less energy. Wind speed measures how rapidly the air is moving in a particular area. For ease, this is usually expressed in metres per second (m/sec). The NOABL wind speed database estimated average wind speeds at this location in the UK are 5.0 m/s at 10 metres above ground, 5.8 m/s at 25 metres above ground and 6.3 m/s at 45 metres above the ground.

Due to the economic challenges in specific locations and technical limitations like inadequate wind speeds that restrict the feasibility of wind turbine installations, wind energy has been disregarded. This decision is informed by the significant visual impact and potential effects on wildlife, all aimed at safeguarding the visual appeal and character of the landscape.

Technology Considered Non-Viable / Technology not to be incorporated into scheme

Table 4. Wind Turbine - Summary

Lane Use	**External to building, additional land required or roof-mounted.**
Planning Requirements	According to PPS 22
Noise	45dbA (A) @ 5m/s per unit
Energy Export	Average
Financial Driver	Feed-in tariff ended in April 2019.

6.3 Photovoltaic Panels

Figure 6. Typical PV Panel

Photovoltaic (PV) cells convert the sun's light energy into electricity, which can be used to supplement the office development energy requirements. The most common types of PV cells available are polycrystalline silicon, monocrystalline silicon, and amorphous silicon. These silicon-based cells are electrically linked to form modules assembled by laminating each cell to guard the surfaces. An inverter, which converts direct current electricity into alternating current, is wired to the PV cells to ensure the energy generated can be used onsite. PV modules are rated by their power in kilowatt-hours peak (kW_p). Monocrystalline, made using cells saw-cut from a single cylindrical crystal of silicon, is generally the most efficient panel type, with an efficiency of approximately 15% in good light conditions.

The ample roof space on the proposed building provides an opportunity to accommodate PV panels that are not only low maintenance but also seamlessly integrate with the building's design. Consequently, this technology has been integrated into the overall scheme.

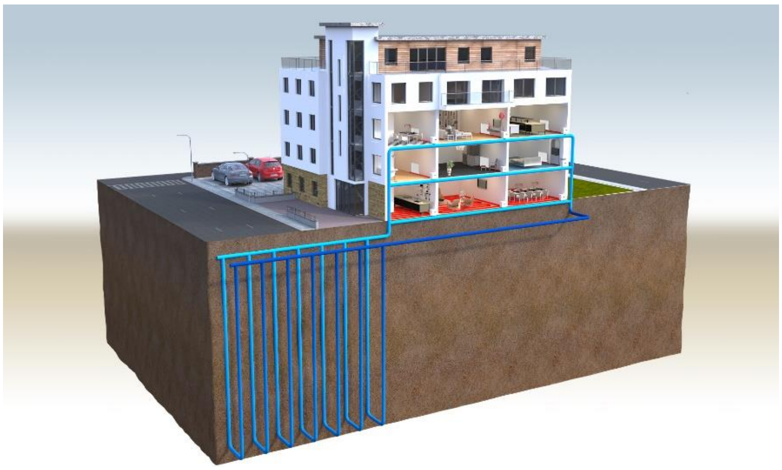
Technology Considered Viable /
Technology to be incorporated into scheme.

Table 5. Photovoltaic (PV) - Summary

Lane Use	**Roof-mounted; no extra land required**
Planning Requirements	According to PPS 22
Noise	N/A
Energy Export	Subject to calculation (>25 years)
Financial Driver	Smart Export Guarantee (SEG)

6.4 Ground Source Heat Pumps

Figure 7. Typical Ground Source Heat Pump Arrangement



Ground source heat pumps (GSHPs) use pipes buried underground to extract heat from the ground. This heat can then be used for space heating, i.e., radiators, underfloor or warm air heating systems and domestic hot water. Heat pumps impact the environment as they need electricity to run, but the heat they extract from the ground, the air, or water is constantly being renewed naturally.

The heat from the ground is absorbed at low temperatures into a fluid inside a loop of pipe (a ground loop) buried underground. The fluid then passes through a compressor that raises it to a higher temperature, which can heat water for the development's heating and hot water circuits. The cooled ground-loop fluid passes back into the ground, absorbing further energy from the ground in a continuous process if heating is required. Below a certain depth, the ground stays at a relatively constant temperature under the surface so that the heat pump can be used throughout the year.

The number and depth of boreholes needed will be contingent upon the building's heating demand and local geological factors, including the presence of the water table. Given the logistical challenges involved, Ground Source Heat Pump (GSHP) technology has not been deemed a feasible Low or Zero Carbon (LZC) option for this development.

Technology Considered Non-Viable /
Technology not to be incorporated into scheme.

Table 6. Ground Source Heat Pump (GSHP) - Summary

Lane Use	**Additional space within plant room with boreholes external to the building, other land required**
Planning Requirements	According to PPS 22
Noise	Plantroom design specifications
Energy Export	N/A
Financial Driver	Renewable heat incentive

6.5 Biomass

Figure 8. Typical Biomass System

Biomass fuels produce much fewer Carbon emissions than fossil fuels, making them a carbon lean technology that would significantly impact CO_2 reduction. Biomass fuels such as wood chips are what are known as contemporary carbon. When they are combusted, they release the same carbon levels that the growing plant recently consumed, meaning that the carbon levels are sustainable. Currently, the most available fuels are wood chips or pellets. The quality of biomass fuel is essential to the efficiency of a boiler. In general, the fuel stock must be of a standard size and moisture content; wood chips should have a maximum moisture content of 30%, representing at least a year of air-drying, if not more.

Biomass boilers will need suitable storage and a local supplier of fuel. The storage facility should eliminate any risk of compost and should be ventilated per building regulations.

The emissions from flue and fuel delivery would have a negative impact on local air quality and therefore not be appropriate for this scheme.

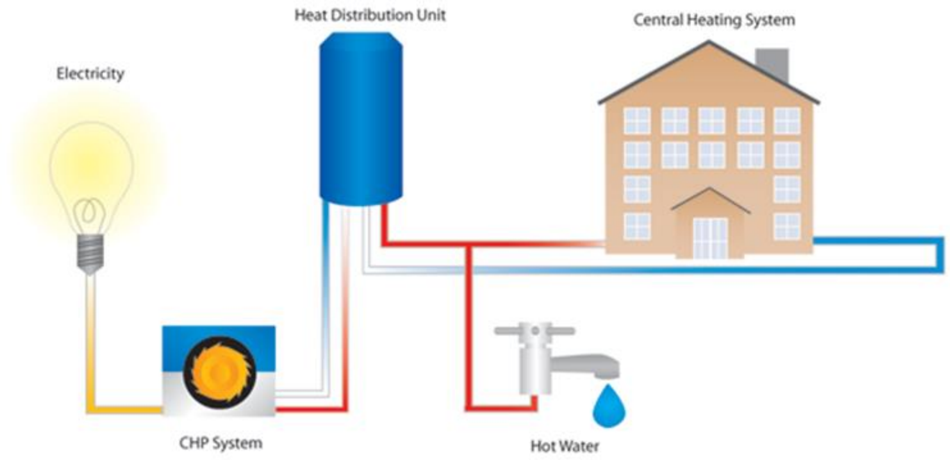
Technology Considered Non-Viable /
Technology not to be incorporated into scheme.

Table 7. Biomass System Summary

Lane Use	**Within the plant room, extra space is required for storage**
Planning Requirements	According to PPS 22
Noise	Plantroom design specification
Energy Export	N/A
Financial Driver	Renewable heat incentive

6.6 Combined Heat & Power (CHP) / Heat Network

Figure 9. Typical Combined Heat & Power (CHP) Arrangement



Combined heat and power (CHP) can provide effective onsite electricity generation; the 'waste heat' from the process can be used by the DHW system, making CHP a lot more efficient than separate utility-provided electricity and onsite heat generation.

Although CHP is commercially available, the heat profile and demand of the development are not deemed appropriate for the operation of the CHP unit. A CHP plant performs at its most efficient when running continuously. If there is a low load, the CHP will automatically shut down, which can cause a malfunction in the CHP plant. This technology has therefore not been considered.

There is currently no area-wide heat network available, therefore it is proposed heating can be provided by another low or zero-carbon technology, which will have more environmental advantages.

Technology Considered Non-Viable /
Technology not to be incorporated into scheme.

Table 8. Combined Heat & Power (CHP) - Summary

Lane Use	**Plantroom, roof or external – additional land required**
Planning Requirements	According to PPS 22
Noise	Plantroom design specification
Energy Export	N/A
Financial Driver	Renewable heat incentive

6.7 Air Source Heat Pumps

Figure 10. Typical Air Source Heat Pump (ASHP)

Air Source Heat Pumps are like Ground Source Heat pumps, with the main difference being the heat is absorbed from the external air instead of the ground. Air Source Heat Pumps come in two categories, air-to-air or air-to-water, depending on whether the heat distribution system in the building uses air or water. The main advantage of Air Source Heat pumps over Ground Source Heat Pumps is their lower installation cost.

Air source heat pumps operate by extracting heat from the air and transferring it into a fluid. This fluid then flows through a heat exchanger, which warms up hot water cylinders for taps and showers, as well as radiators and other heating systems.

Air Source Heat Pumps have been chosen as the heating source for their alignment with the space's heat demand and their economic and technical suitability. These factors make them a fitting choice for the development.

Technology Considered Viable /
Technology to be incorporated into scheme.

Table 9. Air Source Heat Pump (ASHP) - Summary

Lane Use	**Within plant room/roof enclosure for outdoor condenser location**
Planning Requirements	According to PPS 22
Noise	Plant noise attenuation requirements must be reviewed by the acoustic consultant as required.
Energy Export	N/A
Financial Driver	Renewable heat incentive (heating mode)

6.8 Electrical Vehicle Charging

Figure 11. Typical Electric Car Charger

Electric vehicle (EV) charge points at the workplace will permit personnel and visitors to charge their vehicles whilst using the buildings for regular, long-term or short-term meetings. The facility of workplace EV charge points will encourage staff and visitors to promote alternative low carbon fuelled vehicles. It is intended to include EV charge points to provide flexibility and sufficient charge to the building users during their stay.

Technology Considered Viable /
Technology to be incorporated into scheme

Table 10. Electric Vehicle Charging - Summary

Lane Use	**Minimum space required to accommodate the EV Charge Posts.**
Planning Requirements	N/A
Noise	NO noise issues.
Energy Export	N/A
Financial Driver	OLEV Grant available under the Workplace Charging Scheme

7 SUMMARY

The report concludes that Air Source Heat Pumps, coupled with a substantial array of roof-mounted solar photovoltaic panels, are the most fitting LZC technologies for integration into the proposed development. Other renewable energy technologies, including wind turbines, biomass boilers, and ground-source heat pumps, were deemed impractical due to factors such as the development's location, spatial constraints, financial limitations, and technology payback period.

The table below summarises CO_2 emissions for the development with and without Low or Zero Carbon (LZC) technologies. Without LZC technologies, total carbon emissions are 67,487 $kgCO_2$/annum. With LZC technologies, emissions decrease to 7,980 $kgCO_2$/annum, saving 59,504 $kgCO_2$/annum emphasising the reduction of development's carbon footprint.

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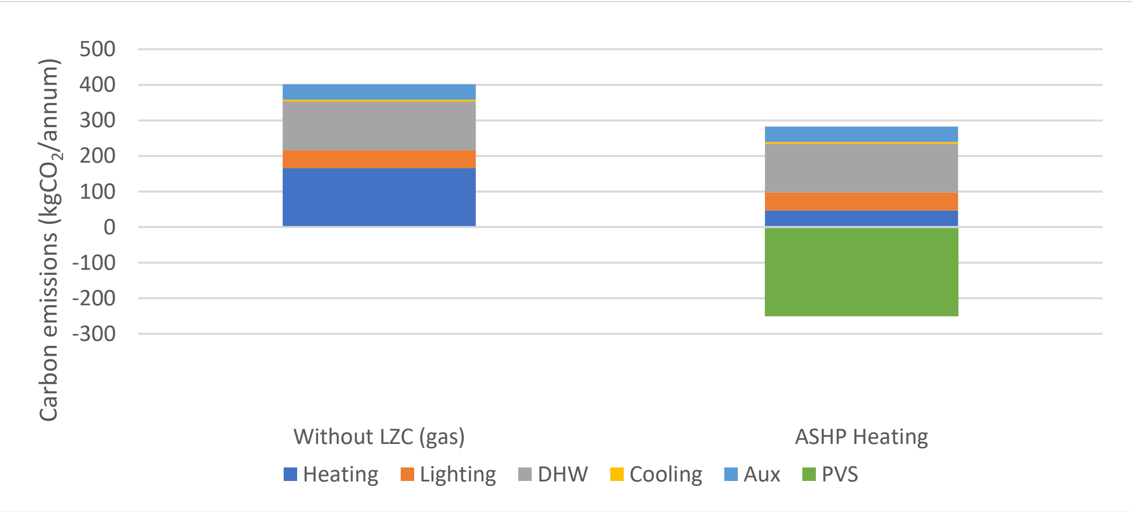
Figure 12. Carbon Emissions ($kgCO_2$/annum)



8 APPENDICES – BRUKL REPORTS & EPC

Garden Centre BRUKL Report (ASHP + PV)
Garden Centre BRUKL Report (without LZC technology)

Garden Centre EPC (ASHP + PV)

8.1 Garden Centre BRUKL Report (ASHP + PV)

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Haskins Forest Lodge Garden Centre

As designed

Date: Thu Jan 04 20:59:14 2024

Administrative information

Building Details

Address: Haskins Forest Lodge Garden Centre, Farnham, GU10 4LD

Certifier details

Name: Neil Bajaj

Telephone number: Phone

Address: Street Address, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.24

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.24

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

Foundation area [m²]: 6238.64

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

Target CO_2 emission rate (TER), $kgCO_2/m^2annum$	5.85	
Building CO_2 emission rate (BER), $kgCO_2/m^2annum$	1.3	
Target primary energy rate (TPER), kWh_{PE}/m^2annum	62.51	
Building primary energy rate (BPER), kWh_{PE}/m^2annum	10.19	
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	0.15	0.15	1_000015:Surf[3]
Floors	0.18	0.12	0.12	1_000015:Surf[0]
Pitched roofs	0.16	0.12	0.12	1_00000C:Surf[2]
Flat roofs	0.18	0.12	0.12	1_000015:Surf[1]
Windows** and roof windows	1.6	1.2	1.2	1_000015:Surf[2]
Rooflights***	2.2	1.3	1.3	1_00001E:Surf[1]
Personnel doors^	1.6	1.3	1.3	CN00000B:Surf[3]
Vehicle access & similar large doors	1.3	1.3	1.3	FF000003:Surf[0]
High usage entrance doors	3	-	-	No high usage entrance doors in building

$U_{a-Limit}$ = Limiting area-weighted average U-values [W/(m²K)]
U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]
U_{i-Calc} = Calculated maximum individual element 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	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- UFH System + NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.2	-	0.2	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- DX + MVHR

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	5	0	-	0.7
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.					

3- Restaurant Supply/Extract

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.2	-	0.2	1.9	0.7
Standard value	2.5*	N/A	N/A	1.9^	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. ^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

4- UFH System + Mech Vent

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.2	-	0.2	-	0.7
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

5- UFH System + Ext

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.2	-	0.2	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- DHW 10L POU

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.041
Standard value	1	N/A

2- DHW Restaurant

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.004
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
CASH OFFICE (WAREHOUSE)	-	-	-	1.5	-	-	-	-	-	-	N/A
CONFERENCE ROOM	-	-	-	1.5	-	-	-	-	-	-	N/A
STAFF ROOM	-	-	-	1.5	-	-	-	-	-	-	N/A
STAFFROOM SHOWERROOM	-	-	-	1.9	-	-	-	-	-	-	N/A
STAFFROOM WC	-	-	-	1.9	-	-	-	-	-	-	N/A
STAFFROOM WC	-	-	-	1.9	-	-	-	-	-	-	N/A
CHANGING PLACES	-	-	-	1.9	-	-	-	-	-	-	N/A
KITCHEN	-	-	1	-	-	-	-	-	1	-	N/A
DDA WC	-	-	-	1.9	-	-	-	-	-	-	N/A
FEMALE WASHROOM	-	-	-	1.9	-	-	-	-	-	-	N/A
MALE WASHROOM	-	-	-	1.9	-	-	-	-	-	-	N/A
OFFICE (KITCHEN)	-	-	-	1.5	-	-	-	-	-	-	N/A
WC (WAREHOUSE)	-	-	0.5	-	-	-	-	-	-	-	N/A
MEETING ROOM (WAREHOUSE)	-	-	-	1.5	-	-	-	-	-	-	N/A
ACC WC (WAREHOUSE)	-	-	0.5	-	-	-	-	-	-	-	N/A
AGM OFFICE (WAREHOUSE)	-	-	-	1.5	-	-	-	-	-	-	N/A
GM OFFICE (WAREHOUSE)	-	-	-	1.5	-	-	-	-	-	-	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
SALES AREA EXIT	120	-	-
PLANT	120	-	-
ENTRANCE LOBBY (WAREHOUSE)	120	-	-
CASH OFFICE (WAREHOUSE)	120	-	-
LOBBY (WAREHOUSE)	120	-	-

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
MEZZANINE PLANT	120	-	-
MEZZANINE PLANT	120	-	-
RESTAURANT	120	120	1.25
CONFERENCE ROOM	120	-	-
FIRE EXIT	120	-	-
STAFF ROOM	120	-	-
STAIRS TO ROOF	120	-	-
DRY STORE 1	120	-	-
STAFFROOM SHOWERROOM	120	-	-
STAFFROOM WC	120	-	-
STAFFROOM WC	120	-	-
DRY STORE 2	120	-	-
FIRE EXIT	120	-	-
CIRCULATION	120	-	-
CHANGING PLACES	120	-	-
KITCHEN	120	-	-
DDA WC	120	-	-
FEMALE WASHROOM	120	-	-
MALE WASHROOM	120	-	-
CLEANERS CUPBOARD	120	-	-
COLD ROOM	120	-	-
LAUNDRY	120	-	-
COSH	120	-	-
CIRCULATION	120	-	-
COLD ROOM	120	-	-
STORE (KITCHEN)	120	-	-
OFFICE (KITCHEN)	120	-	-
FREEZER	120	-	-
WC (WAREHOUSE)	120	-	-
MEETING ROOM (WAREHOUSE)	120	-	-
ACC WC (WAREHOUSE)	120	-	-
MAIN ENTRANCE LOBBY	120	-	-
RETAIL	120	120	1.25
OFFICE (WAREHOUSE)	120	-	-
AGM OFFICE (WAREHOUSE)	120	-	-
CUPBOARD (WAREHOUSE)	120	-	-
GM OFFICE (WAREHOUSE)	120	-	-
IT CUPD	120	-	-
WAREHOUSE	120	-	-

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?
CASH OFFICE (WAREHOUSE)	N/A	N/A
RESTAURANT	YES (+413.3%)	NO
CONFERENCE ROOM	YES (+58.8%)	NO
STAFF ROOM	YES (+76.7%)	NO
OFFICE (KITCHEN)	NO (-74.3%)	NO
MEETING ROOM (WAREHOUSE)	N/A	N/A
RETAIL	YES (+150.2%)	NO
OFFICE (WAREHOUSE)	NO (-70%)	NO
AGM OFFICE (WAREHOUSE)	N/A	N/A
GM OFFICE (WAREHOUSE)	N/A	N/A

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?	YES
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]	6097.9	6097.9
External area [m²]	13212.1	13212.1
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	5	4
Average conductance [W/K]	3614.82	3498.39
Average U-value [W/m²K]	0.27	0.26
Alpha value* [%]	25	10

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

Building Use

% Area	Building Type
100	**Retail/Financial and Professional Services**
	Restaurants and Cafes/Drinking Establishments/Takeaways
	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	7.6	10.15
Cooling	0.89	0.33
Auxiliary	7.04	3.71
Lighting	8.24	7.61
Hot water	22.42	20.12
Equipment*	44.75	44.75
TOTAL**	**46.19**	**41.91**

* 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	40.94	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*40.94*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	90.34	106.99
Primary energy [kWh_{PE}/m²]	10.19	62.51
Total emissions [kg/m²]	1.3	5.85

HVAC Systems Performance

System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	107.8	0	10.5	0	2.1	2.86	0	3.2	0
Notional	143	0	14.3	0	1.2	2.78	0	----	----
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	59.8	0	5.8	0	12	2.86	0	3.2	0
Notional	36.8	0	3.7	0	12.5	2.78	0	----	----
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	16	0	1.6	0	11.2	2.86	0	3.2	0
Notional	16.8	0	1.7	0	5.6	2.78	0	----	----
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	96.6	395.4	7.2	30.9	4.9	3.73	3.55	4	5
Notional	83.5	190	8.3	11.4	2.8	2.78	4.63	----	----
[ST] Central heating using air distribution, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	12.9	0	1.2	0	25.8	3.01	0	3.2	0
Notional	8	0	0.8	0	14.1	2.78	0	----	----
[ST] No Heating or Cooling									
Actual	0	0	0	0	0	0	0	0	0
Notional	0	0	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

Building Services
Consulting Engineers

8.2 Garden Centre BRUKL Report (without LZC technology)

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Haskins Forest Lodge Garden Centre (without LZC)

As designed

Date: Thu Dec 07 13:29:20 2023

Administrative information

Building Details

Address: Haskins Forest Lodge Garden Centre, Farnham, GU10 4LD

Certifier details

Name: Neil Bajaj

Telephone number: Phone

Address: Street Address, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.23

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.23

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

Foundation area [m²]: 6238.64

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	4.22	
Building CO_2 emission rate (BER), $kgCO_2/m^2$annum	11.07	
Target primary energy rate (TPER), kWh_{PE}/m^2annum	6.44	
Building primary energy rate (BPER), kWh_{PE}/m^2annum	89.02	
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	0.15	0.15	1_000015:Surf[3]
Floors	0.18	0.12	0.12	1_000015:Surf[0]
Pitched roofs	0.16	0.12	0.12	1_00000C:Surf[2]
Flat roofs	0.18	0.12	0.12	1_000015:Surf[1]
Windows** and roof windows	1.6	1.2	1.2	1_000015:Surf[2]
Rooflights***	2.2	1.3	1.3	1_00001E:Surf[1]
Personnel doors^	1.6	1.3	1.3	CN00000B:Surf[3]
Vehicle access & similar large doors	1.3	1.3	1.3	FF000003:Surf[0]
High usage entrance doors	3	-	-	No high usage entrance doors in building

$U_{a-Limit}$ = Limiting area-weighted average U-values [W/(m²K)]
U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]
U_{i-Calc} = Calculated maximum individual element 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	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- UFH System + NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	0.2	-	-
Standard value	0.93*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system	NO				

* Standard shown is for gas single boiler systems <=2 MW output and overall for multi-boiler systems. For single boiler systems >2 MW or any individual boiler in a multi-boiler system, limiting efficiency is 0.88.

2- DX + MVHR

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	5	0	-	0.7
Standard value	0.93*	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 gas single boiler systems <=2 MW output and overall for multi-boiler systems. For single boiler systems >2 MW or any individual boiler in a multi-boiler system, limiting efficiency is 0.88.

3- Restaurant Supply/Extract

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	0.2	1.9	0.7
Standard value	0.91	N/A	N/A	1.9^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system	NO				

^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

4- UFH System + Mech Vent

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	0.2	-	0.7
Standard value	0.93*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system	NO				

* Standard shown is for gas single boiler systems <=2 MW output and overall for multi-boiler systems. For single boiler systems >2 MW or any individual boiler in a multi-boiler system, limiting efficiency is 0.88.

5- UFH System + Ext

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	0.2	-	-
Standard value	0.93*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system	NO				

* Standard shown is for gas single boiler systems <=2 MW output and overall for multi-boiler systems. For single boiler systems >2 MW or any individual boiler in a multi-boiler system, limiting efficiency is 0.88.

1- DHW 10L POU

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.041
Standard value	1	N/A

2- DHW Restaurant

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.004
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
CASH OFFICE (WAREHOUSE)	-	-	-	1.5	-	-	-	-	-	-	N/A
CONFERENCE ROOM	-	-	-	1.5	-	-	-	-	-	-	N/A
STAFF ROOM	-	-	-	1.5	-	-	-	-	-	-	N/A
STAFFROOM SHOWERROOM	-	-	-	1.9	-	-	-	-	-	-	N/A
STAFFROOM WC	-	-	-	1.9	-	-	-	-	-	-	N/A
STAFFROOM WC	-	-	-	1.9	-	-	-	-	-	-	N/A
CHANGING PLACES	-	-	-	1.9	-	-	-	-	-	-	N/A
KITCHEN	-	-	1	-	-	-	-	-	1	-	N/A
DDA WC	-	-	-	1.9	-	-	-	-	-	-	N/A
FEMALE WASHROOM	-	-	-	1.9	-	-	-	-	-	-	N/A
MALE WASHROOM	-	-	-	1.9	-	-	-	-	-	-	N/A
OFFICE (KITCHEN)	-	-	-	1.5	-	-	-	-	-	-	N/A
WC (WAREHOUSE)	-	-	0.5	-	-	-	-	-	-	-	N/A
MEETING ROOM (WAREHOUSE)	-	-	-	1.5	-	-	-	-	-	-	N/A
ACC WC (WAREHOUSE)	-	-	0.5	-	-	-	-	-	-	-	N/A
AGM OFFICE (WAREHOUSE)	-	-	-	1.5	-	-	-	-	-	-	N/A
GM OFFICE (WAREHOUSE)	-	-	-	1.5	-	-	-	-	-	-	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
SALES AREA EXIT	120	-	-
PLANT	120	-	-
ENTRANCE LOBBY (WAREHOUSE)	120	-	-
CASH OFFICE (WAREHOUSE)	120	-	-
LOBBY (WAREHOUSE)	120	-	-

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
MEZZANINE PLANT	120	-	-
MEZZANINE PLANT	120	-	-
RESTAURANT	120	120	1.25
CONFERENCE ROOM	120	-	-
FIRE EXIT	120	-	-
STAFF ROOM	120	-	-
STAIRS TO ROOF	120	-	-
DRY STORE 1	120	-	-
STAFFROOM SHOWERROOM	120	-	-
STAFFROOM WC	120	-	-
STAFFROOM WC	120	-	-
DRY STORE 2	120	-	-
FIRE EXIT	120	-	-
CIRCULATION	120	-	-
CHANGING PLACES	120	-	-
KITCHEN	120	-	-
DDA WC	120	-	-
FEMALE WASHROOM	120	-	-
MALE WASHROOM	120	-	-
CLEANERS CUPBOARD	120	-	-
COLD ROOM	120	-	-
LAUNDRY	120	-	-
COSH	120	-	-
CIRCULATION	120	-	-
COLD ROOM	120	-	-
STORE (KITCHEN)	120	-	-
OFFICE (KITCHEN)	120	-	-
FREEZER	120	-	-
WC (WAREHOUSE)	120	-	-
MEETING ROOM (WAREHOUSE)	120	-	-
ACC WC (WAREHOUSE)	120	-	-
MAIN ENTRANCE LOBBY	120	-	-
RETAIL	120	120	1.25
OFFICE (WAREHOUSE)	120	-	-
AGM OFFICE (WAREHOUSE)	120	-	-
CUPBOARD (WAREHOUSE)	120	-	-
GM OFFICE (WAREHOUSE)	120	-	-
IT CUPD	120	-	-
WAREHOUSE	120	-	-

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?
CASH OFFICE (WAREHOUSE)	N/A	N/A
RESTAURANT	YES (+413.3%)	NO
CONFERENCE ROOM	YES (+58.8%)	NO
STAFF ROOM	YES (+76.7%)	NO
OFFICE (KITCHEN)	NO (-74.3%)	NO
MEETING ROOM (WAREHOUSE)	N/A	N/A
RETAIL	YES (+150.2%)	NO
OFFICE (WAREHOUSE)	NO (-70%)	NO
AGM OFFICE (WAREHOUSE)	N/A	N/A
GM OFFICE (WAREHOUSE)	N/A	N/A

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?	YES
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]	6097.9	6097.9
External area [m²]	13646.4	13646.4
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	5	4
Average conductance [W/K]	3686.95	3564.36
Average U-value [W/m²K]	0.27	0.26
Alpha value* [%]	25.32	10

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

Building Use

% Area	Building Type
100	**Retail/Financial and Professional Services**
	Restaurants and Cafes/Drinking Establishments/Takeaways
	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	27.17	31.17
Cooling	0.87	0.31
Auxiliary	7.08	3.17
Lighting	8.24	7.61
Hot water	22.42	20.12
Equipment*	44.75	44.75
TOTAL**	65.78	62.38

* 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	0	50.67
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*50.67*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	90.77	106.76
Primary energy [kWh_{PE}/m^2]	89.02	6.44
Total emissions [kg/m²]	11.07	4.22

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 SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: floor heating, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	108.4	0	37.1	0	2.1	0.81	0	0.91	0
	Notional	142.6	0	43.8	0	0.3	0.91	0	---	---
[ST] Central heating using water: floor heating, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	59.8	0	20.5	0	12	0.81	0	0.91	0
	Notional	36.4	0	11.2	0	12.5	0.91	0	---	---
[ST] Central heating using water: floor heating, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	19.3	0	6.6	0	11.2	0.81	0	0.91	0
	Notional	15.1	0	4.6	0	5.6	0.91	0	---	---
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	98.3	384.8	32.2	30.1	4.9	0.85	3.55	0.91	5
	Notional	84.6	179.7	25.9	10.8	2.8	0.91	4.63	---	---
[ST] Central heating using air distribution, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	13.9	0	4.5	0	26.1	0.86	0	0.91	0
	Notional	9.6	0	2.9	0	14.2	0.91	0	---	---
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	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

8.3 Garden Centre EPC (ASHP + PV)

Energy Performance Certificate
Non-Domestic Building

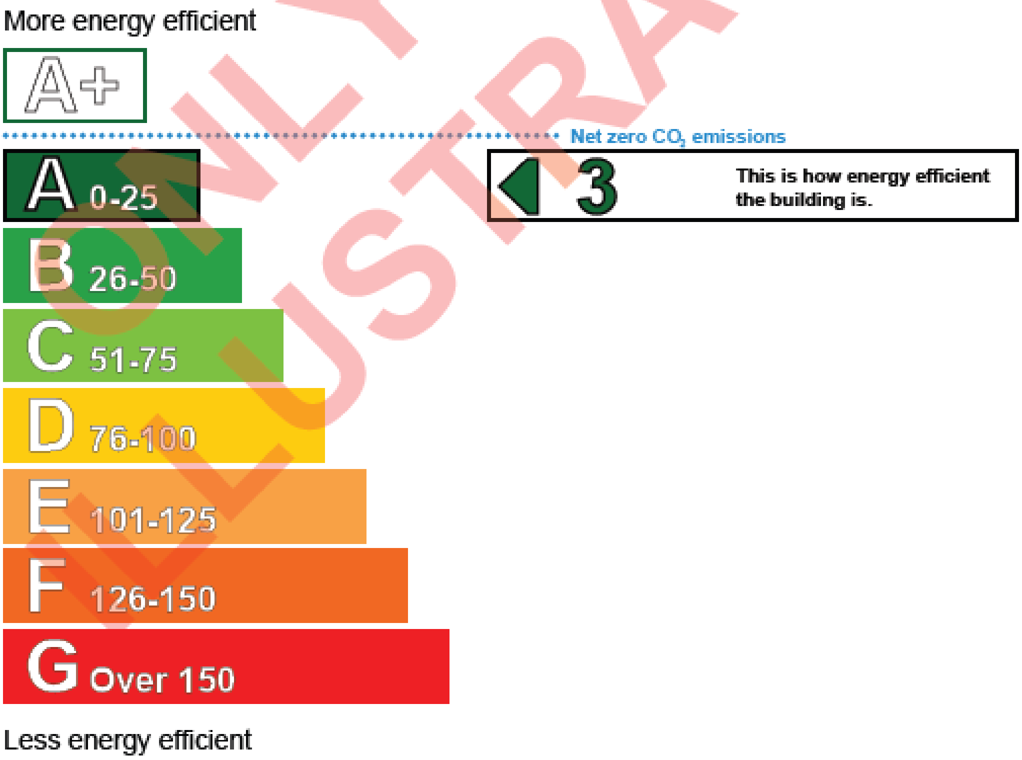
HM Government

Haskins Forest Lodge Garden Centre
Holt Pound
Farnham
GU10 4LD

Certificate Reference Number:
2141-8642-6044-5933-5987

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



Technical information

Main heating fuel:	Grid Supplied Electricity
Building environment:	Heating and Natural Ventilation
Total useful floor area (m^2):	6097.886
Building complexity:	Level 5
Building emission rate ($kgCO_2/m^2$ per year):	1.3
Primary energy use (kWh_{PE}/m^2 per year):	10.19

Benchmarks

Buildings similar to this one could have ratings as follows:

12 If newly built

48 If typical of the existing stock

Administrative information

This is an Energy Performance Certificate as defined in the Energy Performance of Buildings Regulations 2012 as amended.

Assessment Software:	Virtual Environment v7.0.24 using calculation engine ApacheSim v7.0.24
Property Reference:	UPRN-000000000000
Assessor Name:	Neil Bajaj
Assessor Number:	EES/027663
Accreditation Scheme:	Elmhurst Energy Systems
Assessor Qualifications:	NOS5
Employer/Trading Name:	Trading Name
Employer/Trading Address:	Trading Address
Issue Date:	05 Jan 2024
Valid Until:	04 Jan 2034 (unless superseded by a later certificate)
Related Party Disclosure:	Not related to the owner

Recommendations for improving the energy performance of the building are contained in the associated Recommendation Report: 0875-1555-4772-5470-9316

About this document and the data in it

This document has been produced following an energy assessment undertaken by a qualified Energy Assessor, accredited by Elmhurst Energy Systems. You can obtain contact details of the Accreditation Scheme at www.elmhurstenergy.co.uk.

A copy of this certificate has been lodged on a national register as a requirement under the Energy Performance of Buildings Regulations 2012 as amended. It will be made available via the online search function at www.ndepcregister.com. The certificate (including the building address) and other data about the building collected during the energy assessment but not shown on the certificate, for instance heating system data, will be made publicly available at www.opendatacommunities.org.

This certificate and other data about the building may be shared with other bodies (including government departments and enforcement agencies) for research, statistical and enforcement purposes. For further information about how data about the property are used, please visit www.ndepcregister.com. To opt out of having information about your building made publicly available, please visit www.ndepcregister.com/optout.

There is more information in the guidance document *Energy Performance Certificates for the construction, sale and let of non-dwellings* available on the Government website at: www.gov.uk/government/collections/energy-performance-certificates. It explains the content and use of this document and advises on how to identify the authenticity of a certificate and how to make a complaint.

Opportunity to benefit from a Green Deal on this property

The Green Deal can help you cut your energy bills by making energy efficiency improvements at no upfront costs. Use the Green Deal to find trusted advisors who will come to your property, recommend measures that are right for you and help you access a range of accredited installers. Responsibility for repayments stays with the property - whoever pays the energy bills benefits so they are responsible for the payments.

To find out how you could use Green Deal finance to improve your property please call 0300 123 1234.