Sustainability Statement

J5778 Bacon's Lane

Ref: J5778-B-RP-0001
Revision: 02
Status: S2

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REVISION HISTORY

Revision	Status	Date	Author	Reviewer	Approver
00	S2	16.09.2024	AE	PD	PD
01	S2	27.09.2024	AE	PD	PD
02	S2	07.11.2024	AE	PD	PD

1. EXECUTIVE SUMMARY

This report describes the sustainability strategy for the proposed development of 5 Bacon's Lane, London N6 6BL. The project consists of the construction of a 3-bedroom house with an area of approximately 306m^2 GIA. The proposed development will have a ground floor and one storey above.

The guidance and policies used in formulating this report are listed below and the resulting findings are compliant with the content of each;

- Camden Local Planning Documents
- Building Regulations Part L Volume 1

With creating an environmentally friendly scheme being of high priority for the client, the energy strategy proposed aims to achieve the best outcome in terms of sustainability and energy efficiency.

As demonstrated for the proposed energy hierarchy of the development, energy consumption and associated carbon emissions will be reduced through passive and active design measures.

In addition to measures reducing operational energy and associated carbon emissions, the embodied carbon content of materials used will be minimised as far as possible. It is the philosophy of the design team to design efficient, low carbon buildings.

	Regulated residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	1.6	65%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.6	23%
Cumulative on site savings	**2.1**	**87%**

2. INTRODUCTION

This report describes the sustainability strategy for the proposed development of 5 Bacon's Lane, London N6 6BL. The project consists of the construction of a 3-bedroom house with an area of approximately 306m^2 GIA. The proposed development will have a ground floor and one storey above.

This report sets out the sustainability strategy for the proposed development. In developing this strategy local and regional planning policies have been addressed.

Due to the development being below 500m^2 and less than five units, a full Energy Statement is not required. With the client committed to creating a sustainable and environmentally friendly development, this Sustainability Statement demonstrates that all measures feasible have been implemented to reduce environmental impact and improve efficiency as much as possible.

The proposed Sustainability Principles and Engineering Concepts incorporate the requirements and guidelines of the relevant British Standards and CIBSE Guides.

3. PLANNING POLICY BACKGROUND

The main planning documents which constitute the statutory development plan for Camden and form the basis on which decisions will be made for the proposed development are:

- Building Regulations Part L Volume 1
- Camden Planning Guidance – Local Plan 2017 & Energy Efficiency and Adaptation 2021
- London Plan 2021
- CIBSE Technical Manuals and Guides

3.1. Building Regulation Compliance

Building Regulations apply to all developments, and are in place to ensure buildings meet health, safety, welfare, convenience and sustainability standards; they focus on the technical aspects of designing and constructing a building.

The proposed development of 5 Bacon's Lane will be fully compliant with all revisions of the Building Regulations relevant to MEPH design. The most relevant document is the Part L Approved Document: Part L 2021 Volume 1: Conservation of Fuel and Power in Dwellings.

In line with 4.6, the thermal elements shall, as a minimum, be in compliance with the targets in Table 4.1. Please refer to Section 4.1 of the report for proposed target U-values for this project.

Table 4.1 Limiting U-values for new fabric elements and air permeability in new dwellings

Element type	Maximum U-value[1] $W/(m^2 \cdot K)$
All roof types[2]	0.16
Wall[2]	0.26
Floor	0.18
Party wall	0.20
Swimming pool basin[3]	0.25
Window[4][5]	1.6
Rooflight[6][7]	2.2
Doors (including glazed doors)	1.6
Air permeability	$8.0 m^3/(h \cdot m^2)$ @ 50Pa $1.57 m^3/(h \cdot m^2)$ @ 4Pa

All new thermal elements will be in line with Part L requirements. Compliance at the design stage is demonstrated by calculating the CO_2 emissions rate for the proposed development, known as the Building Emissions Rate (BER), which is compared to an equivalent notional building of the same geometry but with a set of benchmark performance characteristics as specified in the 2010 NCM modelling guide, known as the Target Emissions Rate (TER). Compliance is achieved when the BER is lower than TER.

In addition to the requirement for the BER to be lower than the TER of the notional building, the dwelling needs to achieve a lower dwelling fabric energy efficiency (DFEE) than the notional target fabric energy efficiency (TFEE) and lower primary energy rate (DPER) than that of the notional.

In addition to energy compliance, the development will need to be compliant with Part O: Overheating. A CIBSE TM59 overheating assessment has been carried out in order to demonstrate full compliance.

3.2. Camden Planning Guidance 2021

Camden Council strongly encourages projects to be energy and resource efficient. All proposed developments are required to minimise use of energy and other non-renewable resources, as well as to facilitate an increase in the use of low and zero carbon technologies to help reduce carbon dioxide (CO_2) emissions and air pollutants harmful to health.

The development is classified as a minor development and will therefore not need to meet the carbon reduction targets set out in the London Plan or the on-site renewable generation targets required for larger developments under the Camden planning guidance.

In accordance with Camden Local Plan, as the development is less than 500m^2 and less than five residential units, an Energy Statement is not required. However, performance against carbon reduction targets should be included in a Sustainability Statement based on SAP results. A minimum 19% overall reduction in carbon should be achieved. The unregulated consumption and associated emissions of the development should also be calculated.

All developments in Camden are expected to reduce carbon emissions through the application of the London Plan Energy Hierarchy:

- Use less energy (Be Lean);
- Supply energy efficiently (Be Clean)
- Use renewable energy (Be Green); and
- Monitor, verify and report on energy performance (Be Seen)

There is some emphasis in the planning guidance on dealing with future climate change while minimising the risk of overheating and providing comfortable environmental conditions. Measures to achieve this are set out under the cooling hierarchy.

As it is proposed to demolish the existing building onsite and replace it with the proposed, it needs to be demonstrated that it is not possible to retain and improve the existing and more beneficial to fully construct from new.

4. ENVIRONMENTAL DESIGN STRATEGY

It is proposed to use a number of energy efficiency measures to reduce the energy demand of the development in line with the energy hierarchy of Be Lean, Be Clean, Be Green and Be Seen.

4.1. Be Lean

The first step of the London Plan energy hierarchy is to reduce energy use through both passive and active lean design measures. A number of sustainable design and construction methods have been incorporated into the design of the building which comply with the requirement to reduce energy demand. These include:

High Performance Building Envelope

Element	Building Regulation Part L1 Limit U-Value [W/m^{2}K]	Average U-Value [W/m^{2}K] Design
External Wall	0.26	0.15
Ground Floor	0.18	0.10
Roof	0.16	0.16
Windows	1.60	1.20 (0.64 g-value)
Rooflights	2.20	1.20 (0.64 g-value)

Enhanced Air Tightness and Good Detailing

As a new development with a fabric first approach, good detailing shall be achieved in order to avoid the creation of thermal bridges in the fabric and meeting points of elements such as between walls and floors and ceilings. The development will target an air permeability of 1.50 m^3/h/m^2 at 50Pa or better.

Limit Overheating

Systems have been designed to minimise internal heat gains by creating as short as possible service runs and the use of low energy lighting. The façade will be designed in such a way as to maximise solar gains in colder winter months while limiting them in summer months. Exposed thermal mass will be utilised wherever possible to create a more comfortable internal environment.

Daylight

The maximisation of daylight is one of the most important environmental factors for buildings. Artificial lighting contributes up to 25% of the energy costs of a typical building, despite operation largely within daylight hours. Anecdotal evidence also suggests that the provision of good levels of natural light can contribute to enhanced health and well-being. The design shall maximise daylight while limiting solar gains during summer months as much as is technically feasible.

Ventilation

Large openable windows will allow for natural ventilation. Background ventilation from mechanically ventilated heat recovery units will assist in extracting warm air from the rooms.

Heating

An air source heat pump system will provide heating and hot water. Heating controls feature a programmer, TRVs and bypass, with a delayed start thermostat. Heating delivered via an underfloor heating system.

Efficient Systems

Use of efficient systems and equipment with suitable time and temperature controls which have been appropriately commissioned such that the systems can be operated efficiently.

Minimization of lengths and diameters of 'dead legs'. Efficient components i.e. fans, pumps, refrigeration equipment have been appropriately sized to have no more capacity for demand and standby than is required for the task to operate at their optimum levels.

Insulation of pipework, ductwork and hot water systems have been selected to be in line with the future highest standards.

Minimising Water Usage

The design shall incorporate water saving strategies, such as low flush toilets, and non-concussive spray taps in order to keep the maximum water usage to 105 litres/person per day (in accordance with Policy SI5 Water Infrastructure of London Plan 2021. Water consumption will be monitored. Other features shall include mains leak detection and sanitary shut-off.

Energy Efficient Lighting and Appliances

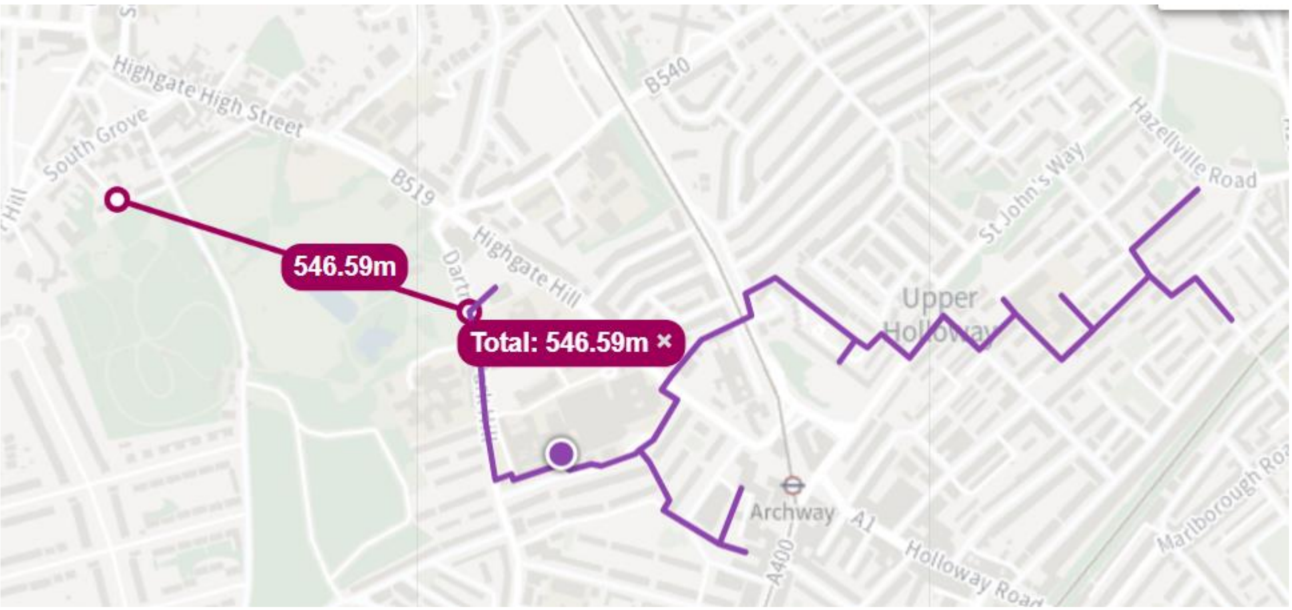
Provision of the required lighting levels whilst minimizing energy consumption by appropriate specification of light fittings and effective control of lighting systems by:

- Specifying 100% of the fixed internal light fittings as dedicated energy efficient fixtures.
- Having suitable energy consumption metering.
- Ensuring systems have been appropriately commissioned.
- Using lighting systems which are efficient and make use of daylight where possible/practical.
- Provision of low output or energy efficient external lighting.
- Avoiding the use of external lighting when communal spaces are unoccupied or during the day by means PIR, daylight sensors and time controls.

A lighting efficacy of average 100 lumens per circuit watt has been used as the design standard. This will be achieved including LED lighting sources throughout.

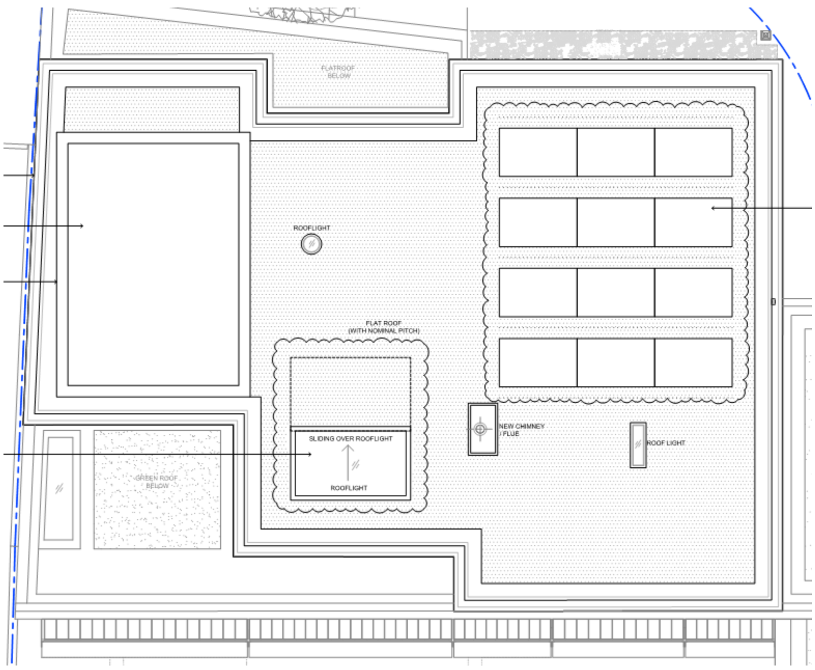
4.2. Be Clean

The site is approximately 550m from the proposed Archway Heat Network energy centre. Due to the development location, it is not proposed to connect to an existing low carbon heat network.



4.3. Be Green

The viability of renewable systems such as Photovoltaic Panels, Solar Thermal, and Heat pumps has been assessed. It is currently proposed to utilise ASHP technology to provide heating and hot water. The external units shall be fitted at ground floor level of the property. 12 photovoltaic panels, with a maximum capacity of 4.74kWp, will be installed on the roof to generate onsite renewable electricity.



4.4. Be Seen

Sufficient information about the building, the fixed building services and their maintenance requirements will be provided to the occupier so that the building can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances. The systems provided within the development will allow for monitoring to ensure they are run at optimum performance.

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5. LOW AND ZERO CARBON TECHNOLOGIES

The following section provides a feasibility analysis of Low or Zero Carbon (LZC) technologies for use at Bacon's Lane. There are various options when it comes to LZC technology, but a combination of project constraints rules these out. The constraints are:

- Capital expenditure
- Return on Investment
- Carbon savings potential
- Clean energy output potential
- Spatial requirements
- Operation and maintenance requirements
- Planning requirements

Out of the technologies considered the following were discounted immediately for this site:

- Ground-source heat pumps: not sufficient space for ground-loop or boreholes
- Hydroelectric: there are no suitable water courses or hydroelectric plants near the site.
- Hydrogen: generation and storage are still in the experimental stage at this scale and no systems are currently commercially available.
- Biomass: planning energy and carbon targets rule out the use of a gas boilers or alternatives (including CHP or biomass CHP). It is also considered not a viable solution due to issues with emissions and transport.
- CHP: as above.
- Biomass CHP: as above.
- Wind Turbines: wind turbine technology is not suitable for high density areas and those within close proximity to residential properties.

The feasibility study therefore reviewed the use of the following technologies to offset CO_2 emissions:

- Air Source Heat Pumps
- Photovoltaics
- Solar Thermal Panels

5.1. Feasibility of LZC Technologies

5.1.1. Air Source Heat Pump

An air to water heat pump uses the air as a heat sink and transfers the heat in the external space into the heating system. The temperature of the Low Temperature Hot Water (LTHW) providing the heating also affects the efficiency (coefficient of performance – COP) of the units, with the ideal flow and return temperatures being 45°C/35°C.

This limits the heating output that is possible using traditional radiator systems or underfloor heating systems. To ensure comfort levels in peak winter conditions, fabric upgrades are required to match the heat pump output to the building heat loss.

Air-source heat pumps (ASHP) need to be located externally, away from noise sensitive receptors. It is proposed to place these at ground floor level.

Considering the proposed design, ASHPs are considered appropriate for the project and included as part of the Architect's proposals.

5.1.2. Solar Photovoltaic (PV) Panels and Detailed information

Photovoltaic (PV) Panels are a renewable technology which will decrease the amount of electricity from the grid used in the building, particularly during the summer months when the solar irradiance is at its peak. Panels can be integrated within the building roof or stand alone; most efficient when south facing and angled at 30° from the horizontal. Such panels would reduce carbon emissions from the electrical uses within the building.

12 panels with a maximum capacity of 4.74kWp is proposed for the development.

5.1.3. Solar Thermal Systems

Solar thermal panels would need to be roof-mounted or integrated into a new roof structure. Flat plate or evacuated tube type panels could be used. The solar thermal panels would be used to heat water which can be used for the domestic hot water supply to the dwelling.

With an all-electric building services strategy proposed, PV panels are considered a more suitable technology.

6. COOLING HIERARCHY

The building will be designed in line with the cooling hierarchy outlined in Policy SI4 Managing heat risk in London Plan 2021 and referenced in the Camden planning guidance. The following measures will be followed at each stage of the hierarchy in order to reduce the demand for cooling.

6.1. Minimising Internal Heat Gains

Stage one of the Cooling Hierarchy is to minimise internal heat generation through energy efficient design.

Heat distribution infrastructure will be designed to minimise pipe lengths. This will be achieved at coordination stage, ensuring pipework is well insulated and that pipe configurations minimise heat loss. Good daylighting and high efficiency light fittings with simple controls will also help to reduce excess heat gains from artificial lighting. Low energy lighting will be specified throughout.

6.2. Reducing Heat Entering the Building

Design and massing of development will maximise daylight availability while minimising internal solar gains in summer months. High performance glazing with a low solar transmittance will help limit overheating due to solar gains. Incorporation of shading and exposed thermal mass will also help to limit solar gains in the summer.

6.3. Passive Ventilation

Openable windows in rooms will allow sufficient natural cross ventilation to prevent overheating.

6.4. Mechanical Ventilation

The MVHR will employ a summer bypass mode in order to maintain a comfortable internal environment along with extracting warm air from spaces.

6.5. Active Cooling

It is not proposed to have any active cooling.

7. OVERHEATING RISK ANALYSIS

The measures described in the Cooling Hierarchy set out how overheating risk will be mitigated through passive design measures.

Using a dynamic thermal model, the residential development has been tested for overheating to ensure a comfortable internal environment is achieved. The chosen method of testing is CIBSE thermal comfort metric **TM59: Design methodology for the assessment of overheating risk in homes**. Compliance for naturally ventilated homes is based on passing both of the following two criteria:

1. The number of hours during which ΔT of indoor air temperature to outdoor is greater than or equal to one degree (K) during the period of May to September shall not exceed 3% of occupied hours.

2. For bedrooms only: to guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26 °C for more than 1% of annual hours.

Methodology

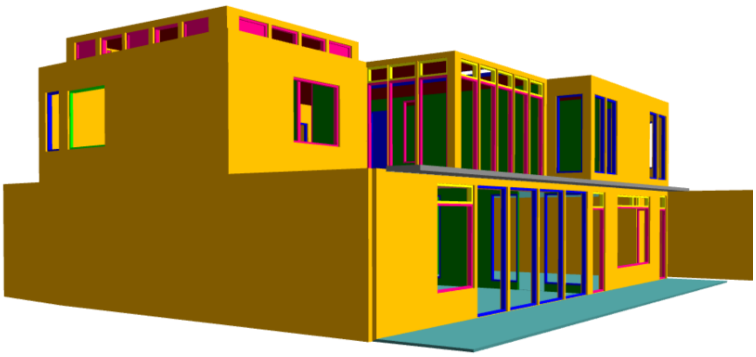
Following CIBSE TM59 guidelines, an assessment was carried out using a dynamic thermal model, which accounts for the building's location, orientation and construction types. Occupancy and usage were also factored in through the internal gains profiles that are specified under TM59.

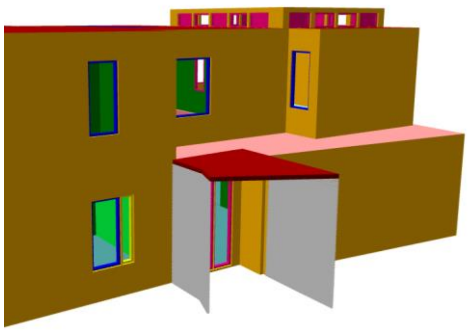
Windows were assumed to be double-glazed. All openable windows, sliding glass doors and internal doors are assumed to begin opening when temperatures reach 22°C, fully opening at 26°C between 8AM and 11PM. For windows on the first floor, if temperatures at 11PM exceed 23°C, they will remain open until 8AM, as stated in TM59. The aperture assignments and openable portions for different window and door types can be found in the first table. The baseline model did not feature any exposed thermal mass and assumes the U-values listed in the following table, along with a g-value of 0.64 for all glazing.

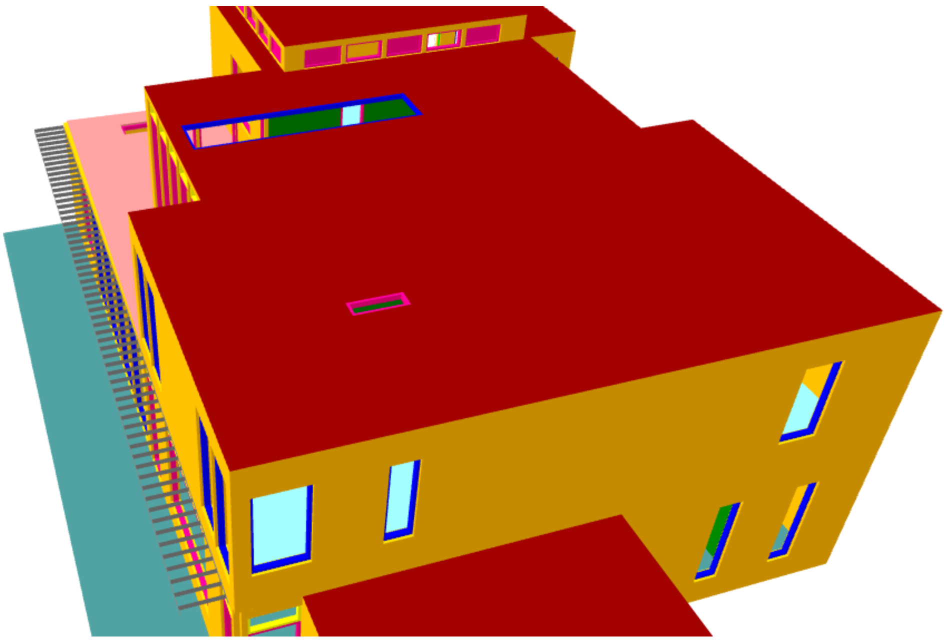
Window colour	Openable portion
Pink	Fixed
Green	50%
Blue	85%
Yellow	50%

Element	U-values
Rooflight	1.2
Roof	0.16
External Wall	0.15
Glazing (windows and doors)	1.20
Ground Floor	0.10

The following images illustrate the development with the proposed increase in purge ventilation windows and awnings on the 1F windows.





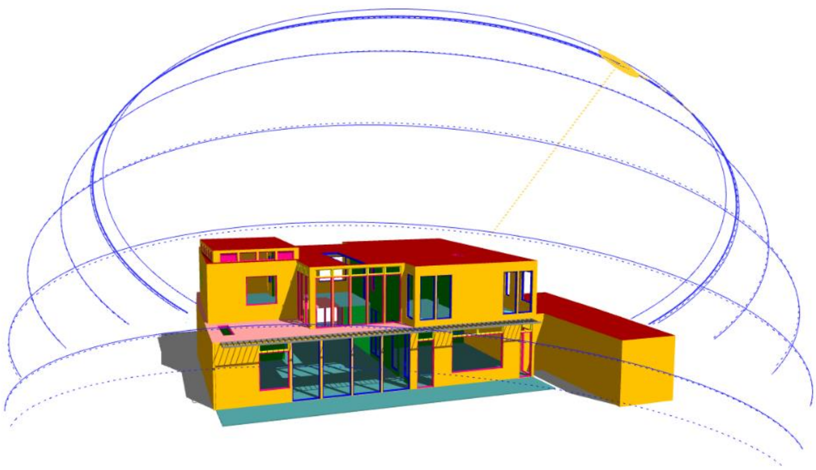


Overheating Results

The development was simulated with exposed stone tiles at a thickness of 25mm, 50mm and 75mm, applied in the soffit of the kitchen, dining and living room space at ground floor level along with the internal wall interfacing the entrance hallway and Bedroom 3. Along with adding thermal mass, night-time purge ventilation was also introduced to cool the stone at night, effectively recharging it and allowing it to emit lower temperatures for the next day. Increased purge ventilation openings were added to the kitchen and full height windows on the first floor. Exposed stone at 50mm was the most effective in reducing overheating hours, and results show that thermal mass in the soffit was able to slightly reduce overheating in the kitchen and dining area. Introducing thermal mass have shown significant improvement in the GF bedroom, almost halving the number of hours in the evening. This is because exposed thermal mass has the ability to absorb and retain heat, which lowers the spaces' internal temperatures and moderates any changes in temperature throughout the day.

			Baseline		GF Stone Soffit (50mm) + purge vent		Internal wall w/ stone tiles (50mm) + purge vent		GF Stone soffit and internal wall (50mm) + purge vent		Stone GF soffit and internal wall (50mm) + MVHR	
Zone Name	Max. Exceedable Hours	Max Exceedable Night Hours	Criterion 1: #Hours Exceeding Comfort Range	Criterion 2: Number of Night Hours Exceeding 26 °C for Bedrooms.	Criterion 1: #Hours Exceeding Comfort Range	Criterion 2: Number of Night Hours Exceeding 26 °C for Bedrooms.	Criterion 1: #Hours Exceeding Comfort Range	Criterion 2: Number of Night Hours Exceeding 26 °C for Bedrooms.	Criterion 1: #Hours Exceeding Comfort Range	Criterion 2: Number of Night Hours Exceeding 26 °C for Bedrooms.	Criterion 1: #Hours Exceeding Comfort Range	Criterion 2: Number of Night Hours Exceeding 26 °C for Bedrooms.
1F Bedroom 1	110	32	81	45	81	44	81	45	81	44	77	12
1F Bedroom 2	110	32	25	22	25	22	25	22	25	22	25	11
1F Studio	59	N/A	87	N/A	86	N/A	86	N/A	86	N/A	81	N/A
GF Bedroom 3	110	32	30	59	30	58	31	56	31	56	24	30
GF Kitchen / Dining	59	N/A	317	N/A	311	N/A	311	N/A	311	N/A	272	N/A
GF Living	59	N/A	158	N/A	157	N/A	156	N/A	156	N/A	125	N/A

Despite the inclusion of exposed thermal mass and adjustments to the MVHR ventilation rates, the results indicate that these measures have limitations in reducing overheating hours to an acceptable level in the kitchen and dining area. Being that it is a critical space to guarantee thermal comfort, additional measures were explored. As shown in the figure below, there are significant solar gains through the full height windows on the first floor, which greatly impacts the overheating performance of the space. To reduce these solar gains, the model was tested with external blinds, fins, and awnings.



Various options for external shading to achieve full TM59 compliance, such as fins, awnings and external blinds. Following these tests, external blinds were incorporated on the south-facing ground floor windows along with west-facing windows of the atrium and Studio. These blinds had a solar transmittance of 15%. In introducing these blinds, solar gains were significantly reduced, which enabled all zones to meet full TM59 compliance. With a compliant strategy, the development was tested against the more onerous weather scenarios of DSY2 and DSY3. It should be noted that full compliance does not need to be achieved for these scenarios.

By implementing exposed thermal mass, natural ventilation and external shading to the development, it is able to comply with the TM59 criteria for overheating.

			External Blinds DSY1		External Blinds DSY2		External Blinds DSY3	
Zone Name	Max. Exceedable Hours	Max Exceedable Night Hours	Criterion 1: #Hours Exceeding Comfort Range	Criterion 2: Number of Night Hours Exceeding 26 °C for Bedrooms.	Criterion 1: #Hours Exceeding Comfort Range	Criterion 2: Number of Night Hours Exceeding 26 °C for Bedrooms.	Criterion 1: #Hours Exceeding Comfort Range	Criterion 2: Number of Night Hours Exceeding 26 °C for Bedrooms.
1F Bedroom 1	110	32	60	8	91	26	129	32
1F Bedroom 2	110	32	23	10	56	35	79	33
1F Studio	59	N/A	37	N/A	68	N/A	95	N/A
GF Bedroom 3	110	32	15	24	44	65	59	81
GF Kitchen / Dining	59	N/A	57	N/A	88	N/A	132	N/A
GF Living	59	N/A	11	N/A	45	N/A	51	N/A

8. ENERGY ASSESSMENT

An energy assessment has been carried out to demonstrate how the targets for regulated CO_2 emissions reduction over and above 2021 Building Regulations will be met using the energy hierarchy outlined in Policy SI2 Minimising greenhouse gas emissions in the London Plan.

Energy consumption and associated carbon emissions have been calculated using approved SAP software and, using the GLA Carbon Emission Reporting Spreadsheet, a sitewide performance has been established. The unregulated energy demands of the development have been estimated based on CIBSE Guide F.

SAP software was used to output a Target Emissions Rate (TER) based on the notional building and a Dwelling Emissions Rate (DER) for the development for each stage of the energy hierarchy outlined below:

- Lean – energy efficiency measures. Compared against a notional building with fabric and system efficiencies as stipulated by GLA Energy Assessment Guidance Appendix 3
- Clean – Same as Lean
- Green – ASHP technology, with actual efficiencies providing heating and hot water, along with PV generation

Additionally, a study has been carried out to demonstrate the energy and associated carbon savings from the demolition of the existing house on site and construction of proposed development.

See Appendix A for full SAP results.

8.1. SAP Model

The SAP model for the proposed development were tested in accordance with the energy hierarchy set by the London and Local Plan.

The following fabric U-values have been assigned for the proposed development.

Building Element	U-value (W/m^2K)
External Wall	0.15
Roof	0.16
Exposed Floor	0.10

Glazing	U-value (W/m^2K)	g-value
Double Glazed Windows	1.20	0.64
Rooflights	1.20	0.64

As a new build, it is assumed a good level of detailing and sealing will be possible. An air permeability of 1.5 m^3/hm^2 @ 50Pa has been assigned. Heating is provided by an ASHP with notional heating and hot water efficiencies at Be Lean stage, with heating efficiency increased to 326% at Be Green stage, and mechanically ventilated with heat recovery. Artificial lighting has been assigned a luminous efficacy of 100 lm/W. 12 PV panels with a maximum capacity of 4.74 kWp has been modelled at Be Green stage.

8.2. Unregulated Energy

The unregulated energy uses for the development has been estimated by the methods and average values described in CIBSE Guide F and TM54: Evaluating operational energy performance of buildings at the design stage. The table below shows the electrical equipment that is used in the residential development. The number of items of equipment has been estimated based on the number of bedrooms as per architectural information.

The power consumption of the equipment has been taken from the CIBSE Guide F 2012, paragraph 12.2. The installed capacity (nameplate rating) does not give an accurate estimate of energy use, so the 'average power consumption' as well as 'sleep mode' consumption have been used for the calculation.

The usage hours of the electrical equipment depend on the operating hours. The number of hours per day takes into account the intermittent usage and the variation of the operation from hour to hour and day to day. Instead of use a diversity factor multiplied by the power consumption, is going to be used an estimated number of hours. Overnight and weekend energy use can contribute significantly to small power energy and has been included. The equation below explains the calculation of the energy consumption.

Annual energy consumption (kWh) =

Number of equipment × {[average power consumption during operation × annual hours of operation] + [sleep mode consumption × (8760 - hours of operation)]}

EQUIPMENT	QUANTITY INSTALLED	AVERAGE POWER DEMAND	SLEEP-MODE POWER DEMAND	HOURS OF OPERATION/DAY	TOTAL HOURS/YEAR	ENERGY CONSUMPTION
		(W)	(W)	hours/day	hours/year	(kWh)
laptops	4	40	4	8	2080	359.52
screens	3	60	10	8	2080	441.20
multifunction devices	2	135	60	2	728	678.48
miscellaneous	6	15		8	2912	262.08
microwave	1	800		0.5	182	145.60
fridge	1	130	20	24	8760	1,138.80
cooking equipment	1	850		2	730	620.50
					TOT (kWh)	**3,646.18**
					Unregulated/m2 (kWh/m2/yr)	**11.18**
					kgCO2/yr	**506.82**
					kgCO2/m2/yr	**1.55**

8.3. Results

The proposed passive and active design measures along with renewable technologies for the development results in an overall improvement over Part L of 87%, with a 65% improvement observed from energy efficiency measures. As previously outlined, as a minor development under Local and London Plan, an overall carbon reduction of 19% or more should be achieved. The degree of improvement observed comfortably meets this target, and the targets of 10% improvement at Be Lean stage and 35% at Be Green required for major developments.

	Regulated residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	1.6	65%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.6	23%
Cumulative on site savings	**2.1**	**87%**

9. ENERGY STUDY

In accordance with Local Plan requirements, a study was carried out in order to understand the benefits of demolishing the current property and replacing it with the proposed development.

The proposal to demolish and re-build the existing building at 5 Bacons Lane, from a structural perspective, is based on the following rationale:

The existing building has suffered movement causing damage to the property. This damage was the subject of an insurance claim in 2006 for the necessary repairs to the superstructure, which were subsequently completed. It is believed that no remedial works were undertaken to the building's foundations.

Today the building shows signs of further movement; apparent with cracks visible in the floor finishes and in the walls of the property. This suggests that movement, albeit slight, is ongoing. The cause of the ongoing movement could be investigated further, and remedial works outlined to repair the damage caused. However, this has been done before and proven not be adequate.

Part of the North and West elevations align with the new proposals so could potentially be incorporated in the new layouts. However, these cavity walls are unlikely to meet current building regulations for thermal performance. These walls are rendered which is not in keeping with the local vernacular.

The proposed house layout has the potential for a small area of the existing fabric to be retained and incorporated. However, would compromise the overall performance of the new house.

Designing and building a new property will ensure that the house is fit for purpose, meets the current building regulations and is built to meet current embodied and operational carbon targets – resulting in a new property that minimises its long-term impact on the environment.

In addition to this an energy study was carried out to demonstrate from an environmental perspective that proposed development will lead to a more energy efficient solution than if it was attempted to retain the existing house and build an extension to it.

A SAP model for the existing house, refurbishment plus extension, and proposed development were created in order to gauge the energy and carbon savings. The following fabric U-values were assigned for the models.

The existing development consists of the main house which was refurbished in 2007 and the annex which was not thermally upgraded at the time. It is assumed thermal elements and windows of the main house were upgraded to minimum standards as stipulated by Part L 2006, and the annex to have uninsulated elements and single-glazed windows.

For the refurbished scenario it was assumed that the retained elements and windows of the annex were upgraded to Part L 2021 minimum standards with the main house not upgraded as fabric performance is already in line with threshold U-values as given in Table 4.3. The extension to main house and annex, to reflect design of the proposed new development, was assigned U-values as those given previously for the proposed elements.

The proposed development was modelled as described in Section 8.1.

Building Element	**U-value (W/m^2K)**
Annex Wall	1.50
Refurbished Wall	0.35
New External Wall	0.15
Annex Roof	2.50
Refurbished Roof	0.25
New Roof	0.10
Annex Floor	0.80
Refurbished Floor	0.25
New Floor	0.10

Glazing	**U-value (W/m^2K)**	**g-value**
Annex Single Glazed Windows & Rooflights	5.80	0.60
Refurbished Double Glazed Windows & Rooflights	1.80	0.40
New Double Glazed Windows & Rooflights	1.20	0.40

For the existing house, it is assumed poor airtightness is present with an air permeability of 10 m^3/hm^2. Heating and hot water is provided by a gas boiler system with an efficiency of 89%. The building is naturally ventilated with extract fans provided to wet rooms. Artificial lighting has a luminous efficacy of 60 W/lm.

For the refurbishment scenario, it is assumed a good level of detailing and sealing will be possible and that air permeability can be improved to 5 m^3/hm^2 @ 50Pa. Heating is provided by an ASHP with heating and hot water efficiencies of 326%, and mechanically ventilated with heat recovery. Artificial lighting has been assigned a luminous efficacy of 100 lm/W. 12 PV panels with a maximum capacity of 4.74 kWp has been modelled at Be Green stage.

For the proposed development the same MEP strategy and inputs as for the refurbishment was assigned. Due to higher thermal performance and ability to ensure much better detailing than if trying to seal an existing building, an air permeability of 1.5 m^3/hm^2 @ 50Pa was assigned.

As the results indicate below, in addition to ensuring structural safety, demolishing and rebuilding will lead to the most energy and carbon efficient design.

	Existing	**Refurb**	**Proposed**
Annual Carbon Emissions (kg CO2)	7103.132	707.42	316.22
Annual Regulated Energy Consumption (kWh)	36226.26	4160.85	1637.71

10. WATER CONSUMPTION

The design shall incorporate water saving strategies, such as low flush toilets, and non-concussive spray taps to keep the water use as low as possible. Water consumption will be monitored. Other features shall include mains leak detection and sanitary shut-off.

11. AIR QUALITY

It is proposed to install an air source heat pump to provide heating and hot water. This shall replace the gas boiler system of the existing house resulting in the elimination of local NO_x and particulate matter emissions. This will improve local air quality.

12. MATERIALS

The development will maximise the use of recycled, responsibly sourced and low impact materials. This will greatly reduce the embodied carbon of the development.

To promote resource efficiency via the effective management and reduction of construction waste. The proposed development will implement a Site Waste Management Plan (SWMP).

Demolition waste will be minimised, reused and recycled, where practicable.

These measures will aid in minimising waste to landfill, with the aim of diverting at least 95% of demolition and construction waste from landfill.

13. OPERATIONAL SUSTAINABILITY

As stated in Section 4.4 Be Seen, sufficient information about the building, the fixed building services and their maintenance requirements will be provided to the occupant so that the building can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances. The systems provided within the development will allow for monitoring to ensure they are run at optimum performance via user-friendly controls, and metering.

High efficiency equipment and appliances will be installed throughout. Where white goods are to be provided fridges and freezers will be A+ rated under the EU Energy Efficiency Rating Scheme, washing machines and dishwashers will be A rated.

14. SUSTAINABLE DRAINAGE

The proposed drainage strategy aims to re-use the existing drainage where possible and its connection into the existing combined Thames Water sewer.

The new building will be served by a separate surface water and foul water drainage discharging into an existing demarcation chamber which eventually connects into the existing public sewer.

Green roofs have been proposed where possible to reduce surface water run-off, improve water quality and enhance biodiversity.

15. CONCLUSION

In line with the Local and London Plan, Planning Policy, and the project Planning conditions, this Sustainability Statement outlines the Environmental Design Strategy for the development and demonstrates the energy efficiency and renewable energy measures applied are able to achieve significant onsite carbon reductions in line with the energy hierarchy.

The works consist of providing high performance thermal fabric together with a new highly efficient heating and hot water, and ventilation system. This results in an overall improvement and reduction of regulated energy consumption and associated carbon emissions of 87% over Part L.

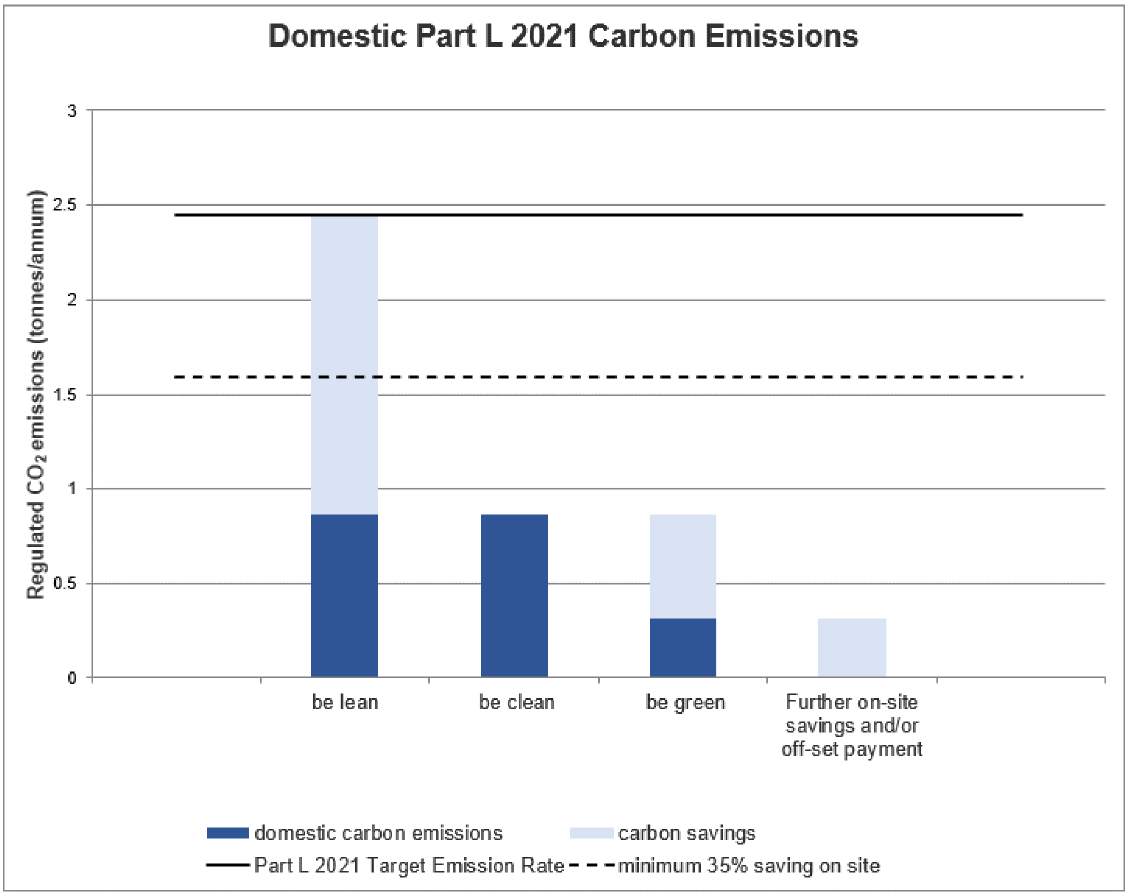
The baseline regulated emissions for the development have been calculated in accordance with Part L of the Building Regulations to be 2.4 tonnes CO_2/year.

When applying proposed construction details and U-Values to all thermal elements and highly efficient means of distributing heating and hot water within the development, the measures equate to a decrease in CO_2 emissions of 65% over the Part L or 1.6 tonnes CO_2/year savings. The use of ASHPs to supply heating and hot water along with electricity generation from photovoltaic panels further reduces energy consumption and associated carbon emissions. A 87% savings in carbon emissions is achieved. The Local Plan states a minimum of 19% carbon reduction should be achieved for minor residential projects. The final calculated regulated emissions of the development is 0.3 tonnes CO_2/year.

This report demonstrates how the energy and sustainability strategy of the development achieves compliance with Building Regulations, Local and London planning policy. Based on the constraints of the site, the report demonstrates how the most energy and carbon efficient design solution has been achieved. In addition to energy efficiency, the development's adaptability to climate change is demonstrated with the proposed steps of the cooling hierarchy along with demonstration of overheating assessment showing full CIBSE TM59 compliance.

	Carbon Dioxide Emissions for residential buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	2.4	0.5
After energy demand reduction (be lean)	0.9	0.5
After heat network connection (be clean)	0.9	0.5
After renewable energy (be green)	0.3	0.5

	Regulated residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	1.6	65%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.6	23%
Cumulative on site savings	**2.1**	**87%**



APPENDIX A – SAP CALCULATIONS

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Stroma SAP 10.2 SAP 10 program, 10.2

Date: Fri 20 Sep 2024 14:40:46

Project Information			
Assessed By	Webb Yates Engineers	Building Type	House, Detached
OCDEA Registration	STRO037816	Assessment Date	2024-08-28

Dwelling Details			
Assessment Type	As designed	Total Floor Area	326 m^2
Site Reference	J5778 - Bacons Lane LEAN 200924	Plot Reference	J5778
Address	N6 6BL		

Client Details	
Name	Not Provided
Company	Not Provided
Address	Not Provided, Not Provided, WF10 5QU

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*7.51 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	2.66 $kgCO_2/m^2$	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*40.47 kWh_{PE}/m^2*	
Dwelling primary energy	28.02 kWh_{PE}/m^2	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*42.8 kWh/m^2*	
Dwelling fabric energy efficiency	39.5 kWh/m^2	OK

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.15	External Wall (0.15)	OK
Party walls	*0.2*	N/A	N/A	**N/A**
Curtain walls	*1.6*	N/A	N/A	**N/A**
Floors	*0.18*	0.1	Ground Floor (0.1)	OK
Roofs	*0.16*	0.16	Roof (0.16)	OK
Windows, doors, and roof windows	*1.6*	1.4	1 (1.4)	OK
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: External Wall	255.851	0.15
Ground floor: Ground Floor	182	0.1 **(!)**
Exposed roof: Roof	176.53	0.16

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
1, Windows (1)	56.229	South East	0.9	1.4
2, Windows (1)	14.14	North West	0.9	1.4
3, Windows (1)	9.9	North East	0.9	1.4
4, Windows (1)	12.03	South West	0.9	1.4
5, Roof windows (1)	5.47	South	0.9	1.4

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))
Building part **1 - Main Dwelling**: SAP default y-value (0.2 W/m^2K) used for thermal bridging

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	1.5 m^3/hm^2, Design value **(!)**	OK
Air permeability test certificate reference	Not Provided	

4 Space heating		
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity		
Efficiency	264.0%	
Emitter type	Underfloor	
Flow temperature	45°C	
System type		
Manufacturer		
Model		
Commissioning		
Secondary heating system: N/A		
Fuel	N/A	
Efficiency	N/A	
Commissioning		

5 Hot water		
Cylinder/store - type: Cylinder		
Capacity	300 litres	
Declared heat loss	2.09 kWh/day	
Primary pipework insulated	Yes	
Manufacturer		
Model		
Commissioning		
Waste water heat recovery system 1 - type: N/A		
Efficiency		
Manufacturer		
Model		

6 Controls		
Main heating 1 - type: Programmer, TRVs, and bypass		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	100 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.94 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	91%	OK
Manufacturer/Model		
Commissioning	Not Provided / Not Provided	

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence
N/A

12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:	Date:	
b. Client Declaration		
N/A		

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Stroma SAP 10.2 SAP 10 program, 10.2

Date: Thu 07 Nov 2024 14:01:59

Project Information			
Assessed By	Webb Yates Engineers	Building Type	House, Detached
OCDEA Registration	STRO037816	Assessment Date	2024-08-28

Dwelling Details			
Assessment Type	As designed	Total Floor Area	326 m^2
Site Reference	J5778 - Bacons Lane GREEN 071124	Plot Reference	J5778
Address	N6 6BL		

Client Details	
Name	Not Provided
Company	Not Provided
Address	Not Provided, Not Provided, WF10 5QU

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*7.51 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	0.97 $kgCO_2/m^2$	**OK**
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*40.47 kWh_{PE}/m^2*	
Dwelling primary energy	14.79 kWh_{PE}/m^2	**OK**
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*42.8 kWh/m^2*	
Dwelling fabric energy efficiency	39.4 kWh/m^2	**OK**

2a Fabric U-values

Element	*Maximum permitted average U-Value [W/m^2K]*	Dwelling average U-Value [W/m^2K]	Element with highest individual U-Value	
External walls	*0.26*	0.15	External Wall (0.15)	**OK**
Party walls	*0.2*	N/A	N/A	**N/A**
Curtain walls	*1.6*	N/A	N/A	**N/A**
Floors	*0.18*	0.1	Ground Floor (0.1)	**OK**
Roofs	*0.16*	0.16	Roof (0.16)	**OK**
Windows, doors, and roof windows	*1.6*	1.4	1 (1.4)	**OK**
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))

Name	Net area [m^2]	U-Value [W/m^2K]
Exposed wall: External Wall	255.851	0.15
Ground floor: Ground Floor	182	0.1 **(!)**
Exposed roof: Roof	176.53	0.16

2c Openings (better than typically expected values are flagged with a subsequent (!))

Name	Area [m^2]	Orientation	Frame factor	U-Value [W/m^2K]
1, Windows (1)	56.229	South East	0.9	1.4
2, Windows (1)	14.14	North West	0.9	1.4
3, Windows (1)	9.9	North East	0.9	1.4
4, Windows (1)	12.03	South West	0.9	1.4
5, Roof windows (1)	5.47	South	0.9	1.4

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))

Building part **1 - Main Dwelling**: SAP default y-value (0.2 W/m^2K) used for thermal bridging

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	1.5 m^3/hm^2, Design value **(!)**	**OK**
Air permeability test certificate reference	Not Provided	

4 Space heating		
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity		
Efficiency	326.0%	
Emitter type	Underfloor	
Flow temperature	45°C	
System type		
Manufacturer		
Model		
Commissioning		
Secondary heating system: N/A		
Fuel	N/A	
Efficiency	N/A	
Commissioning		

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	300 litres
Declared heat loss	2.09 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls	
Main heating 1 - type: Programmer, TRVs, and bypass	
Function	
Ecodesign class	
Manufacturer	
Model	
Water heating - type: Cylinder thermostat and HW separately timed	
Manufacturer	
Model	

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	100 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.94 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	91%	OK
Manufacturer/Model		
Commissioning	Not Provided / Not Provided	

9 Local generation	
Technology type: **Photovoltaic system (1)**	
Peak power	4.74 kWp
Orientation	Horizontal
Pitch	Horizontal
Overshading	None or very little
Manufacturer	Not Provided
MCS certificate	

10 Heat networks
N/A

11 Supporting documentary evidence
N/A

12 Declarations

a. Assessor Declaration

This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.	

Signed:	Assessor ID:
Name:	Date:

b. Client Declaration

N/A

APPENDIX B – GLA SPREADSHEET

The applicant should complete all the light blue cells including information on the modelled units, the area per unit, the number of units, the TER/DER/BER and the TFEE/DFEE.

RESIDENTIAL CO_2 ANALYSIS (PART L1)																				
				Baseline		'Be Lean'	'Be Clean'	'Be Green'	Fabric Energy Efficiency (FEE)		Baseline		'Be Lean'			'Be Clean'			'Be Green'	
Unit identifier (e.g. plot number, dwelling type etc.)	Model total floor area (m²) (Row 4)	Number of units	Total area represented by model (m²)	TER ($kgCO_2$ / m^2) (Row 273)	Energy saving/generation technologies (-) ($kgCO_2$ p.a.) (Row 269)	DER ($kgCO_2$ / m^2) (Row 273 or 384)	DER ($kgCO_2$ / m^2) (Row 273 or 384)	DER ($kgCO_2$ / m^2) (Row 273 or 384)	Target Fabric Energy Efficiency (kWh/m²)	Dwelling Fabric Energy Efficiency (kWh/m²)	Part L 2021 CO_2 emissions ($kgCO_2$ p.a.)	Energy saving/generation technologies ($kgCO_2$ p.a.)	Part L 2021 CO_2 emissions ($kgCO_2$ p.a.)	Part L 2021 CO_2 emissions with Notional PV savings included ($kgCO_2$ p.a.)	'Be Lean' savings ($kgCO_2$ p.a.)	Part L 2021 CO_2 emissions ($kgCO_2$ p.a.)	Part L 2021 CO_2 emissions with Notional PV savings included ($kgCO_2$ p.a.)	'Be Clean' savings ($kgCO_2$ p.a.)	Part L 2021 CO_2 emissions ($kgCO_2$ p.a.)	'Be Green' savings ($kgCO_2$ p.a.)
Bacon's Lane	326	1	326	7.51	0.00	2.66	2.66	0.97	40.47	28.02	2,448	0	867	867	1,581	867	867	0	316	551
Sum		1	326	7.5	0.0	2.7	2.7	1.0	40.5	28.0	2,448	0	867	867	1,581	867	867	0	316	551
NON-RESIDENTIAL CO_2 ANALYSIS (PART L2)																				
				Baseline		'Be Lean'	'Be Clean'	'Be Green'			Baseline		'Be Lean'			'Be Clean'			'Be Green'	
Building Use	Model Area (m²)	Number of units	Total area represented by model (m²)	BRUKL TER ($kgCO_2$ / m^2)	BRUKL Displaced electricity (-) (kWh / m^2)	BRUKL BER ($kgCO_2$ / m^2)	BRUKL BER ($kgCO_2$ / m^2)	BRUKL BER ($kgCO_2$ / m^2)			Part L 2021 CO_2 emissions ($kgCO_2$ p.a.)	Energy saving/generation technologies ($kgCO_2$ p.a.)	Part L 2021 CO_2 emissions ($kgCO_2$ p.a.)	Part L 2021 CO_2 emissions with Notional PV savings included ($kgCO_2$ p.a.)	'Be Lean' savings ($kgCO_2$ p.a.)	Part L 2021 CO_2 emissions ($kgCO_2$ p.a.)	Part L 2021 CO_2 emissions with Notional PV savings included ($kgCO_2$ p.a.)	'Be Clean' savings ($kgCO_2$ p.a.)	Part L 2021 CO_2 emissions ($kgCO_2$ p.a.)	'Be Green' savings ($kgCO_2$ p.a.)
Sum		0	0	0.0	0.0	0.0	0.0	0.0			0	0	0	0	0	0	0	0	0	0
SITE-WIDE ENERGY CONSUMPTION AND CO_2 ANALYSIS																				
Total Sum			326	-	-	-	-	-			2,448	0	867	867	1,581	867	867	0	316	551

Part L 2021 Performance

Residential

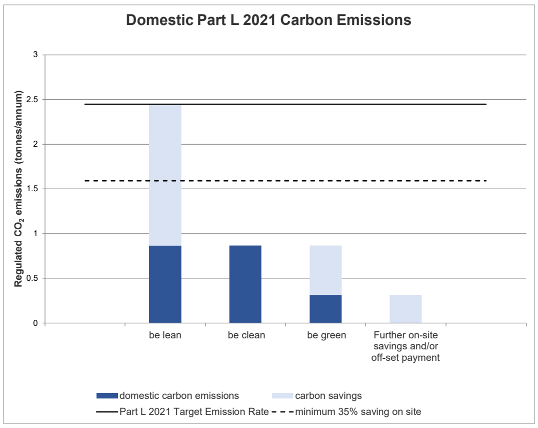
Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for residential buildings

	Carbon Dioxide Emissions for residential buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	2.4	0.5
After energy demand reduction (be lean)	0.9	0.5
After heat network connection (be clean)	0.9	0.5
After renewable energy (be green)	0.3	0.5

Table 2: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for residential buildings

	Regulated residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	1.6	65%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.6	23%
Cumulative on site savings	**2.1**	**87%**
Annual savings from off-set payment	0.3	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**9**	-
Cash in-lieu contribution (£)	**901**	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development Information' tab



Non-residential

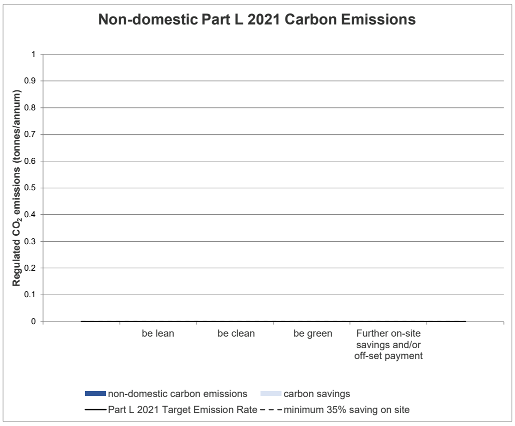
Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for non-residential buildings

	Carbon Dioxide Emissions for non-residential buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	0.0	
After energy demand reduction (be lean)	0.0	
After heat network connection (be clean)	0.0	
After renewable energy (be green)	0.0	

Table 4: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for non-residential buildings

	Regulated non-residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	0.0	0%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.0	0%
Total Cumulative Savings	**0.0**	**0%**
Annual savings from off-set payment	0.0	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**0**	-
Cash in-lieu contribution (£)	**0**	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development Information' tab



SITE-WIDE

	Total regulated emissions (Tonnes CO_2 / year)	CO_2 savings (Tonnes CO_2 / year)	Percentage savings (%)
Part L 2021 baseline	2.4		
Be lean	0.9	1.6	65%
Be clean	0.9	0.0	0%
Be green	0.3	0.6	23%
Total Savings	-	2.1	87%
	-	CO_2 savings off-set (Tonnes CO_2)	-
Off-set	-	9.5	-

	Target Fabric Energy Efficiency (kWh/m²)	Dwelling Fabric Energy Efficiency (kWh/m²)	Improvement (%)
Development total	40.47	28.02	31%

	Area weighted non-residential cooling demand (MJ/m²)	Total non-residential cooling demand (MJ/year)
Actual		
Notional		

EUI & space heating demand (predicted energy use)

Residential

Building type	EUI (kWh/m²/year) (excluding renewable energy)	Space heating demand (kWh/m²/year) (excluding renewable energy)	EUI value from Table 4 of the guidance (kWh/m²/year) (excluding renewable energy)	Space heating demand from Table 4 of the guidance(kWh/m²/year) (excluding renewable energy)	Methodology used (e.g. 'be seen' methodology or an alternative predictive energy modelling methodology)	Explanatory notes (if expected performance differs from the Table 4 values in the guidance)

Non-residential

Building type	EUI (kWh/m²/year) (excluding renewable energy)	Space heating demand (kWh/m²/year) (excluding renewable energy)	EUI value from Table 4 of the guidance (kWh/m²/year) (excluding renewable energy)	Space heating demand from Table 4 of the guidance(kWh/m²/year) (excluding renewable energy)	Methodology used (e.g. 'be seen' methodology or an alternative predictive energy modelling methodology)	Explanatory notes (if expected performance differs from the Table 4 values in the guidance)