34 BELSIZE LANE

ENERGY & SUSTAINABILITY ASSESSMENT

MARCH 2024

EEP REF: 4262

ENVIRONMENTAL
ENGINEERING
PARTNERSHIP

CONSULTING ENGINEERS

The Chapel House,
High Street, West Wycombe,
Buckinghamshire.
HP14 3AG
Telephone: 01494 464544
Facsimile: 01494 464282
e-mail: consulting@eep.co.uk
Website: eep.co.uk

EEP Project Services Ltd trading as
Environmental Engineering Partnership

Directors:
Nigel V Bowater IEng MASHRAE MIHEEM
Neil Reynolds MSc BEng CEng MCIBSE

Associate Directors:
Ashley Barrett EngTech LCIBSE
Dr Tygue S Doyle BEng EngD
Isabelle Phillips BEng MIE

Consultants:
Martin R Clark MSc BSc CEng MCIBSE
David Gadsdon BSc CEng MIMechE MCIBSE
David Simcox IEng ACIBSE

Company Registration No. 02584221
Registered in England
VAT Number GB 314 0971 80

BSRIA Member

Contents

Author	Revision	Date
MH	P1	15/03/24
MH	P2	19/03/24
MH	P3	26/03/24

INTRODUCTION

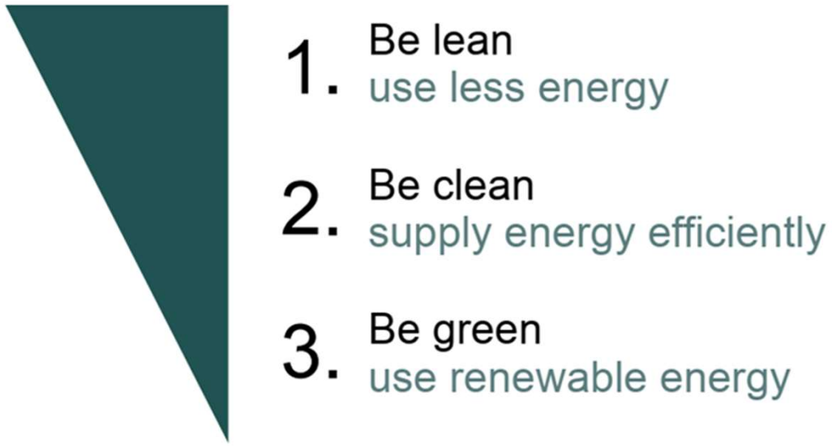
The Mayor is committed to making London a zero-carbon city and with almost 80% of the city's emissions coming from buildings, therefore there is a big drive to tackle emissions starting with new build and major refurbishment projects.

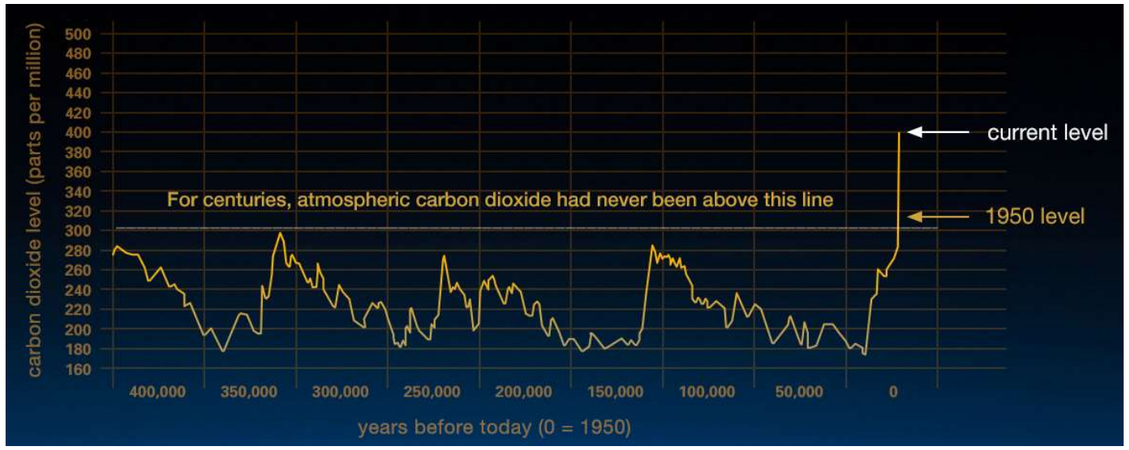
34 Belsize Lane resides in Hampstead, which comes under the Camden Local Plan 2017 which covers the necessary local council's planning policies which set out the various energy and sustainability targets for project's requiring planning consent. The Camden Local Plan is the name given to a group of policies that altogether form the development plan for Camden.

This energy assessment will look at the relevant policies within the required plans and shall demonstrate how this development plans to apply the principles of each policy in both the architectural and building services design.

34 Belsize Lane resides in Hampstead, Camden and the relevant sections in The Camden Local Plan 2017 are:

1. Policy CC1 Climate change mitigation
2. Policy CC2 Adapting to climate change





Policy and Context

Building Regulations Approved Document L1A 2021 – Conservation of fuel and power in existing dwelling

The Regulations place a legal requirement for the Building CO_2 Emission Rate (calculated using an approved software package) must be less than the Target Emission Rate for which there is prescribed method for calculating.

The intention of the Government is to reduce the regulated carbon emissions from buildings and in each amendment to the Regulations, the requirement for CO_2 reductions increases. The process for this building is different to most as it is Grade 2 listed which signifies that the work required need not comply fully with the energy efficiency requirements where to do so would unacceptably alter the dwellings character or appearance.

The London Plan

The Mayor's London Plan sets targets and provides guidance to the 32 London boroughs and the Corporation of the City of London for the spatial development of London to 2036. The current version was updated in March 2021.

Policy and Context

The Camden Local Plan

Policy CC1: Climate Change Mitigation

The Energy Hierarchy

The energy hierarchy is a sequence of steps that minimise the energy consumption of a building. Buildings designed in line with the energy hierarchy priorities lower cost passive design measures, such as improved fabric performance over higher cost active systems such as renewable energy technologies. The following diagram shows a simplified schematic of the energy hierarchy, which is explained further in supplementary planning document Camden Planning Guidance on sustainability.

Be Lean

Proposals should demonstrate how passive design measures including the development orientation, form, mass, and window sizes and positions have been taken into consideration to reduce energy demand, demonstrating that the minimum energy efficiency requirements required under building regulations will be met and where possible exceeded.

Be Clean

The second stage of the energy hierarchy 'be clean' should demonstrate how the development will supply energy efficiently through clean energy systems.

Be Green

The "be green" stage of the energy hierarchy requires that developments make use of renewable technologies to achieve the sites overall carbon dioxide emissions target.

Resource efficiency, demolition and retrofitting existing buildings

Existing buildings have significant impact on Camden's CO_2 emissions, the Council will support proposals that seek to sensitively improve the energy efficiency of existing buildings. All efforts have been made to improve the efficiency of 34 Belsize lane without the need for significant demolition or extension. The scope of work will follow the guidance set out by the Camden council surrounding listed buildings, which can be found in the 'Retrofitting planning guidance'.

Policy CC1 Climate change mitigation

The Council will require all development to minimise the effects of climate change and encourage all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation.

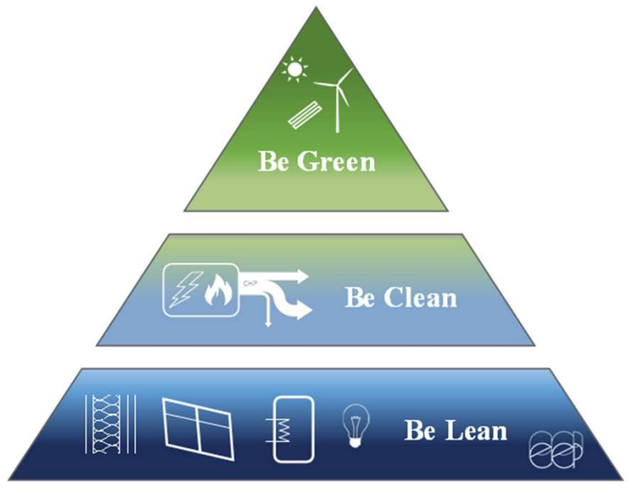
We will:

a. promote zero carbon development and require all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy;
b. require all major development to demonstrate how London Plan targets for carbon dioxide emissions have been met;
c. ensure that the location of development and mix of land uses minimise the need to travel by car and help to support decentralised energy networks;
d. support and encourage sensitive energy efficiency improvements to existing buildings;
e. require all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building; and
f. expect all developments to optimise resource efficiency.

For decentralised energy networks, we will promote decentralised energy by:

g. working with local organisations and developers to implement decentralised energy networks in the parts of Camden most likely to support them;
h. protecting existing decentralised energy networks (e.g. at Gower Street, Bloomsbury, King's Cross, Gospel Oak and Somers Town) and safeguarding potential network routes; and
i. requiring all major developments to assess the feasibility of connecting to an existing decentralised energy network, or where this is not possible establishing a new network.

To ensure that the Council can monitor the effectiveness of renewable and low carbon technologies, major developments will be required to install appropriate monitoring equipment.



Policy and Context

The Camden Local Plan,

Policy CC2: Adapting to climate change

- To minimise the risks connected with climate change the constituents of 34 Belsize lane have anticipated changes to the climate. The Camden Plan 2017 states 'It is understood that some adaptation measures may be challenging for listed buildings and some conservation areas', so all efforts where possible are being made to help mitigate the effects of climate change.

- The cooling hierarchy will be implemented into the design process to establish the spaces within the property which will require cooling.

- A new green roof for bio-diversity, storm water runoff and rainwater attenuation will be implemented on the extension roof as a sustainable drainage system.

Policy CC2 Adapting to climate change

The Council will require development to be resilient to climate change.

All development should adopt appropriate climate change adaptation measures such as:

a. the protection of existing green spaces and promoting new appropriate green infrastructure;
b. not increasing, and wherever possible reducing, surface water run-off through increasing permeable surfaces and use of Sustainable Drainage Systems;
c. incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate; and
d. measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy.

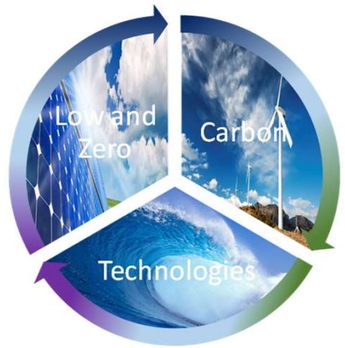
Any development involving 5 or more residential units or 500 sqm or more of any additional floorspace is required to demonstrate the above in a Sustainability Statement.

Sustainable design and construction measures

The Council will promote and measure sustainable design and construction by:

e. ensuring development schemes demonstrate how adaptation measures and sustainable development principles have been incorporated into the design and proposed implementation;
f. encourage new build residential development to use the Home Quality Mark and Passivhaus design standards;
g. encouraging conversions and extensions of 500 sqm of residential floorspace or above or five or more dwellings to achieve "excellent" in BREEAM domestic refurbishment; and
h. expecting non-domestic developments of 500 sqm of floorspace or above to achieve "excellent" in BREEAM assessments and encouraging zero carbon in new development from 2019.

Low and Zero Carbon Technologies



Before undertaking any energy assessment, it is important to review the Low and Zero Carbon (LZC) technologies available and their suitability to the project. There are several factors influencing the decision to pursue any LZC installation and these include; location, local environment, political drivers, feasibility (financial and technical) and marketability. In the following sections various available LZC technologies will be reviewed before presenting a decision matrix that will define which technologies will be pursued and tested.

Solar Thermal Collectors

Solar water heating (SWH) using solar thermal collectors is a well proven technology and payback periods are relatively short. There are two main types of collector technology – flat plate collectors and evacuated tube collectors. Evacuated tubes are more efficient, around 20% (including better operation on cloudy days) and can produce higher temperature water up to around 150°C for processes that may be useful in kitchens. An Annual outputs of approximately 450 – 600+ kWh/yr per m^2 of collector (flat plate – evacuated) could be possible for a fully optimised installation.

SWH collection panels can achieve net efficiencies around 50%, which is much higher than that of PVs. On the negative side they are slightly more maintenance intensive as PVs benefit from not having any moving parts nor any wet services (i.e. pipework).

Photovoltaics

PVs are one of the few true zero carbon energy technologies available on the market. There are no moving parts and therefore they require very low maintenance. Systems can be easily integrated into almost any surface at any point in building's life (including fit-out) without major intervention.

The annual solar availability in London is around 1000 kWh/m^2 cumulative solar radiation incident on an unobstructed (unshaded) horizontal surface. Photovoltaic cells (PV) convert that solar energy (sunlight) into electricity. They are commonly manufactured into glazed collectors which can be ground mounted, roof mounted or building-integrated. The performance of PVs is heavily influenced by over-shadowing. 10% shading could result in 80% loss in electrical performance.

Low and Zero Carbon Technologies

Wind Turbines

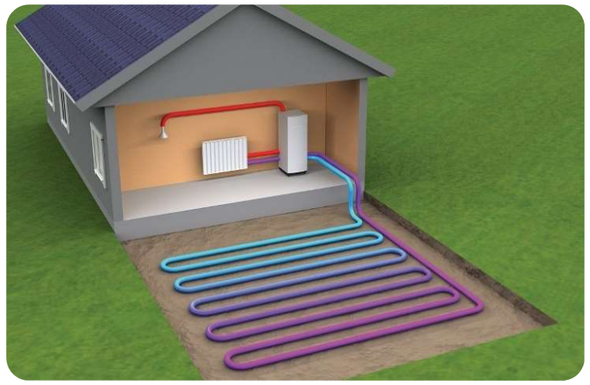
Wind turbines convert the kinetic energy contained in a flowing air/wind mass into electrical energy using an electrical generator.

The following criteria pertaining to this technology have been taken into account for the preliminary viability assessment–visual impacts, noise, intermittent power production, local planning such as height restrictions, impacts on migratory paths of birds, interference with radio and/or TV signals and so on.

The amount of energy which can be extracted is proportional to the square of the turbine diameter and the cube of the wind speed hence the size of the turbine is critical for the viability of an installation. Wind turbines are also known to be quite loud during operation as the mechanically driven generator can be quite noisy.

Heat Pumps

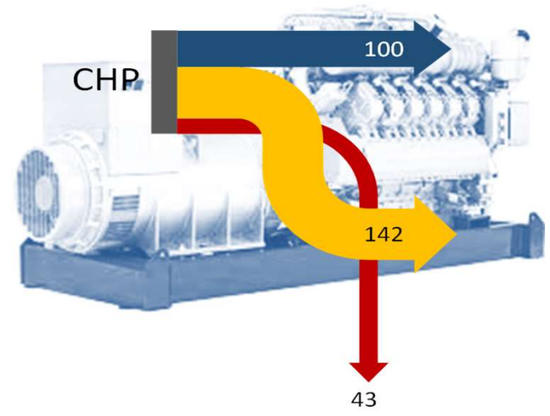
Properly designed and installed heat pumps offer very low carbon space heating and can also provide low carbon cooling. The pumps are powered by electricity although there are variants such as gas-fired absorption units available - albeit with lower efficiencies. Heat pumps take low temperature heat and upgrade it to a higher more useful temperature. The heat source can be from the external ambient air, a nearby water source or the ground. Ambient air and ground as the source of renewable energy have been considered in this assessment.



Combined Heat and Power

There are various types of co-generation (i.e. CHP/CCHP) prime movers, typically gas turbines, gas engines and fuel cells - or a mix thereof. It is possible that in a modular system some co-generation units could run on biomass (e.g. wood pellets), biofuels, bio-methane from anaerobic digestion of organic wastes, or syngas generated from wastes (e.g. cooking oils, municipal solid waste).

A key requisite for good practice co-generation is that the plant should operate for at least 5,000 hours per annum, i.e. that there is a significant base load for heat all year round - both day and night. Any scheme should as a minimum conform to the CHPQA Good Quality CO-GENERATION Standards (which will also ensure compliance with the EC CO-GENERATION Directive).



Low and Zero Carbon Technology Decision Matrix applicable at 34 Belsize lane

	Technology	Lifecycle Carbon Saving Potential	Grants	Lifecycle Costs	Space Requirements	Planning Restrictions	Noise	Appropriate for the site	Reason for inclusion / exclusion
Solar Energy	**Solar Hot Water**	Low	Renewable Heat Incentive	Medium	Low	Suitable	Suitable	Suitable	Feasible but reduces the number of PV panels which offer greater CO_2 savings.
	Photovoltaics	Low-Medium	Feed-In Tariff	High	Low	Suitable	Suitable	Suitable	Tested and shown to provide substantial CO_2 savings.
Wind Energy	**Wind Turbines**	Low-Medium	Feed-In Tariff	Medium	Medium-High	Not acceptable	Noise from gears and generator	Not suitable for urban areas	Noisy and not suitable in urban areas (due to turbulence coming from surrounding buildings).
Heat Pumps	**Ground Source Heat Pumps**	Medium	Renewable Heat Incentive	Medium-High	Low	Suitable	Suitable	Not suitable	Limited ground space due to tree root protection zone
	Air Source Heat Pumps	Low-Medium	Renewable Heat Incentive	Low	Low	Suitable	Fan & compressor noise	Suitable	ASHP tested and found to provide substantial savings during heating and cooling.
Co-generation and alternative fuels	**Biomass Boilers**	Medium	Renewable Heat Incentive	Medium-Low	Medium	PM10 particulate	Consideration for vehicle noise during regular fuel deliveries to be considered	Not suitable	Discounted due to concerns over emissions, air quality, noise from deliveries and concerns over fuel supplies.
	Biomass CHP	High	Renewable Heat Incentive	Medium	Medium	PM10 particulate		Not suitable	
	Gas-fired CHP	Medium	Feed-In Tariff	Medium-Low	Low	Suitable	Located in acoustically treated plnatrooms	Not suitable	Discounted due to conserns over noise and required demand being too low to be cost effective
	Gas-fired CCHP	Medium	Feed-In Tariff	Medium-High	Low	Suitable		Not suitable	
	Fuel Cell CHP/CCHP	Medium	Feed-In Tariff	High	Low	Suitable	Suitable	Not suitable	
	District Heating/cooling	Medium-High	Renewable Heat Incentive	Medium	Low	Suitable	Suitable	N/A	No networks or future networks planned for the area.
Hydro Power	**Small Scale Hydro Power**	Low	Feed-In Tariff	Low	N/A	N/A	N/A	N/A	Not applicable due geographical restrictions.
	Tidal Power	Low	Feed-In Tariff	Low	N/A	N/A	N/A	N/A	
	Wave Power	Low	Feed-In Tariff	Low	N/A	N/A	N/A	N/A	

Technology to be considered
Technology unfeasible or non-applicable

COOLING HIERARCHY

Overheating and Cooling

Several measures have been adopted to reduce the risk of overheating and mitigating the need for cooling, whilst at the same time trying to maximise the views to the North and South.

Passive design measures to prevent solar gains entering the building include:

- Glazing ratios have been adjusted for optimisation of solar gain.
- Double glazing has been specified with very low g-values

Passive design measures that have been implemented to mitigate heat gain within the building include:

- Internal heat gains will be reduced through the specification of low heat emitting LED light fittings
- Exposed thermal mass
- Naturally, ventilated living quarters
- Green roof for bio-diversity, storm water runoff and rainwater attenuation.

Cooling provision will be limited to the areas where dynamic thermal modelling proves that passive measures alone are not enough to maintain thermal comfort levels.

The proposed cooling system shall utilise Fan Coil units as they offer the largest capacity for the best efficiency, cooling measures are prominent due to the substantial amount of glazing from the existing listed structure.

Annual CO_2 Emission Calculation – Be lean

Modelling Inputs **Scenario : Be Lean**

	Value	Unit	Notes
External Wall - U-value	0.15 - 0.13	$W/m^2.K$	
Ground Floor - U-value	0.1	$W/m^2.K$	
Roof - U-value	0.11	$W/m^2.K$	
Window - U-value	1.2 & 1.0	$W/m^2.K$	
Window - g-value	0.40		
Air permeability	3.0	$m^3/hr/m^2$	
Electricity power factor	> 0.95		
Lighting efficacies	30 -50	lm/cW	
Ventilation SFPs	n/a	W/l/s	
Heat Exchanger Efficiency	n/a		
Heating Boiler efficiency	70%		Condensing boiler
DHW boiler efficiency	70%		Condensing boiler

The 'Be Lean' scenario is used to identify the building's current demand and has been used to identify reduction measures that are to be incorporated on the project including;

- Fabric insulation and glazing specification

To maximise passive energy savings that become inherent to the building and to comply with the circular economy plan outlined in the Camden plan, the fabric parameters of the building are going to be renovated with a high level of insulation being achieved with and new elements for parameters which cannot be improved. The first-floor extension will have U-Values which exceed current L1 Building Regulations.

- Lighting efficacy and controls

Through the use of low energy LED light fittings, we can provide a 10-fold improvement on the old tungsten and fluorescent fittings meaning significant energy savings can be achieved by optimising the lighting design. Lighting can account for as much as 25% of the building's energy consumption and through design can be reduced by 75%.

- Efficient mechanical services design strategy

The current Building Regulations set a minimum standard for system efficiencies and there are several approaches that can be used. Selection will depend on the building environment that include factors such as; size, location, use and local authorities. To meet the building's proposed ventilation requirements, the proposed design shall include a mechanical ventilation system with heat recovery as well as natural ventilation provided via trickle vents at windows.

Annual CO_2 Emission Calculation – Be Clean

Modelling Inputs

Scenario : Be Clean

	Value	Unit	Notes
External Wall - U-value	0.15 – 0.13	W/m².K	Ground and First
Ground Floor - U-value	0.1	W/m².K	
Roof - U-value	0.11	W/m².K	
Window - U-value	1.20 & 1.0	W/m².K	Double glazed unit - centre pane u-value
Window - g-value	0.40		
Air permeability	3	m³/hr/m²	
Electricity power factor	> 0.95		
Lighting efficacies	90 - 100	lm/cW	
Ventilation SFPs	0.5 - 1.5	W/l/s	MVHR & toilet extract fans
Heat Exchanger Efficiency	> 87%		
Heating efficiency	3.5	SCOP	Heat Pump
Cooling efficiency	3.5	EER	Heat Pump
DHW efficiency	3.3		Heat Pump

The 'Be Clean' scenario is used to identify the building's current demand and has been used to identify reduction measures that are to be incorporated on the project including;

- MVHR

Mechanical ventilation heat recovery allows the occupant to control moisture and air changes throughout the day without losing a lot of heat energy, with the low U-values outlaid in the proposed study stale air , dust and pollen build up is a possibility and MVHR would improve the overall air quality of the domestic property.

- Air Source Heat Pump

To ensure that an Air Source Heat Pump runs efficiently the system needs to be accurately sized. The size of a heat pump depends on factors, including outdoor design temperature, desired room temperature and the system flow and return temperatures. The proposed plan for the ASHP installation is shown in appendix B.

Annual CO_2 Emission Calculation – Be Green

Modelling Inputs **Scenario : Be Green**

	Value	Unit	Notes
External Wall - U-value	0.15 – 0.13	W/m².K	Ground and First
Ground Floor - U-value	0.1	W/m².K	
Roof - U-value	0.11	W/m².K	
Window - U-value	1.20 & 1.0	W/m².K	Double glazed unit - centre pane u-value
Window - g-value	0.40		
Air permeability	3	m³/hr/m²	
Electricity power factor	> 0.95		
Lighting efficacies	90 - 100	lm/cW	
Ventilation SFPs	0.5 - 1.5	W/l/s	MVHR & toilet extract fans
Heat Exchanger Efficiency	> 87%		
Heating efficiency	3.5	SCOP	Heat Pump
Cooling efficiency	3.5	EER	Heat Pump
DHW efficiency	3.3		
PV efficiency	22.7		
PV solar conversion factor	95.0%		Easily accessible for maintenance

The 'Be Green' scenario modelling input shows the significant thermal improvements and associated carbon reduction measures proposed for the project including;

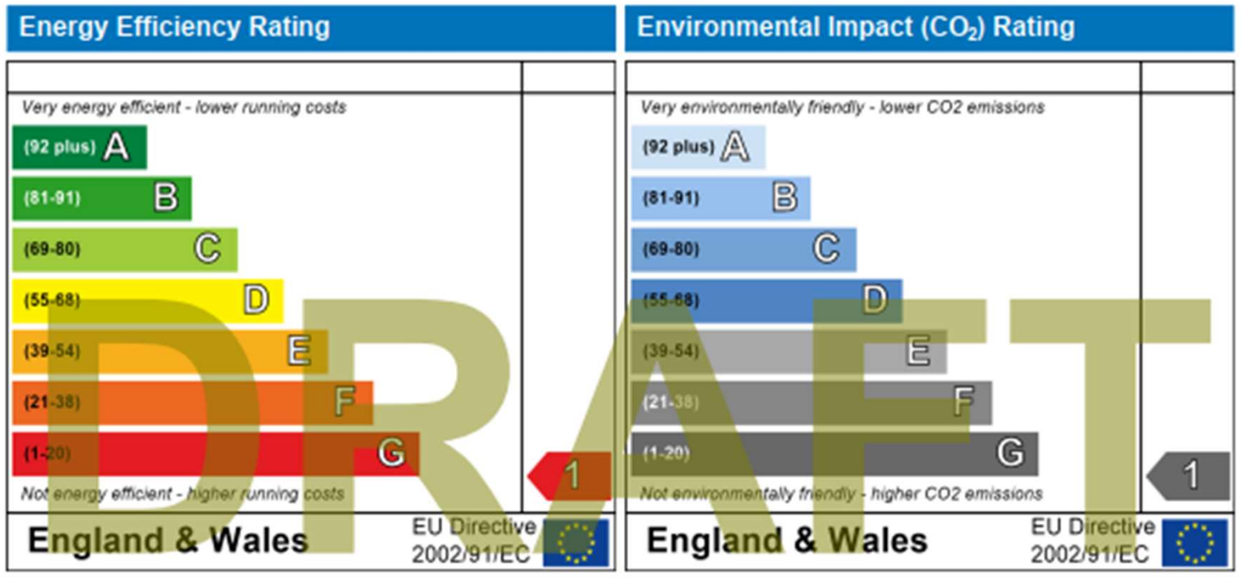
- PV panels

PV Panels proposed on the first-floor extension roof. These are proposed to be installed with minimum pitch to ensure there is little visual impact. The proposed plan for the PV panel installation is shown in appendix A.

Annual CO_2 Emission Calculation – Existing SAP Calculation

Existing SAP Calculation:

An SAP calculation has been undertaken for the existing house based on the year of construction and the likely U-value applicable together with the building services installed. The property is listed and therefore is not required to meet Part L1 of Building Regulations including the referencing reduction set out by the Camden Plan where feasible.

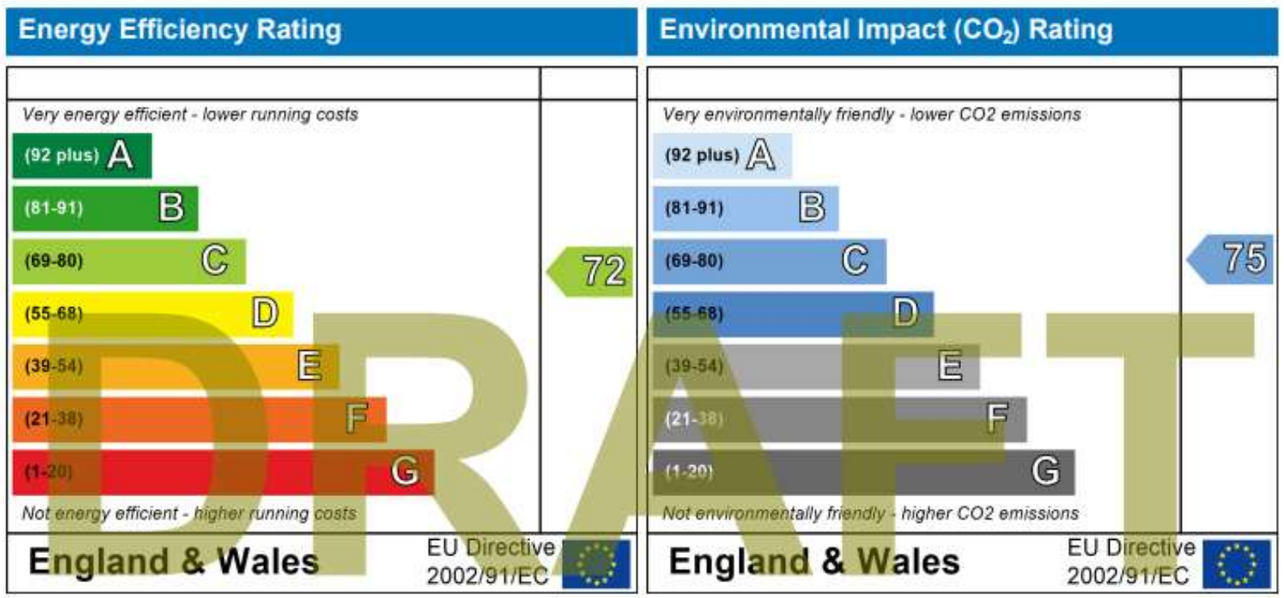


Annual CO_2 Emission Calculation – Proposed (be Green) SAP calculation

Proposed SAP Calculation:

The SAP calculation for the proposed 'Be Green@ scenario works looks to achieve an improved rating through a conscientious effort to improve the building fabric and services system.

The SAP shows that the rating goes from a 1G based on the existing building to an 72B incorporating the associated thermal and carbon reduction measures set out by the architect.



Sustainability Statement

Notwithstanding the constraints imposed by a listed building, the client and occupiers of 34 Belsize Lane have set an ambitious target for sustainability where the design team have been tasked with maximising energy savings through passive and active designs, as well as measures looking at water savings and ecology

In response, the following measures can be directly attributed to the sustainability design of the building:

Passive architectural designs:

- High insulation levels exceeding minimum Building Regulation requirements.
- High-performance double-glazing units with low g-values.
- Exposed thermal mass designed to reduce heating and cooling demands.

Active services designs:

- Space heating and cooling provided by highly efficient air source heat pumps.
- Specification of low energy LED lighting with occupancy controls and dimming.
- Use of mechanical ventilation with heat recovery to capture energy otherwise lost.
- Provision of electrical charge points to promote use of electrical bikes and cars.
- Proposed PV panel installation on the extension roof.

Water saving measures:

- Rainwater harvesting to be used for irrigation.
- Flow restrictors to water outlets to limit over consumption of water.

Ecological features:

- Green roofs feasibility to be established, as they can also provide rainwater attenuation to limit the impact to the local sewers.

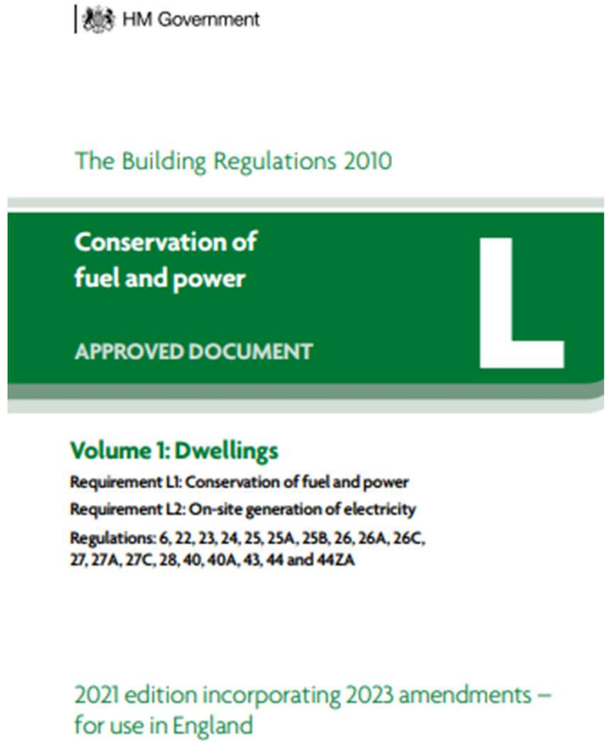
CONCLUSIONS

Every effort has been made to prioritise energy savings and carbon dioxide emission reductions through early engagement with the design team during concept development and extensive energy modelling.

Ambitious levels of thermal performance have been set by the architect for the building fabric with double glazing specified for all new windows and the target U-values for all external elements have been set well below the limits set in the Building Regulations.

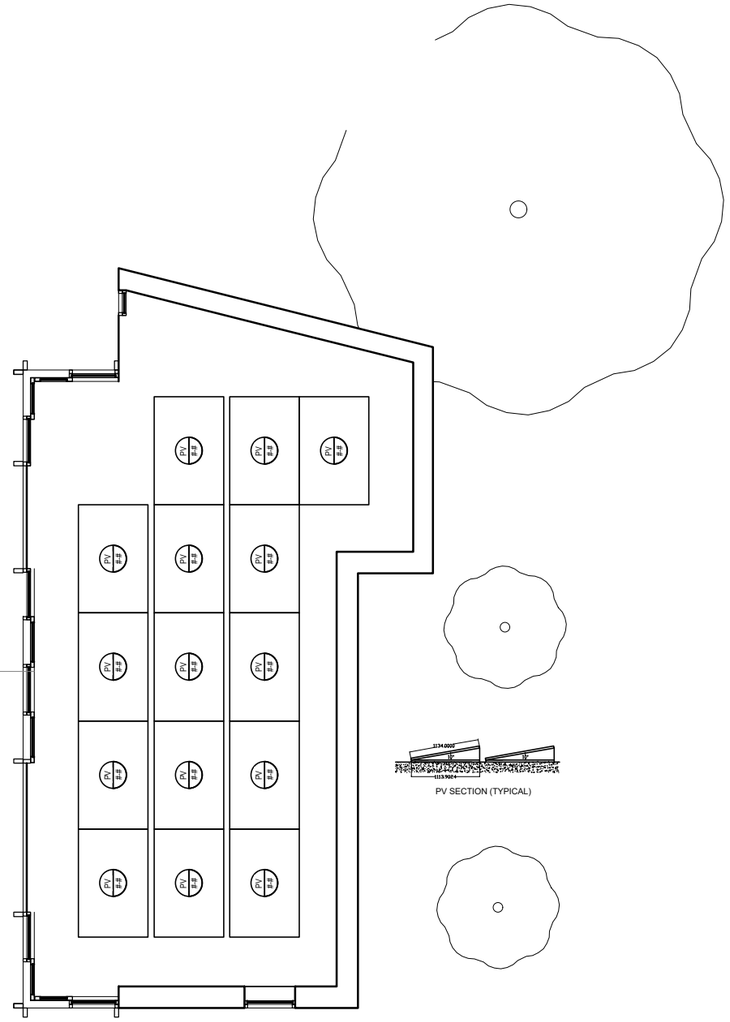
All efforts will be made to achieve the proposed U-values but the unknowns of working with a listed building could cause issues within the construction process.

Overall, the carbon reductions achieved by this study would bring new life to an existing building and coordinate well within the L1 Building Regulation Part L (2021) and the Camden plan 2017.



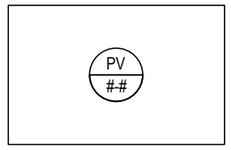
Appendix A

SOUTH



PV SECTION (TYPICAL)

INDICATIVE PANEL DETAILS (NTS)



MODULE POWER: 445w
POWER TOLERANCE: 0/+5
MODULE WEIGHT: 22kg
DIMENSIONS (L x W x H): 1762x 1134 x 30mm

INDICATIVE PV SYSTEM PANELS LAYOUT FOR ROOF AREA.

15 PANELS - SOUTH FACING AT A MINIMUM 10 DEGREE ANGLE

- ESTIMATED TOTAL WEIGHT: APPROX. 450KG (30KG PER PANEL INCLUDING MOUNT AND CLAMPS)
- ESTIMATED TOTAL PEAK OUTPUT: 6.6 KWP

THE INFORMATION IN THIS DRAWING IS INDICATIVE ONLY. IT IS THE SPECIALIST CONTRACTOR'S RESPONSIBILITY TO PRODUCE A DETAILED AND COORDINATED DESIGN.

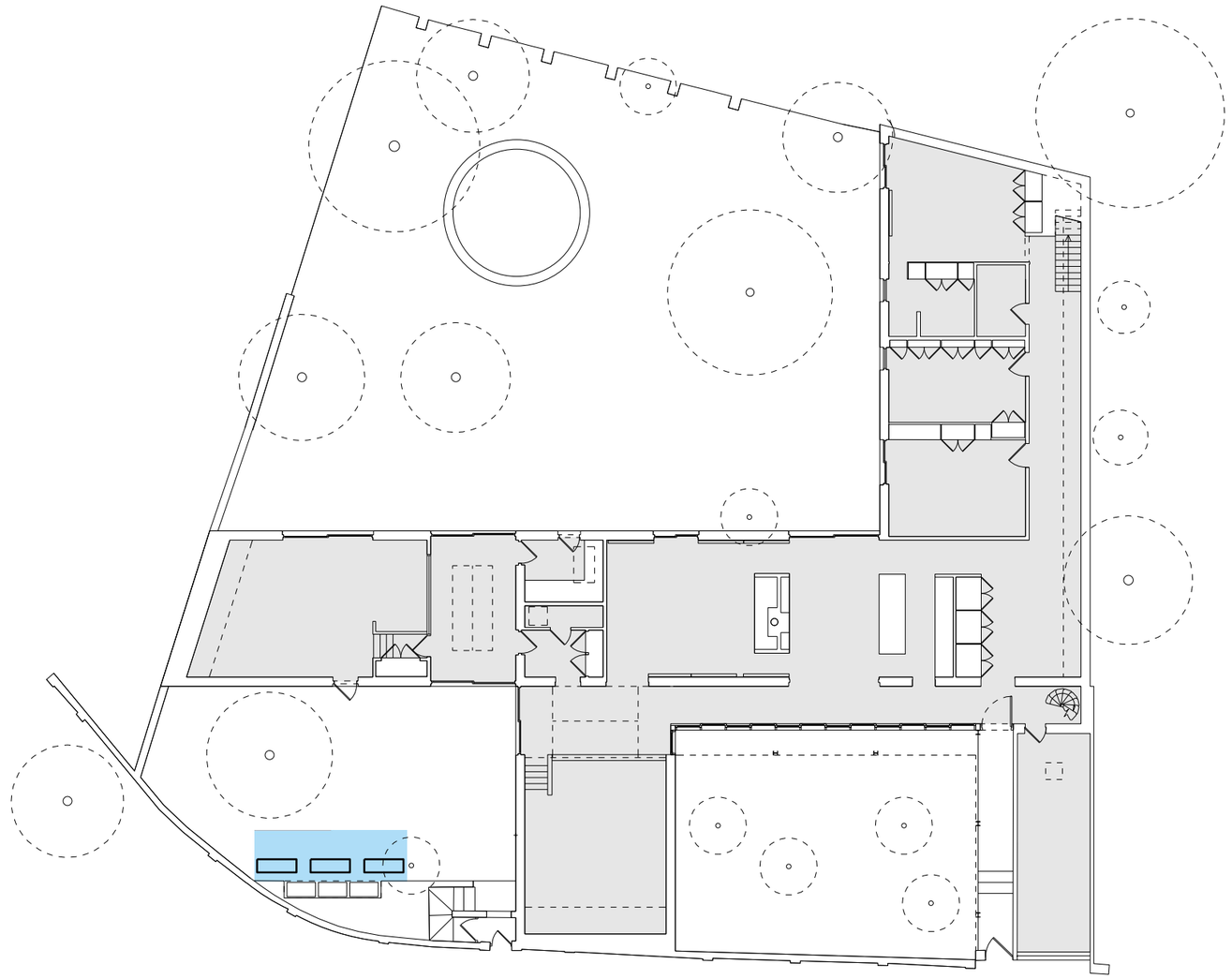
NOTES

REV	DATE	DESCRIPTION

ENVIRONMENTAL ENGINEERING PARTNERSHIP
CONSULTING ENGINEERS
www.eep.co.uk
01494 464 544

CLIENT CHARLIE & CHRISTINA	*DRAWN* IP	*SCALE* 1:100@A3
PROJECT 34 BELSIZE LANE	*CHECKED* IP	*DATE* MARCH 2024
TITLE PROPOSED PHOTOVOLTAIC LAYOUT	*DRAWING No.* 4262/ESK/01	*REVISION* P1

Appendix B



BELSIZE LANE

NOTES

REV	DATE	DESCRIPTION

ENVIRONMENTAL ENGINEERING PARTNERSHIP
CONSULTING ENGINEERS
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01494 464 544

CLIENT CHARLIE & CHRISTINA	*DRAWN* MH	1:200@A3
PROJECT 34 BELSIZE LANE	*CHECKED* NB	MARCH 2024
TITLE PROPOSED LOCATION OF CONDENSING UNITS	*DRAWING No.* 4262/MSK/01	P1

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