125 CLERKENWELL ROAD

SUSTAINABILITY STRATEGY

November 2015 – Rev B

Etude

Context

The London Borough of Camden (LBC) aims to reduce the environmental impact of development in the area through planning policy and guidance. Local policy, strategies, and the National Planning Policy Framework have informed this sustainability strategy for 125 Clerkenwell Road.

The following context is particularly relevant to 125 Clerkenwell Road in terms of environmental sustainability:

- 30% of LBC's CO_2 emissions come from domestic buildings (compared with 33% for London as a whole). Ensuring that new domestic buildings are energy efficient is therefore an important part of LBC's CO_2 reduction strategy;
- LBC aim for an 80% reduction in carbon emissions by 2050. A substantial amount of this will be through energy efficiency in domestic buildings.

Additionally the Council is committed to a number of key environmental objectives that are covered by this report. These include:

a. Promoting resource and water efficiency
b. Maximising renewable energy generation and locally distributed energy
c. Building to high standards of sustainable design and construction
d. Reducing waste generation
e. Supporting environmental protection and enhancement
f. Minimising the environmental impacts of development including water / air pollution
g. Requiring sustainable urban drainage systems in new development, wherever feasible.

This Sustainability Strategy

The aim of this document is to demonstrate that energy efficiency and sustainability considerations are integral to the development proposals for 125 Clerkenwell Road and that the suitability of renewable energy technologies has been robustly considered. It is submitted in support of the planning application.

In particular this document sets out how the proposed development will have exceptional levels of energy efficiency with measures including:

- Super insulation achieving U-values typically associated with Passivhaus buildings.
- Consideration and mitigation of all thermal bridging through the external environment.
- High performance triple-glazed windows with insulated frames.
- Exceptional levels of air-tightness to minimise heat loss from unwanted air movement.

This report is presented as follows

1 Overview of the policy context in terms of energy performance & sustainability requirements

2 Summary of the package of measures adopted to improve Energy efficiency and sustainability

3 A review of the suitability and impact of renewable technologies on the site.

4 Summary of the impact of on carbon emissions of the measures adopted

5 Summary of other sustainable interventions as part of the scheme

6 Conclusions

Location

The site is located on the South side of Clerkenwell Road near the junction with Grays Inn Road. MBH Architects are proposing to redevelop an existing house to create eight separate apartments over four floors above an existing bar. The bar and façade will be retained.

The existing solid wall property will be replaced by a highly insulated and energy efficient building shell whilst retaining the existing street façade.

Proposed Street Elevation

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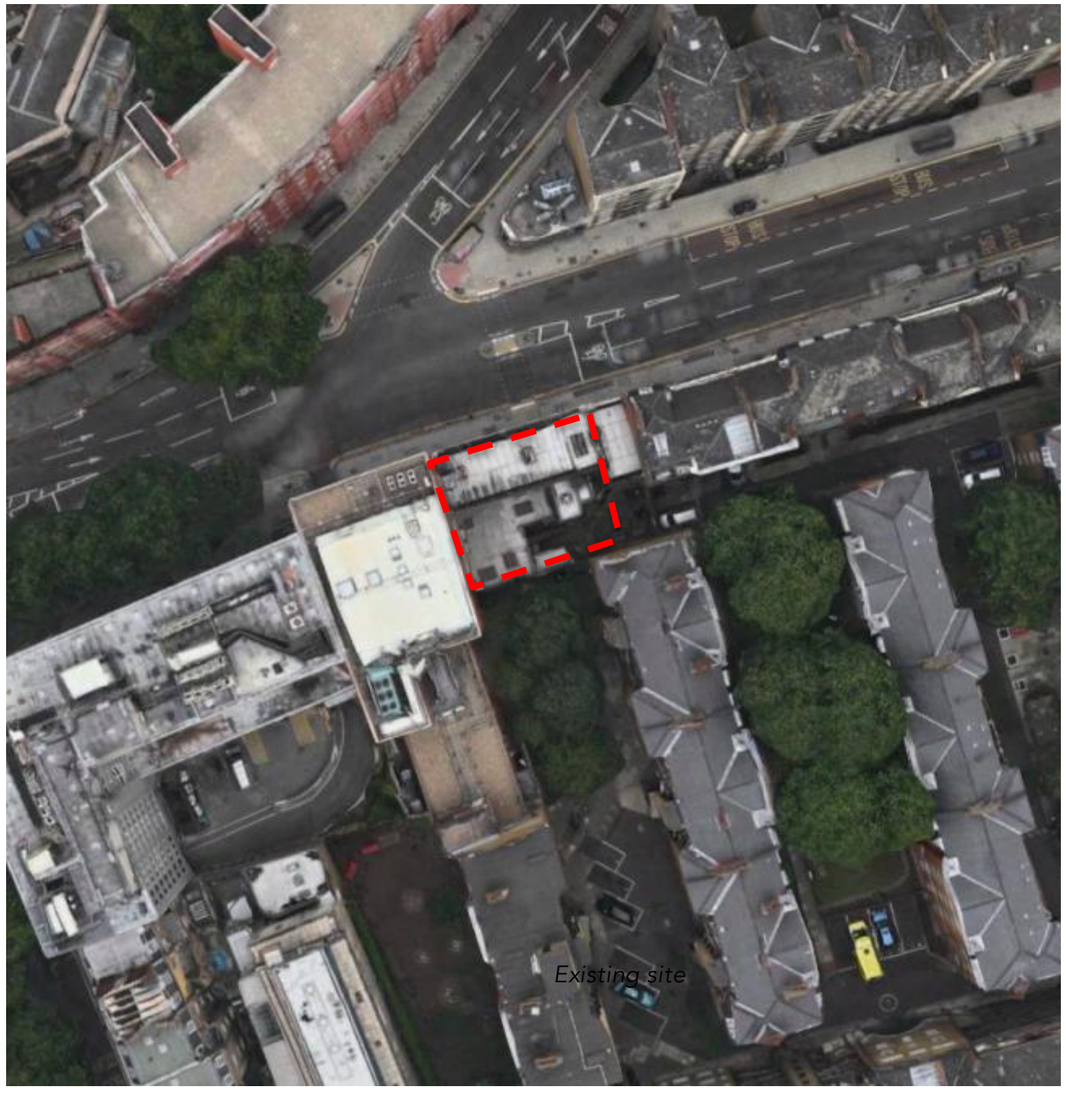
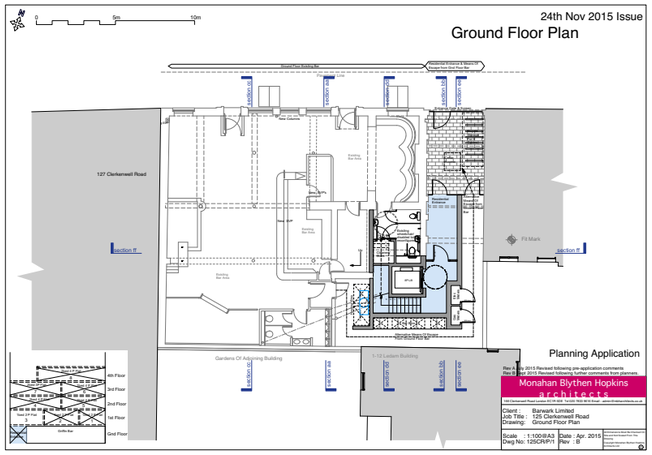
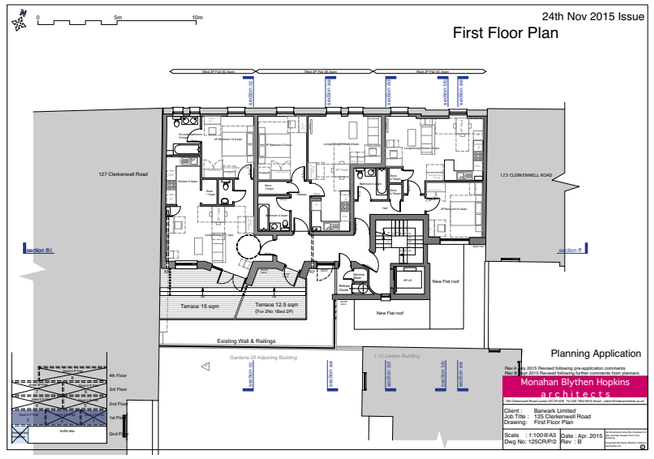
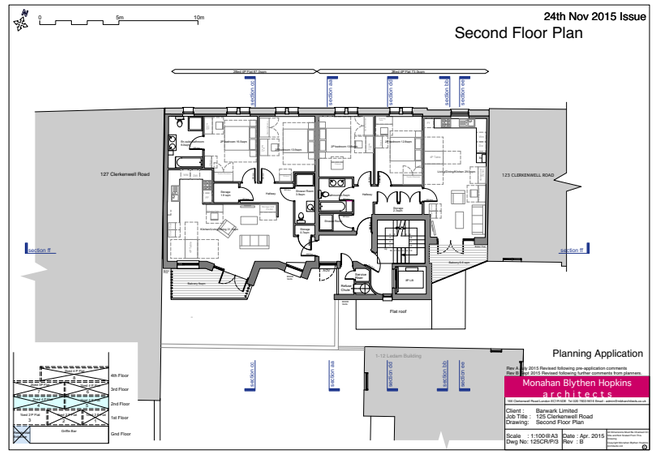
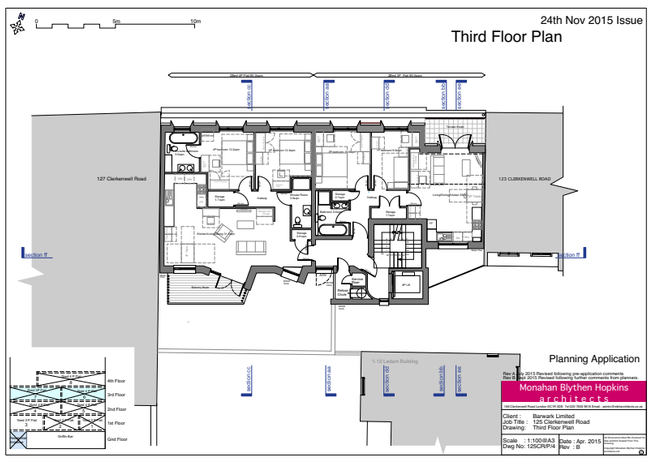


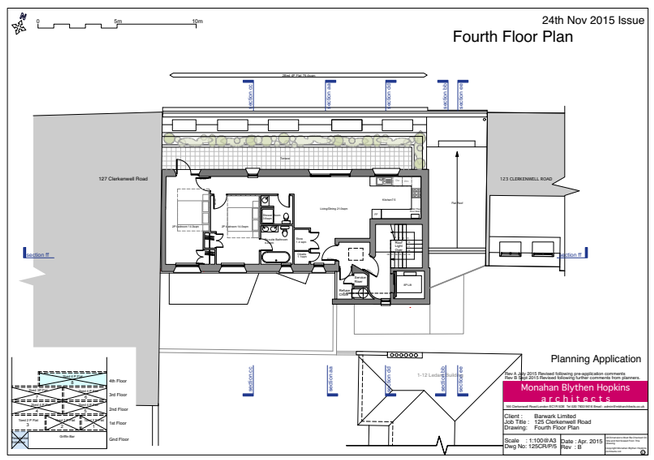
Existing site

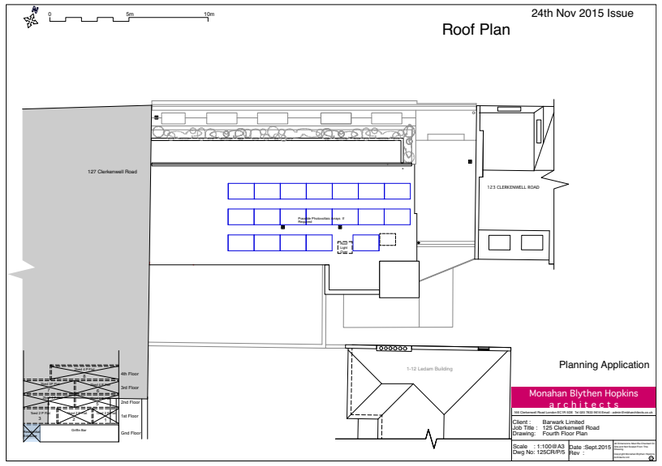












Proposed Floor plans considered in this report

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Information used

Three key sets of documents have influenced and will continue to shape the Energy and Sustainability design strategy for 125 Clerkenwell Road.

1. **The London Plan (2015)** which requires new major developments to submit in support of the planning application a detailed energy assessment to demonstrate how the proposals respond to the Mayor's Energy Hierarchy, although this scheme is considered 'minor' the overarching aims of the London plan have been followed;
2. **Camden Council's Core Strategy and Development Policies and guidance,** which promote sustainable design and construction on all developments. In particular this document will address the requirements of the following policies:
    - New build development of more than 5 dwellings are required to achieve at least a 20% improvement over Part L 2013 as a minimum.
    - Policy CS13 – Tackling climate change; requires that all developments achieve a 20% reduction in on-site carbon dioxide emissions through renewable technologies, unless demonstrated that such provision is not feasible.
    - Policy DP22 – Promoting sustainable design and construction.
    - Camden's sustainability guidance CPG3.
3. **Part L 2013 of the Building Regulations,** which requires minimum energy efficiency standards

It is understood that no environmental assessment is required for the new build dwellings, such as Code for Sustainable Homes, however a summary of sustainability measures in this report demonstrates how the development mitigates its environmental impact.

Planning policy

London Plan (2015)

Camden's Core Strategy (2010)

Camden's Development Policies (2010)

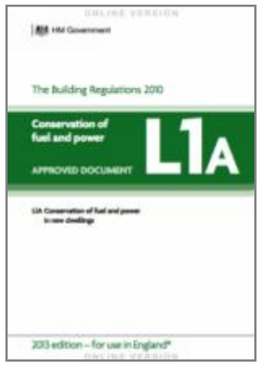
Guidance

GLA Guidance on Energy Assessments (2015)

GLA Sustainable Design and Construction SPG (2014)

Camden's Sustainability guidance (2015)

Building regulations



Part L1A (New dwellings)

Overview

The design follows the energy hierarchy set out in the London Plan and has sought to reduce the energy demand to reach the performance required through energy efficiency alone.

Passivhaus design criteria and modelling in the Passivhaus Planning Package (PHPP) have been carried out alongside the standard assessment modelling (SAP) to assess the potential of achieving Passivhaus on this building.

A number of energy analysis iterations were carried out pre-planning to help inform the architectural design and the energy strategy. The key specifications are illustrated on the following pages.

In summary:

- Optimised proportions of façade glazing will mean winter solar gains contribute to heating in the apartments;
- The fabric will be highly-insulated and achieve an air-tightness of $3m^3/m^2h$;
- Thermal bridges will be reduced by significantly improving on the requirements of Accredited Construction Details;
- Mechanical Ventilation with Heat Recovery (MVHR) will be installed in each unit.
- Individual high efficiency gas boilers will supply heating and hot water.

The Mayor's energy hierachy has been followed in the energy strategy for 125 Clerkenwell Road

Glazing

High performance triple glazed window frames are specified throughout. These components are suitable for Passivhaus levels of construction.

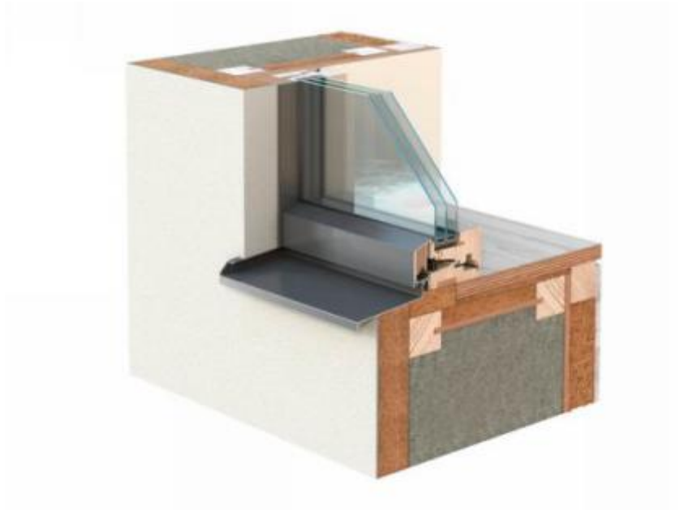
On the street elevation these will be in keeping with the existing sash windows, on the South facing side casement windows with better performance are utilised.

A detailed analysis of the building was carried out using the Passivhaus planning package (PHPP v8.5) alongside Stroma FSAP 2012 modelling.

The window sizes and locations on the first and second floors of the North façade are fixed by the retained facade. The upper floor windows have been designed to reflect the proportions of this façade and to reduce heat loss.

The South elevation is relatively heavily shaded by the surrounding buildings. Individual windows give opportunity for solar gains into the building and these have been optimised where possible.

An example triple glazed sash window, in this case a casement lookalike, viewed from outside. © Passisash



An example triple glazed casement window mounted in a dummy wall structure showing the glazing thickness ©Smartwin

South facing windows shaded by other buildings

North facing glazing has been reduced on the top floor following Passive design considerations.

Insulation

The building is specified with high levels of insulation using widely available and robust construction methods. The major building elements have U-values of <0.15W/m²K. These represent best practice thermal performance and meet or exceed CPG3 guidelines.

The front façade is being retained and insulated internally. Due to concerns about increased interstitial condensation and moisture risk the U-value of this wall area has reduced performance (>0.3W/m2K) in line with English heritage recommendations. The additional heat loss from this area is made up with improvements to other elements.

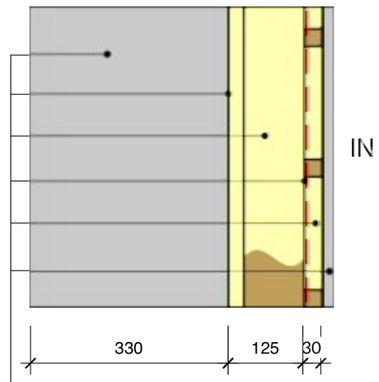
The roof terrace element has a limited construction thickness, due to the limited area it is considered reasonable to reduce the target performance slightly for this area and compensate in other parts of the construction.

Air tightness

The building is targeting an air permeability of <3m³/m²h @50Pa. This is good practice to reduce air infiltration heat loss when coupled with heat recovery ventilation.

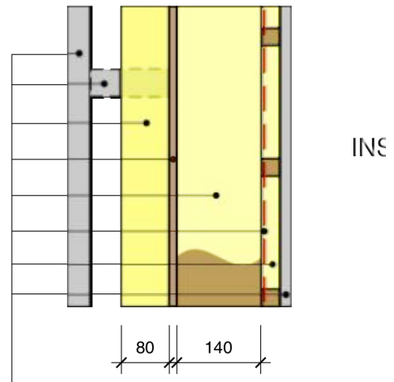
Target Air permeability
3m³/m²h

WL01 Retained front facade
U-value = 0.23 W/m²K



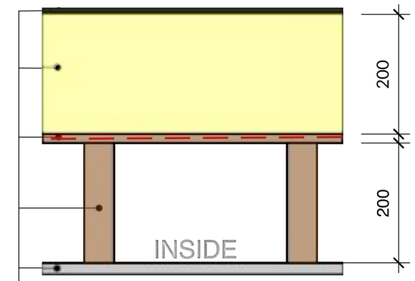
- **Existing external masonry**
  Remove existing plaster and render to expose brickwork
- **Spray PIR insulation between timber stud**
  BASF Walltite or similar
  λ = 0.025 W/mK
- **Air barrier membrane**
- **Service void with mineral wool insulation**
- **Plasterboard and skim**

WL02 New wall construction
U-value = 0.13 W/m²K



- **External wall finish**
  Facade hanger. Should be thermally broken or included in U-value calculation.
- **Rigid PIR insulation board**
  λ = 0.023 W/mK
- **OSB timber**
- **Spray PIR insulation between timber stud**
  BASF Walltite or similar
  λ = 0.025 W/mK
- **Air barrier membrane**
- **Service void with mineral wool insulation**
- **Plasterboard and skim**

RF01 Main flat roof
U-value = 0.11 W/m²K



- **Liquid plastic waterproofing**
- **Rigid PIR or Phenolic Insulation**
  Kingspan Kooltherm or similar
  λ < 0.023 W/mK
  Fully adhered
- **Plywood roof deck.**
- **Roof structure and services**
- **Plasterboard and skim finish**

Indicative construction build ups for 125 Clerkenwell Road. For information only. Below is a summary of the U-values aimed for on each element. The elements not meeting the Camden guidelines are highlighted and explanation given opposite.

Construction element	Camden standard values from CPG 3	Targeted for this building
Retained façade wall	n/a	0.30 W/m²K
Typical external wall	0.20 W/m²K	0.13 W/m²K
Party wall	n/a	0.28 W/m²K
Party floor to bar	n/a	0.15 W/m²K
Terrace roof	0.13 W/m²K	0.18 W/m²K
Mansard roof	0.20 W/m²K	0.13 W/m²K
Flat roof	0.13 W/m²K	0.11 W/m²K
Air tightness	3 m³/m²h @50Pa	3 m³/m²h @50Pa

Minimising cold bridging

With such high levels of insulation a high proportion of the heat from the building is lost through thermal bridges at construction junctions.

A steel framed structural solution is proposed. This makes it more important that the structure is kept outside the insulation layer. Metal is very thermally conductive and if any connection bridges the insulation it results in a significantly higher heat loss through the construction.

Throughout the detailed design each junction has been considered at this early stage in order to minimise heat transfer. This has been tested by desk review of drawings and calculation using 2D thermal modelling software (PsiTherm 2014) where necessary.

Where structure is required through the insulation layer a thermal break product will be used.

The details are generally expected to be significantly below the Ψ values for accredited construction details.

Example thermal break products for steelwork connections. © Insula

Lighting

Energy efficient compact fluorescent and LED lighting is proposed throughout. A lighting scheme minimising the number of fittings will also be developed.

All external lighting, lighting in common areas and security lighting (excluding statutory safety lighting) will be energy efficient and controlled to prevent unnecessary operation (e.g. daylight or PIR sensor).

Appliances

Appliances will be provided in the dwellings and will achieve minimum EU energy efficiency label ratings as opposite. This is a measure of their energy use per operation. A++ appliances will be targeted in order to exceed the minimum ratings.

Fridge-freezer

Dishwasher

washer dryer

Energy efficient lighting
throughout

Best practice MVHR system in all apartments
Specific Fan Power 0.64 W/l.s
Heat Recovery Efficiency > 85%

Energy monitoring

Electricity and gas consumption display devices will be provided in each apartment. The equipment will comprise a self-charging sensor fixed to the incoming mains supply to measure and transmit electrical energy and gas consumption data to a visual display unit. The device will display current mains electrical and gas energy consumption (kW / kWh), CO_2 emissions and current cost, enabling residents to understand, monitor and reduce their energy consumption.

Energy display devices
To enable residents to monitor their energy use

A **simple home user guide**
will be produced to help the residents understand their new home and use it efficiently (e.g. MVHR controls)

Heating

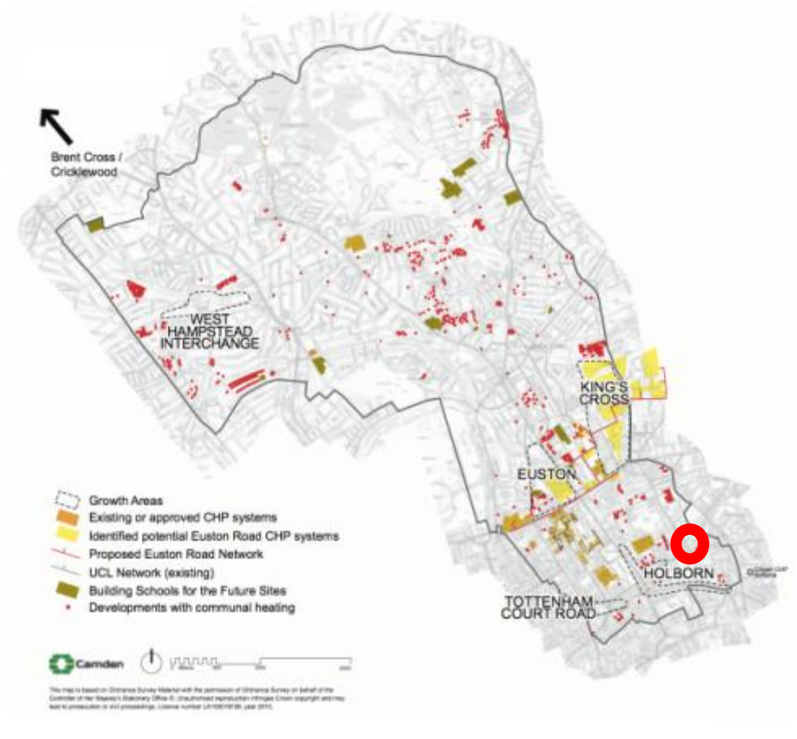
The London Heat Map and Camden policy mapping documents show the closest heat network to be the Citigen CHP scheme. The site is 0.65km from the heat network. As the development is only for 8 apartments and has high levels of energy efficiency it is expected that the distribution losses and capital cost would far exceed the benefits and savings in connecting to the network.

Individual combination condensing gas boilers will be installed in each of the apartments.

Heat recovery ventilation

Background ventilation will be provided by MVHR units in each apartment. To ensure maximum actual efficiency these will be positioned on or near external walls and be fully accessible for maintenance such as changing the filters. The system will be designed with acoustic attenuation to minimise sound in living rooms. Using MVHR has a number of distinct advantages:

- It provides fresh air to the occupants independent of the weather and how they choose to use the building.
- Similarly it removes pollutants, moisture, and odours.
- An F7 grade filter on the supply air removes pollutants from the air and means a significant improvement in indoor air quality.
- It is possible to heat the incoming fresh air with the exhaust air in a high efficiency heat exchanger. In a low energy building this significantly reduces the heating demand on the building.



Location of site on Camden heat network plan.

Best practice MVHR system in all apartments
Specific Fan Power 0.64 W/l.s
Heat Recovery Efficiency > 85%

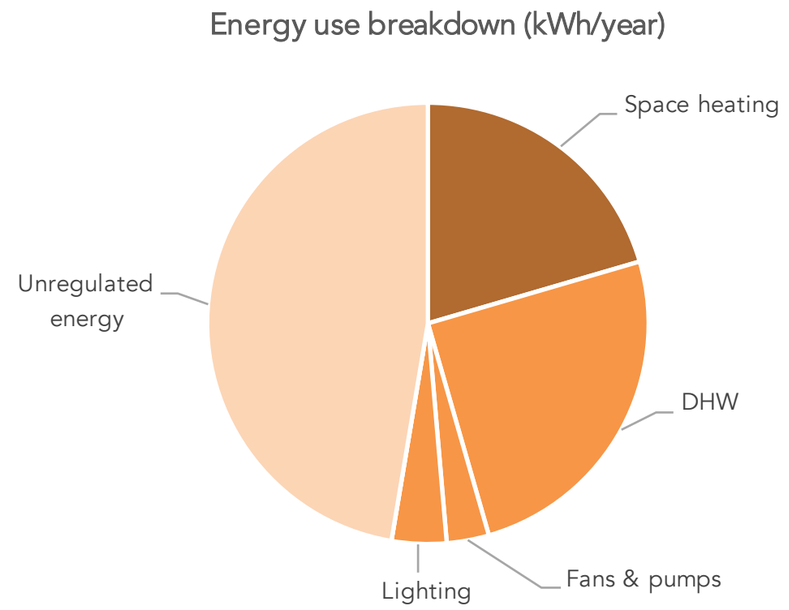
Example location of combination condensing gas boiler in apartment 1.

Example location of the MVHR unit near an external wall in apartment 4.

Energy consumption

The following table and adjacent figure summarises the estimated energy consumption at 125 Clerkenwell Road based on the preliminary Part L1A 2013 calculations. An estimate for 'unregulated' energy uses and CO_2 emissions (e.g. small power, appliances, etc.) is also provided for information.

	Space Heating (kWh/yr)	Domestic Hot Water (kWh/yr)	Fans & Pumps (kWh/yr)	Lighting (kWh/yr)	Cooling (kWh/yr)	Total regulated (kWh/yr)	Total un-regulated (kWh/yr)
Residential	**12,800**	**15,700**	**1,900**	**2,500**	**0**	**32,900**	**29,558**

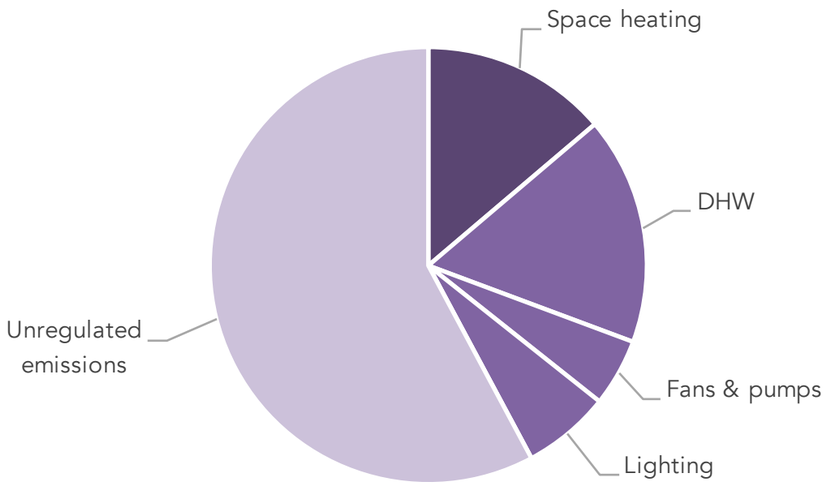


As can be seen, thermal energy (space heating and hot water) represents the vast majority of 'regulated' energy use on site. However, due to the energy efficiency measures on site the estimated 'unregulated' energy consumption represents almost half of the total load.

CO_2 emissions

The following table and figure summarises the estimated breakdown of 'regulated' CO_2 emissions. Part L 2013 carbon factors have been used for this analysis: 0.519 $kgCO_2/m^2/yr$ for grid-supplied electricity and 0.216 $kgCO_2/m^2/yr$ for natural gas. 'Unregulated' CO_2 emissions are also provided for information.

	Space Heating ($kgCO_2$/yr)	Domestic Hot Water ($kgCO_2$/yr)	Fans & Pumps ($kgCO_2$/yr)	Lighting ($kgCO_2$/yr)	Cooling ($kgCO_2$/yr)	Total regulated ($kgCO_2$/yr)	Total un-regulated ($kgCO_2$/yr)
Residential	**2,760**	**3,380**	**1,000**	**1,300**	**0**	**8,440**	**11,590**



It can be seen that unregulated CO_2 emissions are expected to represent well almost two thirds of CO_2 emissions for the scheme. Space heating and domestic hot water make up the majority of 'regulated' CO_2 emissions.

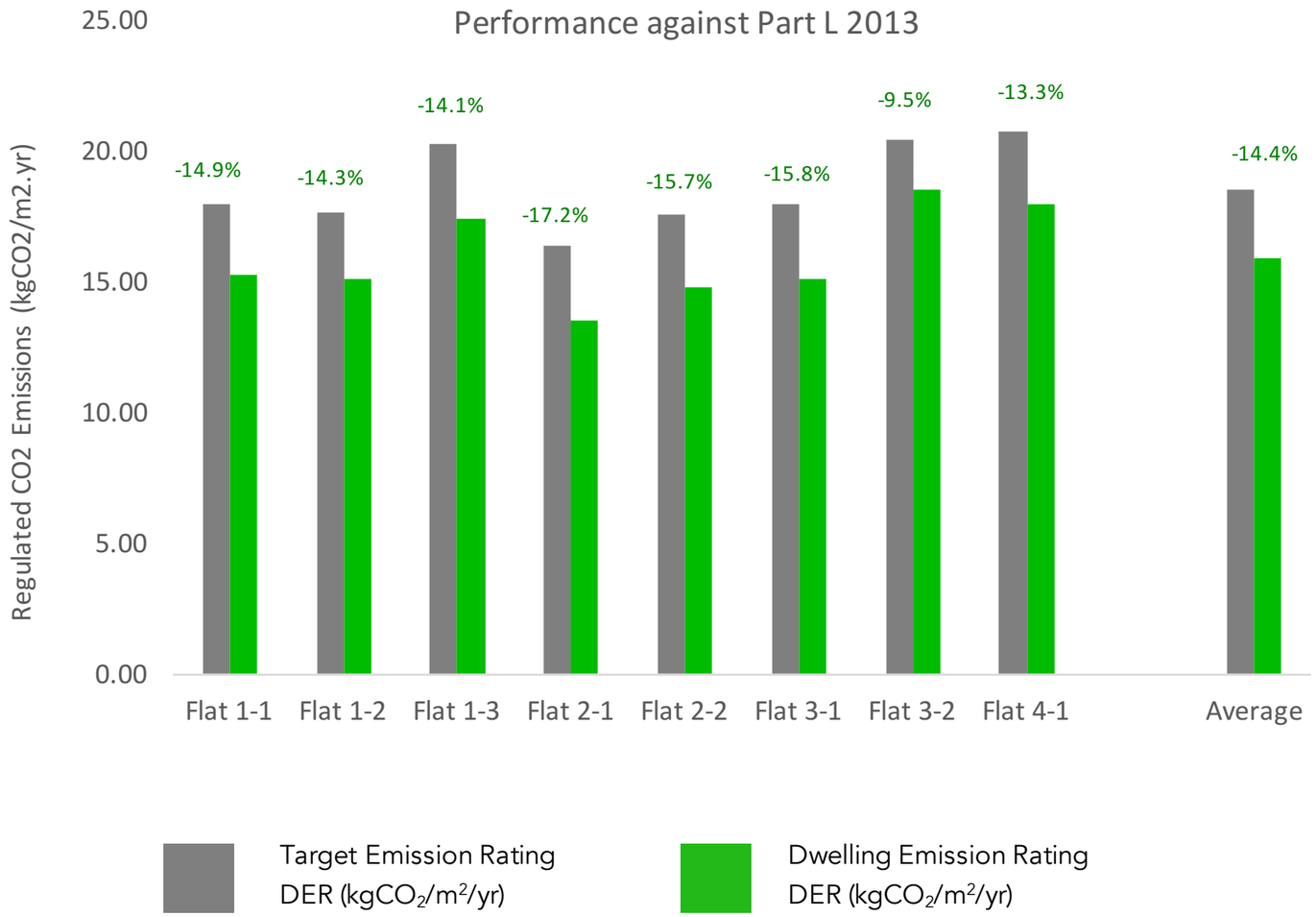
Preliminary Part L calculations

All eight units were modelled using an accredited Part L software to confirm compliance with the Camden planning targets and Part L 2013 (with Stroma FSAP 2012 v.1.0.1.10). The preliminary Part L 2013 results (summarised on the bar chart on the right) are based on the following detailed energy energy efficiency parameters and do not include any renewable provision:

- Retained front façade wall U-value: 0.30 W/m².K
- External Wall U-value: 0.13 W/m².K
- Floor above bar U-value: 0.15 W/m².K
- Roof U-value: 0.11 W/m².K
- Terrace Roof U-value: 0.18 W/m².K
- Window U-value: 0.85 W/m².K
- Average Frame Proportion: 35%
- Window g-value: 0.50
- External door U-value: 1.0 W/m².K
- Solid or fully filled party wall
- Air permeability rate: 3 m³/h/m² at 50 Pa
- Thermal bridges: Better than Accredited Construction Details (ACDs)
- Individual gas combi boilers – efficiency = > 89.5%
- Mechanical Ventilation with Heat Recovery:
    - Brink Renovent 300 or equivalent
    - Specific Fan Power (SFP) = 0.64 Ws/l
    - Heat Recovery (HR) efficiency = 85%
- 100% energy efficient lighting

Performance naturally varies according to the orientation and design of each unit. However, all units perform well against Part L 2013, with between 9.5% and 17.2% improvement, with an area weighted average improvement of 14.4%.

The performance of the 8 tested dwellings against **Part L 2013** gives an area weighted average improvement of 14.4% through fabric efficiency measures only. The minimum requirements for Camden planning are exceeded by the inclusion of solar PV panels.



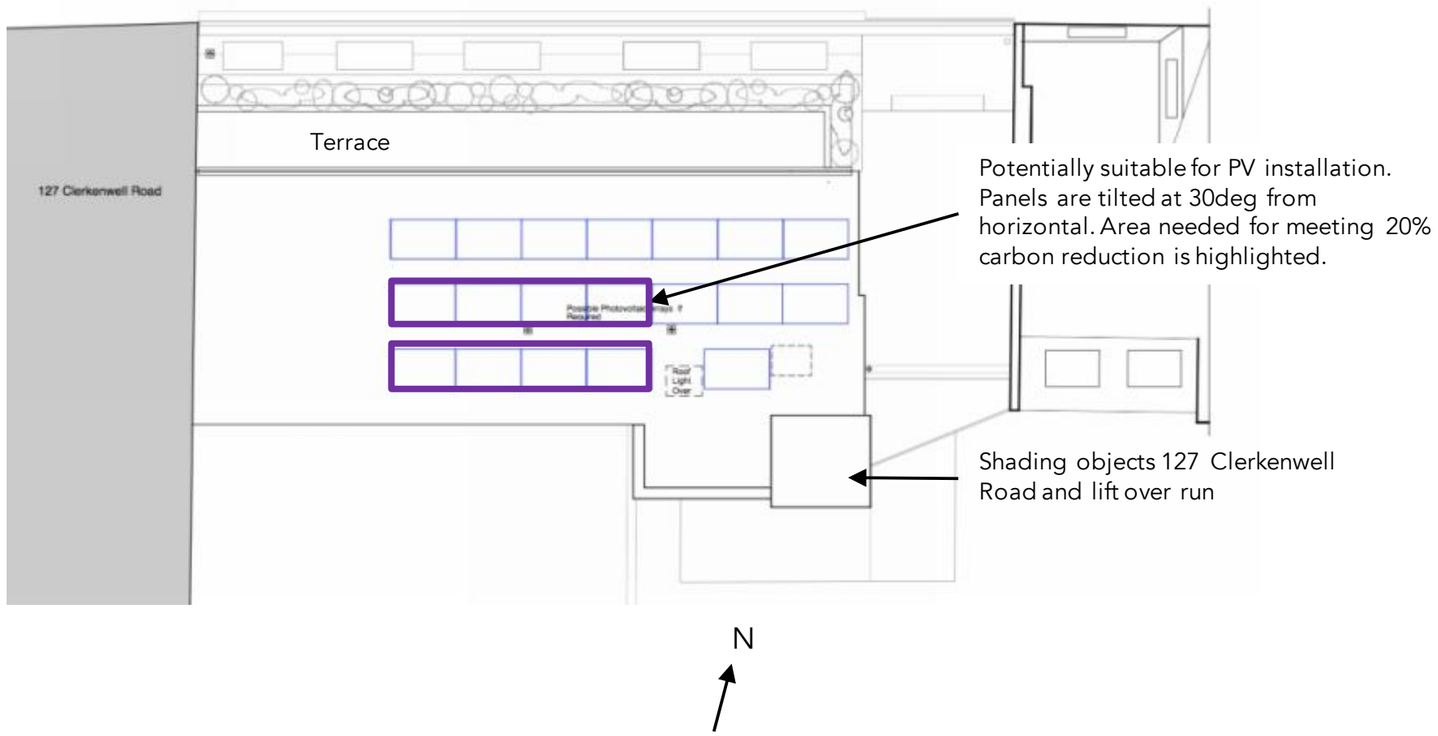
Please note that these specifications are subject to change as the design develops.

Low or Zero carbon technologies

The following renewable/low or zero carbon energy technologies have been considered at 125 Clerkenwell Road:

- Combined Heat and Power (CHP) would not be appropriate given the scale of the development (8 apartments) and therefore the low baseline hot water demand.
- Solar PVs and Solar water heating are both technically feasible and could be mounted on the roof. Solar PVs were considered to be more appropriate for the scheme due to the location of the boilers and potential tank resulting in long pipe lengths. There is 60m^2 of potential free roof space, some of which is heavily shaded by surrounding buildings.
- Air source heat pumps are technically feasible but would not result in a carbon saving on the site. They would also contribute to local noise pollution and reduce the available external space for the properties.
- A ground source heat pump would not be appropriate due to site constraints and results in minimal carbon saving.
- Biomass heating and wind turbines are inappropriate on this site due to operational and site constraints respectively (building heights, proximity to residential properties).

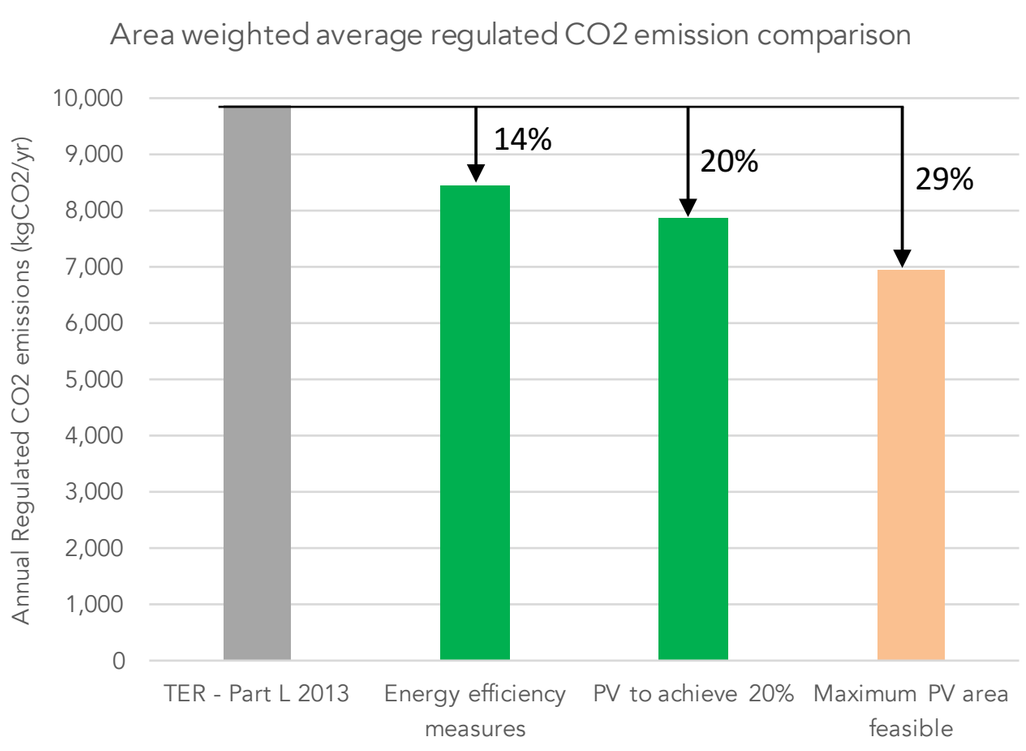
		TOTAL CAPACITY/ NUMBER OF UNITS REQUIRED	REGULATED CO_2 SAVINGS ($kgCO_2/yr$)	REGULATED CO_2 SAVINGS (%)
Photovoltaics		2.64 kWp (8no. 330W Panels)	558	6.6%



Summary of regulated CO_2 reduction

In summary, the development achieves a 14% improvement over Part L 2013 exclusively through passive design and energy efficiency (e.g. fabric U-values, triple-glazed windows, MVHR, efficient boilers). A further 6% points are achieved by renewable technologies.

To achieve a 20% reduction of carbon emissions by renewables a 7.9kWp PV array would be required. Given the restricted roof area and heavy shading in some parts this is not possible. The maximum feasible PV array is shown for comparison and represents a 17.5% reduction in emissions by renewables alone.



CO_2 emissions (tonnes / yr)	Regulated	Unregulated
Baseline (Part L 2013)	9,860	11,590
After energy demand reduction	8,440	11,590
With Solar PV installation	7,880	11,590

CO_2 savings	tonnes / yr	%
From energy demand reduction	1,420	14.4%
From renewable technologies	558	6.6%

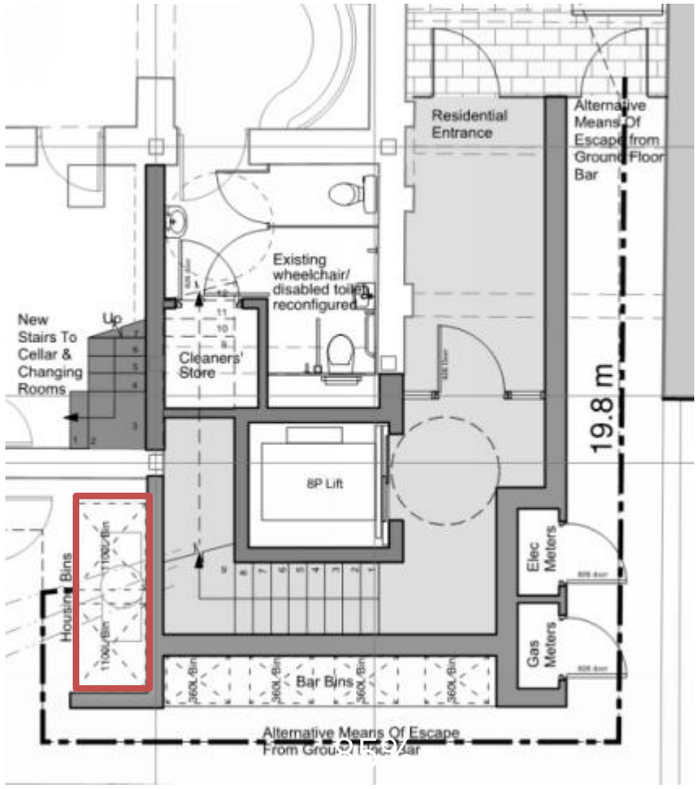
Waste

In each unit, the following storage systems will be provided to maximise recycling rates:

- a bin for non recyclable waste;
- a 30-litre bin (minimum) for recyclable waste;

Communal bin stores for the apartments will be located at the rear of the building. There will be separate provision for 1100l of recycling and non-recyclable waste.

Example of proposed internal bins



Location of communal bin stores showing distance to the front entrance. The access is constrained by the existing footprint and requirements from the commercial premises on the ground floor.

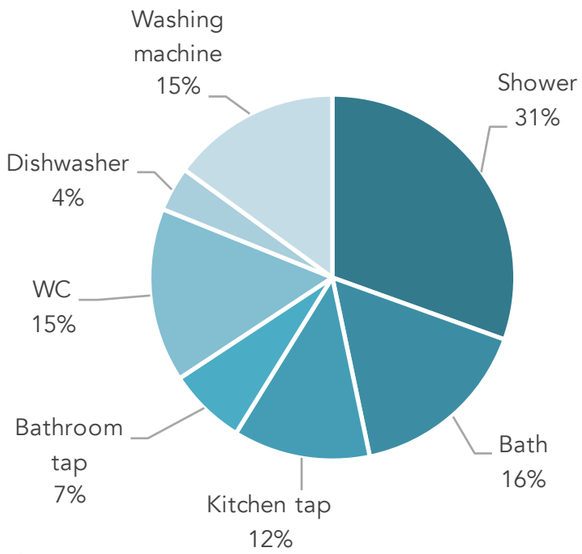
Water

Water-efficient fittings will be provided in order to reduce internal water consumption to less than 105 litres/person/day. The following flow rates are targeted. According to the Water Calculator this would represent an internal water consumption of 104.3 l/p/day. The Association of Environmentally Conscious Builders (AECB) water standards 'good practice' have been used to specify the consumption criteria.

104.3 litres / person / day

- **Shower**: 8 litres/min
- **Bath**: 180 litres to overflow
- **Kitchen tap**: 6 litres/min
- **Bathroom tap**: 4 litres/min
- **WC:** dual flush 6 / 3 litres
- **Dishwasher**: 1.25 litre/place setting
- **Washing machine**: 8.2 litres/kg dry load

Breakdown of internal water consumption at 125 Clerkenwell Road



Environmental impact of materials

The Green Guide to Specification has been consulted and will continue to be used in order to inform the selection of materials. The objective is to minimise their environmental impact across their whole life cycle. The build-ups selected at this stage and their corresponding Green Guide Ratings are shown in the adjacent table.

Responsible sourcing of materials

The procurement of materials will seek to favour responsibly sourced materials. Suppliers will be asked to supply, where feasible, evidence of compliance with the following schemes:

- BES6001:2008 (Responsible Sourcing Standard)
- FSC, PEFC
- CSA
- Certified EMS

Additionally, 100% of any timber in these elements will be sourced in accordance with the UK public procurement policy on timber.

Element	Description	Rating
External walls	Autoclaved fibre cement (calcium silicate) cladding and timber battens, breather membrane, OSB/3 sheathing, timber frame with insulation, vapour control layer, plasterboard on battens, paint	A+
Internal walls	Timber stud, plasterboard, paint	A+
Floors	Chipboard decking on metal web joists	A+
Roof	Timber joists, OSB/3 decking, vapour control layer, insulation, Polyester cold applied liquid waterproofing membrane system.	A+
Windows	Preservative pre-treated softwood window, triple glazed, water based opaque coating internally and externally (WWA specification)	A+

Ecology

The site is currently residential dwellings above a recreational commercial space. There are no permeable surfaces or existing planting on the site.

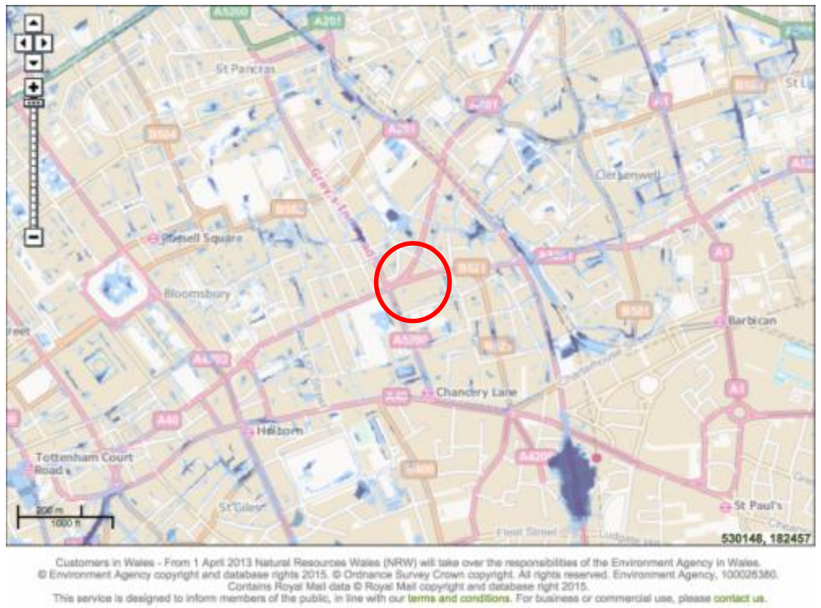
It is assumed the site currently has low ecological value. This will be improved by introducing fixed planters to the roof terrace spaces.

Flood risk management

The proposed accommodation will be on levels at first floor and above so should not be affected by local flooding. The communal staircase could be affected.

Initial review of the Environment Agency flood mapping shows no risk of flooding from surface water or water courses.

Satellite image of the existing site showing hard standing and no existing planting.



Environment Agency mapping showing no flood risk for rivers and seas, or surface water.

Transport

The development will include a secure communal cycle store on the ground floor for use by the residents of the flats. The area will include space for a minimum of 8 cycles to be stored.

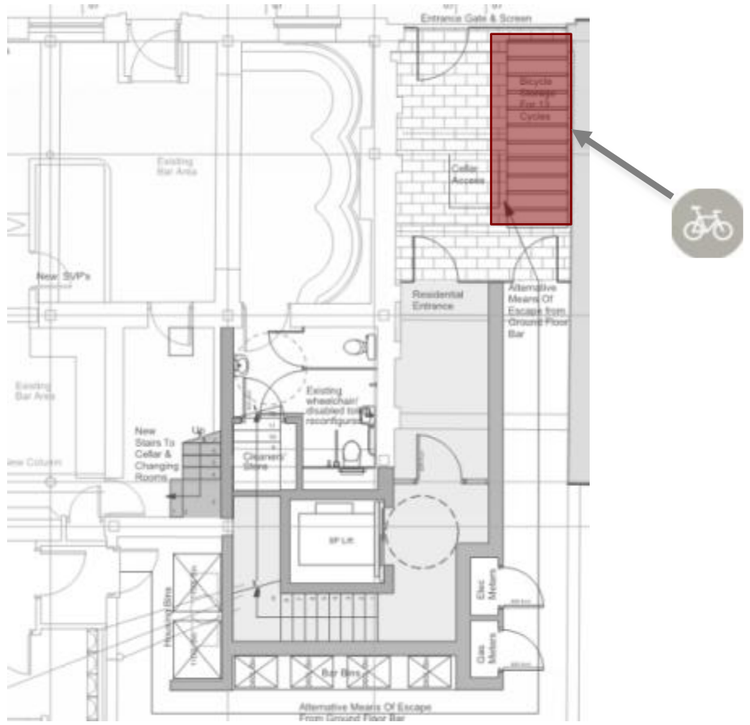
The flats do not have provision for parking however are at the junction of Grays Inn Road and Clerkenwell Road and have excellent public transport connections.

Air quality

Low VOCs paints and finishes will be used (e.g. floor coverings, wall coverings and ceiling finishes). High-efficiency low NO_x gas boilers (with an emission rate of less than 40mg/kWh) will be specified to reduce the impact on external air quality.

Light Pollution

Light pollution will be minimised through the appropriate design and specification of external lighting fittings. This includes using low power directional fittings with minimal spillover and control systems such as PIR detection and timer switches.



Ground floor level Communal Cycle Storage in entrance

125 Clerkenwell Road | Sustainability strategy | Summary

The proposals for 125 Clerkenwell Road include a number of exemplar energy and sustainability measures demonstrating that sustainable design standards in line with the LBC development policies and guidance have been considered pre-planning.

The design measures will be incorporated during construction and a review carried out on completion to ensure that they are implemented.

The key sustainability features of the development are summarised opposite:

- Exemplary level of energy efficiency
- Solar PV system
- Recycling and food waste storage facilities
- Cycle storage
- Water efficient fittings and appliances
- High green guide ratings and responsible sourcing

The SAP worksheet output calculations are included as an Appendix to this report.