9&11 MANSFIELD ROAD

ENERGY STRATEGY

September 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 energy efficiency and renewable energy plan for 9 & 11 Mansfield Road.

The following context is particularly relevant to Mansfield 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 in line with the national target 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 and the accompanying Sustainability plan. These include:

a. Promoting energy, 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 Energy efficiency and renewable energy plan

The aim of this document is to demonstrate that energy efficiency is integral to the development proposals for 9 & 11 Mansfield Road and that the suitability of renewable energy technologies has been robustly considered. It is prepared as part of the submission to discharge planning conditions as "The Energy Efficiency and Renewable Energy plan".

This document will be reviewed at completion and the development will be operated in strict accordance with this plan as approved by LBC.

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.
- Consideration of massing and form factor for flats.

This report is split up into three sections:

1. An overview of the policy context in terms of energy performance
2. Summary of the package of measures adopted to improve Energy efficiency
3. A review of the suitability and impact of renewable technologies on the site.

Planning condition interpretation

Section 2.10(b) of the Section 106 agreement for 9&11 Mansfield Road states:

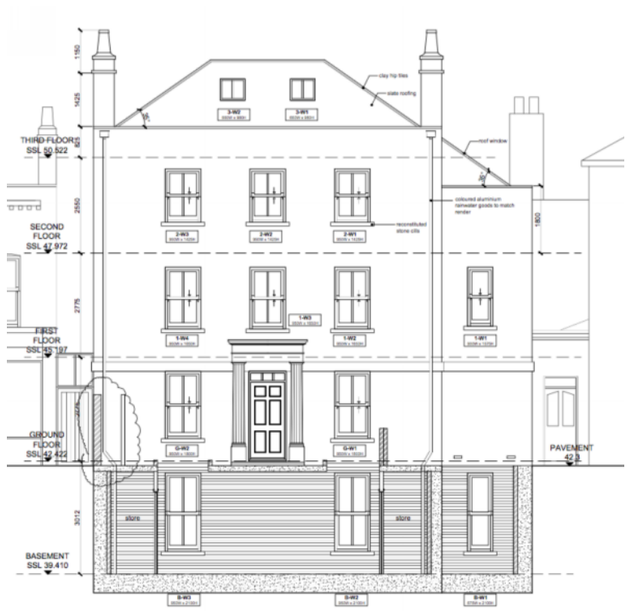
"... Ensuring the Owner will target a reduction of at least 25% in carbon emissions in relation to the Property using a combination of low and zero carbon technologies."

This has been taken to refer to the 25% reduction in CO_2 emission over building regulations Part L1a 2010 as required to achieve level 4 CfSH. As per CfSH Addendum 2014 this analysis assumes this equates to a 19% reduction over Part L1a 2013 and this is what has been targeted.

Location

The site is located on the South side of Mansfield Road near Gospel Oak over ground station. Abbotswood Homes are proposing to redevelop an existing house to create four separate apartments over three floors, a mezzanine and a basement.

Existing site



Proposed North Elevation

Proposed South Elevation

© Abbotswood Properties

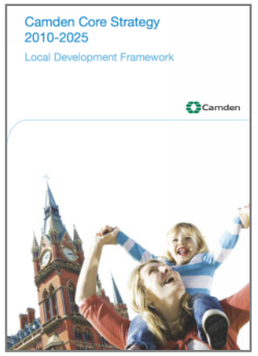
Information used

Four key sets of documents have influenced and will continue to shape the Energy and Sustainability design strategy for 9&11 Mansfield Road.

1. **The London Plan (2011)** which requires all new 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;
2. **Camden Council's Core Strategy and Development Policies,** which promote sustainable design and construction within all developments. In particular this document will address the requirements of the following policies:
    - Policy CS13 – Tackling climate change;
    - 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, and represent approximately a 3-13% improvement (dependent on building type) over the previous version of Part L (2010).
4. **The Code for Sustainable Homes (CfSH)** assessment method which awards credits based on energy efficiency and good environmental design. The new build dwellings are required to achieve at least a 25% improvement over Part L 2010 as a minimum mandatory requirement to be awarded a **CfSH Level 4** rating. This is equivalent to a 19% improvement over Part L 2013 as per the CfSH Addendum 2014 document.

Planning policy

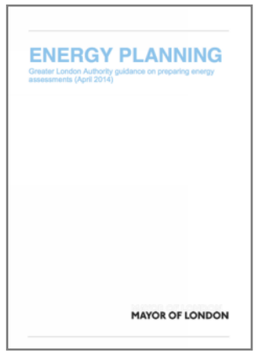
London Plan (2011)



Camden's Core Strategy (2010)

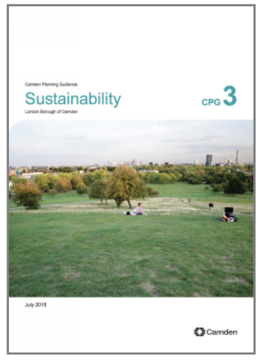
Camden's Development Policies (2010)

Guidance



GLA Guidance on Energy Assessments (2013)

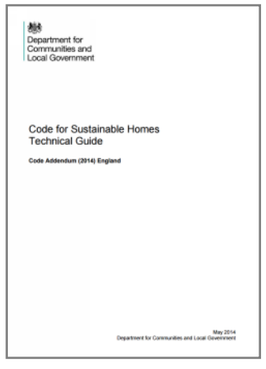
GLA Sustainable Design and Construction SPG



Camden's Sustainability guidance (2015)

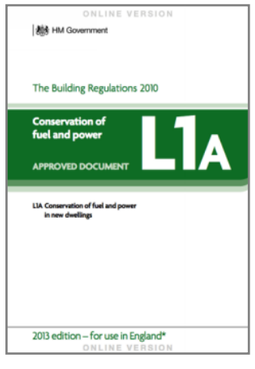
Environmental assessment

Code for Sustainable Homes (2010)



Code Addendum (2014)

Building regulations



Part L1A (New dwellings)

Overview

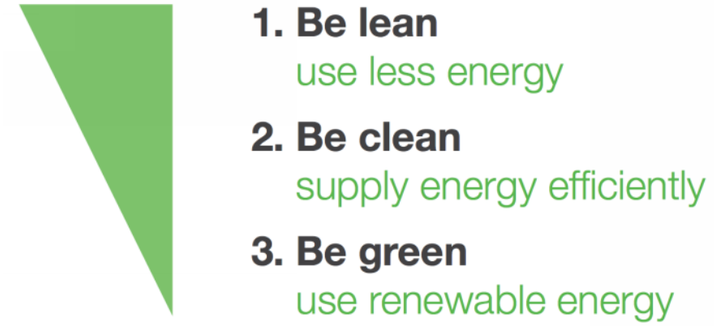
The design follows the energy hierarchy set out in the London Plan and has sought to reduce the energy demand to reach the performance required through energy efficiency alone.

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

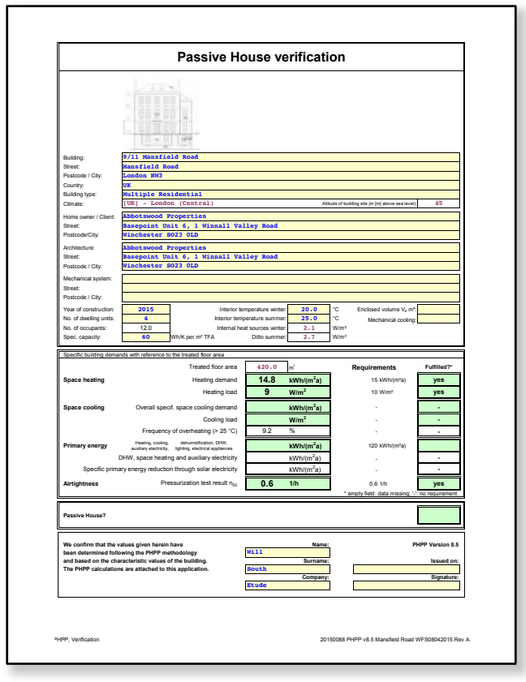
A number of energy analysis iterations were carried out pre-planning to help inform the architectural design and the energy strategy. The key specifications are illustrated on the following pages.

In summary:

- Optimised proportions of façade glazing will allow winter solar gains to heat the apartments;
- Façade design and external shutters on the South façade minimise the summer over-heating and mean natural ventilation can achieve the cooling demand. There is no need for air conditioning.
- The fabric will be highly-insulated and achieve an air-tightness of 1m^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. A central high efficiency gas boiler will supply heating and hot water.



The Mayor's energy hierachy has been followed in the energy strategy for 9&11 Mansfield Road



Passive House verification

Building:	9/11 Mansfield Road
Street:	Mansfield Road
Postcode / City:	London NW3
Country:	UK
Building type:	Multiple Residential
Climate:	[UK] - London (Central) — Altitude of building site (in [m] above sea level): 65
Home owner / Client:	Abbotswood Properties
Street:	Basepoint Unit 6, 1 Winnall Valley Road
Postcode/City:	Winchester SO23 0LD
Architecture:	Abbotswood Properties
Street:	Basepoint Unit 6, 1 Winnall Valley Road
Postcode / City:	Winchester SO23 0LD
Mechanical system:	
Street:	
Postcode / City:	
Year of construction:	2015
No. of dwelling units:	4
No. of occupants:	12.0
Spec. capacity:	60 Wh/K per m² TFA
Interior temperature winter:	20.0 °C
Interior temperature summer:	25.0 °C
Internal heat sources winter:	2.1 W/m²
Ditto summer:	2.7 W/m²
Enclosed volume V_e m³:	
Mechanical cooling:	

* Specific building demands with reference to the treated floor area

			Requirements	Fulfilled?*
	Treated floor area	420.0 m²		
Space heating	Heating demand	14.8 kWh/(m²a)	15 kWh/(m²a)	yes
	Heating load	9 W/m²	10 W/m²	yes
Space cooling	Overall specif. space cooling demand	kWh/(m²a)	-	-
	Cooling load	W/m²	-	-
	Frequency of overheating (> 25 °C)	9.2 %	-	-
Primary energy	Heating, cooling, auxiliary electricity / dehumidification, DHW, lighting, electrical appliances	kWh/(m²a)	120 kWh/(m²a)	
	DHW, space heating and auxiliary electricity	kWh/(m²a)	-	-
	Specific primary energy reduction through solar electricity	kWh/(m²a)	-	-
Airtightness	Pressurization test result n_{50}	0.6 1/h	0.6 1/h	yes

* empty field: data missing! "-": no requirement

Passive House?

We confirm that the values given herein have been determined following the PHPP methodology and based on the characteristic values of the building. The PHPP calculations are attached to this application.

Name: Will
Surname: South
Company: Etude

PHPP Version 8.5
Issued on:
Signature:

PHPP, Verification — 20150088 PHPP v8.5 Mansfield Road WFS08042015 Rev A

The building has been initially modelling in the Passivhaus Planning package but is not targeting Passivhaus certification.

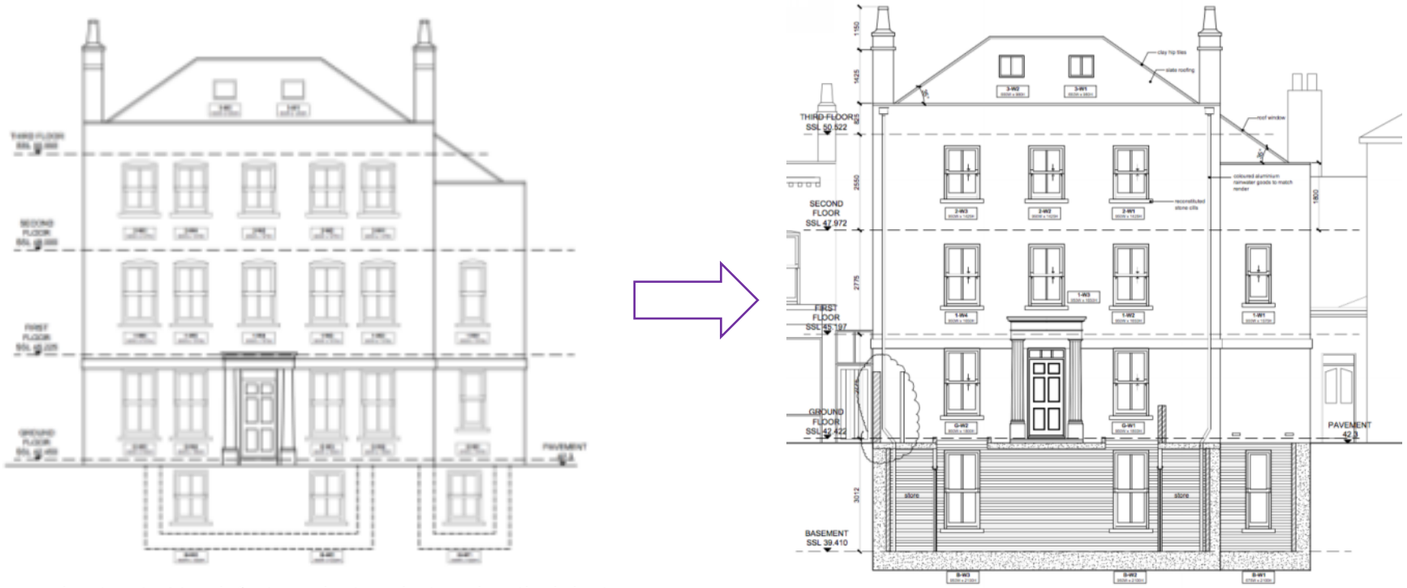
Glazing optimisation

A detailed analysis of the building was carried out using the Passivhaus planning package (PHPP v8.5) alongside the fSAP modelling. This included a site specific analysis of solar gain into the building and potential over heating.

From this a reduction in the glass area on the North façade has been implemented. The North facing glass does not contribute to heating from solar gain, and the windows are about 1/5th the performance of the wall elements.

The South elevation is relatively unshaded and large full height glass doors have been included to the living areas of every apartment. The solar gain from these windows gives a significant reduction in the heating load of the building.

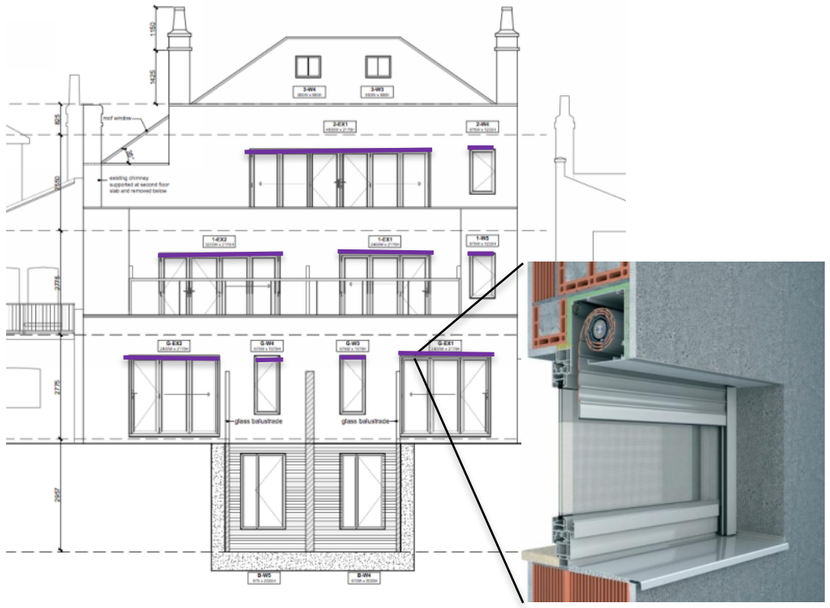
The heating gains and losses into and out of the building are shown in the energy balance graph. The contribution from solar gain is highlighted, this is larger than the heat losses from windows showing that they provide a net heat gain to the building.



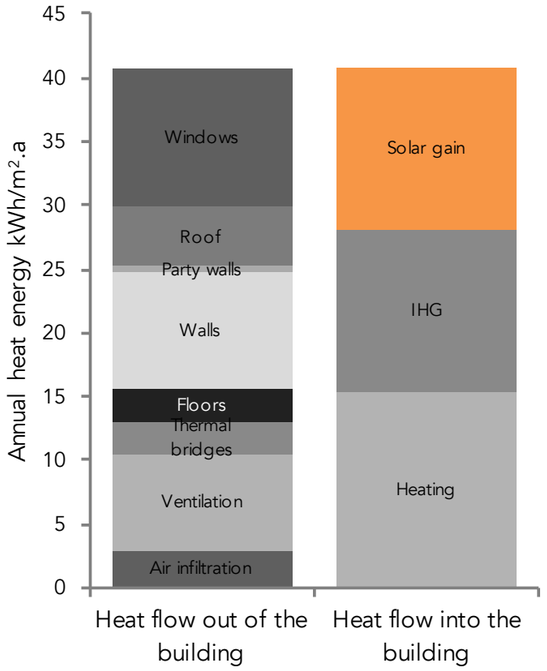
The reduction in North facing glazing during detailed design to significantly reduce the heat loss from the building.

Shading

To reduce the summer time cooling required integral external shutters are specified on all South facing windows. These can be deployed by the user to cut out solar gain to the building during the summer months.



South facing windows with integral external blinds



Insulation

The building is specified with very high levels of insulation using widely available and robust construction methods. The major building elements have U-values of <0.15W/m2K with the walls and floor both around 0.10W/m2K. These represent best practice thermal performance.

Air tightness

A robust strategy for the air tightness using Passivhaus methodology has been developed to minimise the heat loss from air infiltration and improve comfort in the apartments.

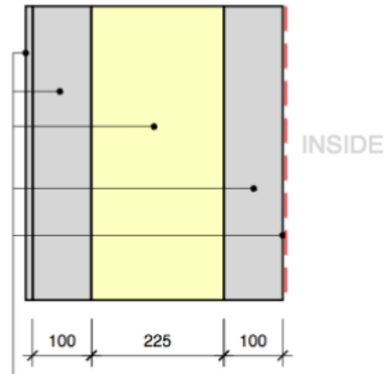
The primary air barrier in each construction is highlighted in red on the build ups shown opposite. A strategy for each junction connection has been developed to ensure a continuous barrier.

For wet plaster elements an initial layer of plaster basecoat will be applied behind all first fix services to prevent electric outlet back boxes and chasing for cables bridging the air barrier.

The building is targetting an air permeability of <1m^3/m^2h. This is exceptionally low.

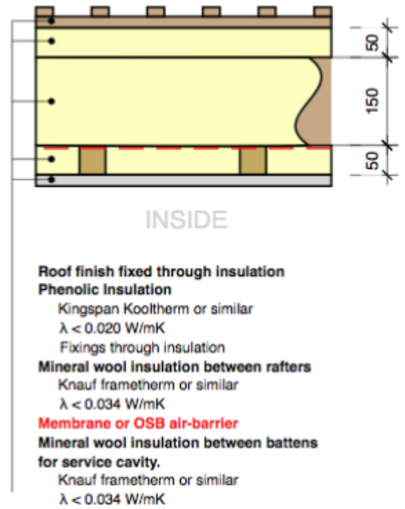
Target Air permeability
1m^3/m^2h

WL01 Main wall
U-value = 0.11 W/m²K



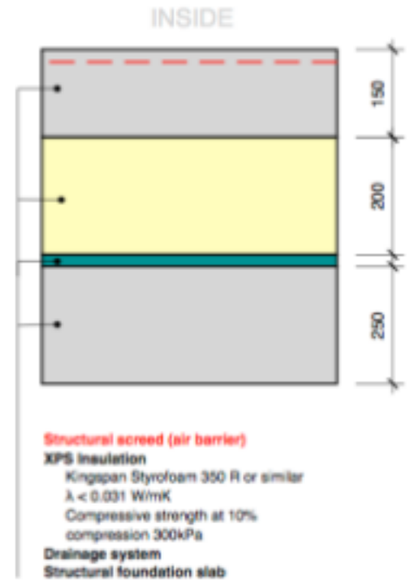
External render
Lightweight block wall with thin joint
Thermalite Shield
λ = 0.16 W/mK
EPS insulation
Springvale Ecobead Platinum or similar
λ = 0.033 W/mK
Ancon Low conductivity wall ties
Lightweight block wall with thin joint
Thermalite 7
λ = 0.19 W/mK
Wet gypsum plaster air-tightness layer

RF01 Main pitched roof
U-value = 0.15 W/m²K



Roof finish fixed through insulation
Phenolic Insulation
Kingspan Kooltherm or similar
λ < 0.020 W/mK
Fixings through insulation
Mineral wool insulation between rafters
Knauf frametherm or similar
λ < 0.034 W/mK
Membrane or OSB air-barrier
Mineral wool insulation between battens for service cavity.
Knauf frametherm or similar
λ < 0.034 W/mK
Plasterboard and skim finish

FL01 Basement floor
U-value = 0.10 W/m²K



Structural screed (air barrier)
XPS Insulation
Kingspan Styrofoam 350 R or similar
λ < 0.031 W/mK
Compressive strength at 10% compression 300kPa
Drainage system
Structural foundation slab

Indicative construction build ups for 9&11 Mansfield Road. For information only. Below summary of the U-values aimed for on each element.

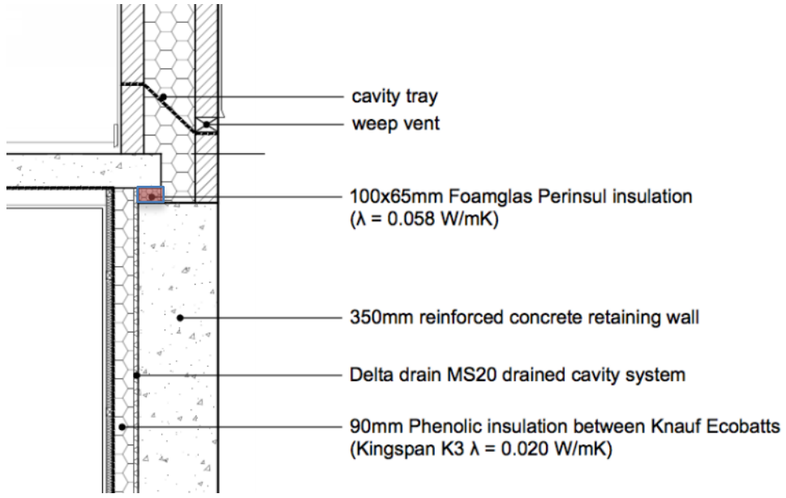
Construction element	Camden standard values from CPG 3	Targeted for this building
Main wall	0.20 W/m^2K	0.11 W/m^2K
Average basement wall	0.20 W/m^2K	0.15 W/m^2K
Party wall	n/a	0.28 W/m^2K
Main wall above party wall	0.20 W/m^2K	0.15 W/m^2K
Basement floor	0.20 W/m^2K	0.10 W/m^2K
Terrace roof	0.13 W/m^2K	0.18 W/m^2K
Pitch roof	0.13 W/m^2K	0.15 W/m^2K
Flat roof	0.13 W/m^2K	0.13 W/m^2K
Air tightness	3 m^3/m^2h	1 m^3/m^2h

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.

Throughout the detailed design each junction has been considered in order to minimise the heat transfer. This has been tested by inspection and desk review, using 2D thermal modelling software (PsiTherm) where necessary.

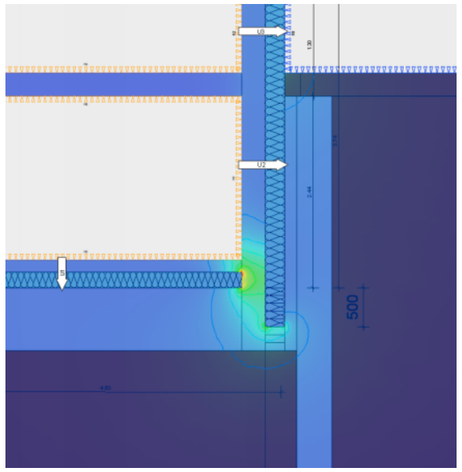
The details are generally expected to be significantly below the Ψ values for accredited details.



The ground floor to external wall connection showing how the concrete retaining wall is thermally broken from the floor slab with a Foamglas connecting block.

Thermal mass

The building is constructed with an internal blockwork skin and concrete floor cassettes giving a very high internal thermal mass of >200Wh/K per m^2 floor area. This will help damp internal summer temperatures by absorbing heat in the hottest part of the day.



Thermal bridge calculation of a different design

Lighting

Energy efficient compact fluorescent and LED lighting is proposed throughout. A lighting scheme minimising the number of fittings is being 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 to exceed the minimum ratings.

Fridge-freezer

Dishwasher

washer dryer

Energy efficient lighting
throughout

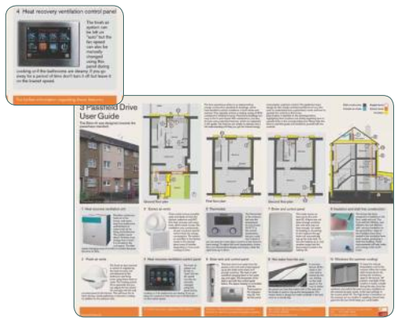
Energy monitoring

Electricity 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 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.

In addition the ventilation and water services are designed with minimum fan and pumping powers to further reduce auxiliary electricity.

Best practice MVHR system in all apartments
Specific Fan Power < 0.6 W/l.s
Heat Recovery Efficiency > 90%

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)

Decentralised heating

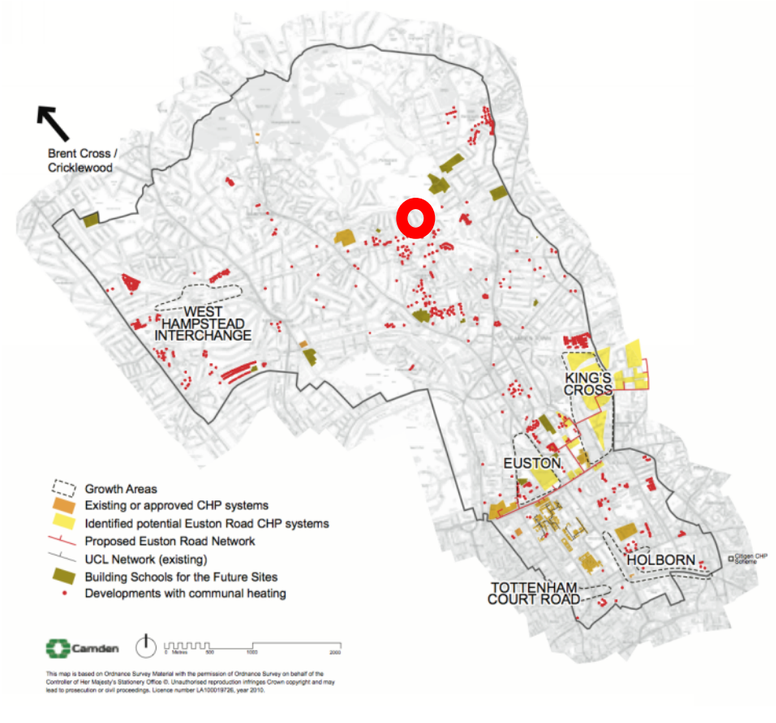
The London Heat Map and Camden policy mapping documents show the closest heat network to be the Royal Free Hospital. The site is 0.97km from the heat network. As the development is only for 4 apartments and has high levels of energy efficiency it is expected that the distribution losses would far exceed the benefits in connecting to the network. An allowance for future connection to a heating network will be provided.

To align with Camden's aspiration for centralised heat energy generation a high efficiency centralised communal boiler will be shared between the four apartments to provide heating and hot water.

Heat recovery ventilation

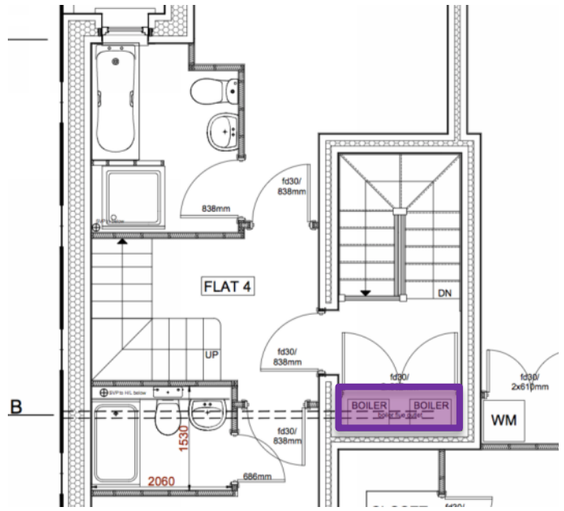
Background ventilation will be provided by MVHR units in each apartment. To ensure maximum actual efficiency these will be positioned on external walls and be fully accessible for maintenance such as changing the filters. The system will be designed with acoustic attenuation so that it is inaudible in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

- It provides reliable fresh air to the occupants independent of the weather and how they choose to use the building.
- Similarly it reliably 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.

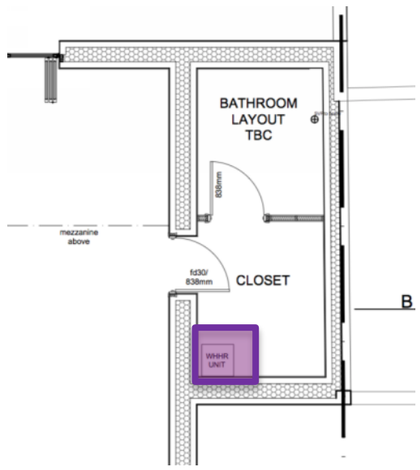


Location of site on Camden heat network plan. There are no existing or planned heat networks near the site.

Best practice MVHR system in all apartments
Specific Fan Power < 0.6 W/l.s
Heat Recovery Efficiency > 80%



Location of communal gas boilers on the first floor of 9&11 Mansfield Road.

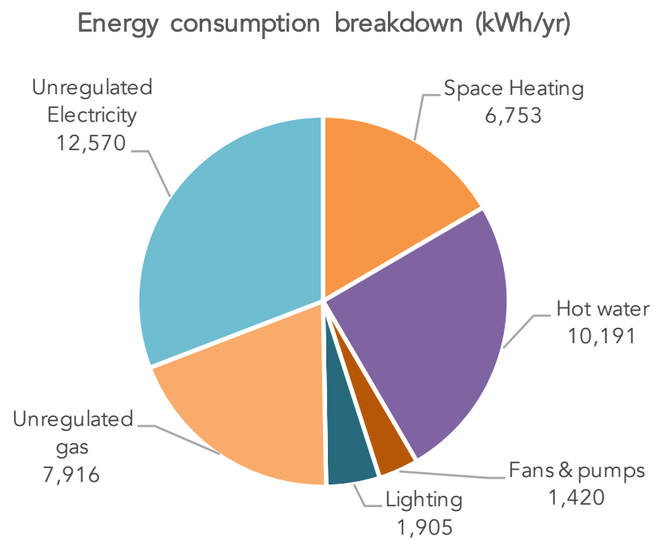


Example location of the MVHR unit near an external wall in flat 4.

Energy consumption

The following table and figure summarises the estimated energy consumption at 9&11 Mansfield Road based on the preliminary Part L 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	**6,753**	**10,191**	**1,420**	**1,905**	**0**	**20,269**	**20,486**

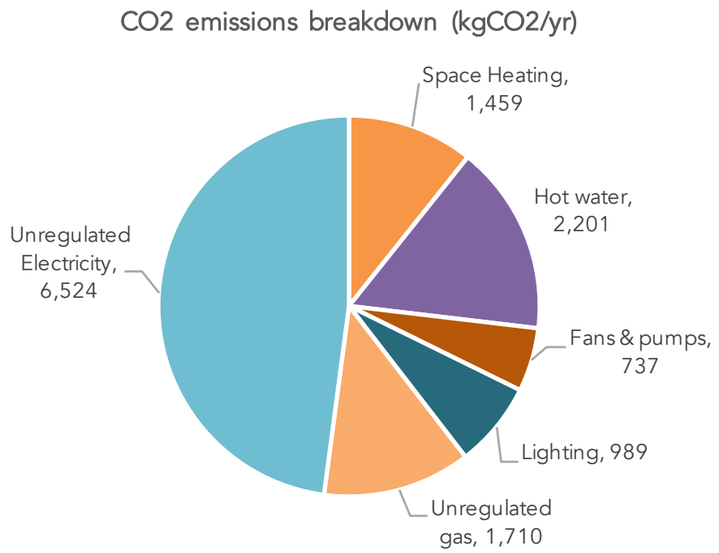


As can be seen, thermal energy (space heating and hot water) represents the vast majority of 'regulated' energy use on site. The estimated 'unregulated' energy consumption represents almost half of the total load.

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, namely 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	**1,459**	**2,201**	**737**	**989**	**0**	**5,386**	**8,234**



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.

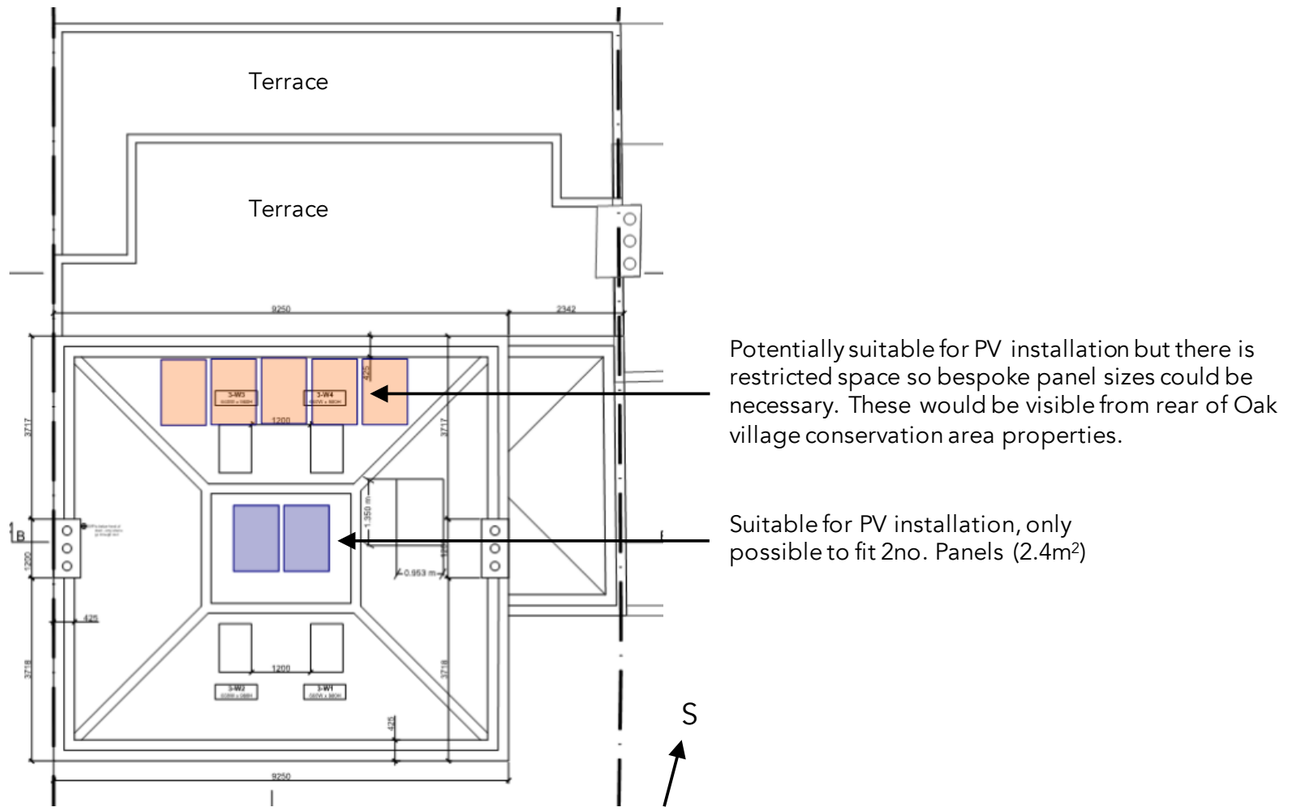
Low or Zero Carbon technologies

The following renewable/low or zero carbon energy technologies have been considered:

- Combined Heat and Power (CHP) would not be appropriate given the scale of the development (4 units). A centralised gas boiler is specified.
- 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 boiler and potential tank resulting in long pipe lengths. There is very limited roof space on the South facing roof, this limits any potential PV array to between 2.4 and 10m^2. This is deemed too small to have a meaningful contribution to energy saving.
- A ground source heat pump would not be appropriate due to site constraints and results in a 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).

Due to the restricted roof the actual installed PV may be as low as 0.3kWp which would only give a 22% saving in regulated CO_2. For this reason and the already high levels of energy efficiency incorporated in the design it is shown that on site renewable energy and low carbon technologies are not feasible at 9&11 Mansfield Road.

		TOTAL AREA / NUMBER OF UNITS REQUIRED	REGULATED CO_2 SAVINGS ($kgCO_2/yr$)	REGULATED CO_2 SAVINGS (%)
Photovoltaics		1.0kWp (8 sqm)	452	26.3%



Preliminary Part L calculations

All four units were modelled using an accredited Part L software to confirm compliance with Code Level 4 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:

- Average basement wall U-value: 0.15 W/m^2.K
- External Wall U-value: 0.11 W/m^2.K
- Basement Floor U-value: 0.10 W/m^2.K
- Roof U-value: 0.15 W/m^2.K
- Window U-value: 0.85 W/m^2.K
- Average Frame Proportion: 35%
- Window g-value: 0.50
- External door U-value: 1.0 W/m^2.K
- Solid or fully filled party wall
- Air permeability rate: 1 m^3/h/m^2 at 50 Pa
- Thermal bridges: Accredited Construction Details (ACDs) or better
- Individual gas combi boilers – efficiency = > 89.5%
- Mechanical Ventilation with Heat Recovery:

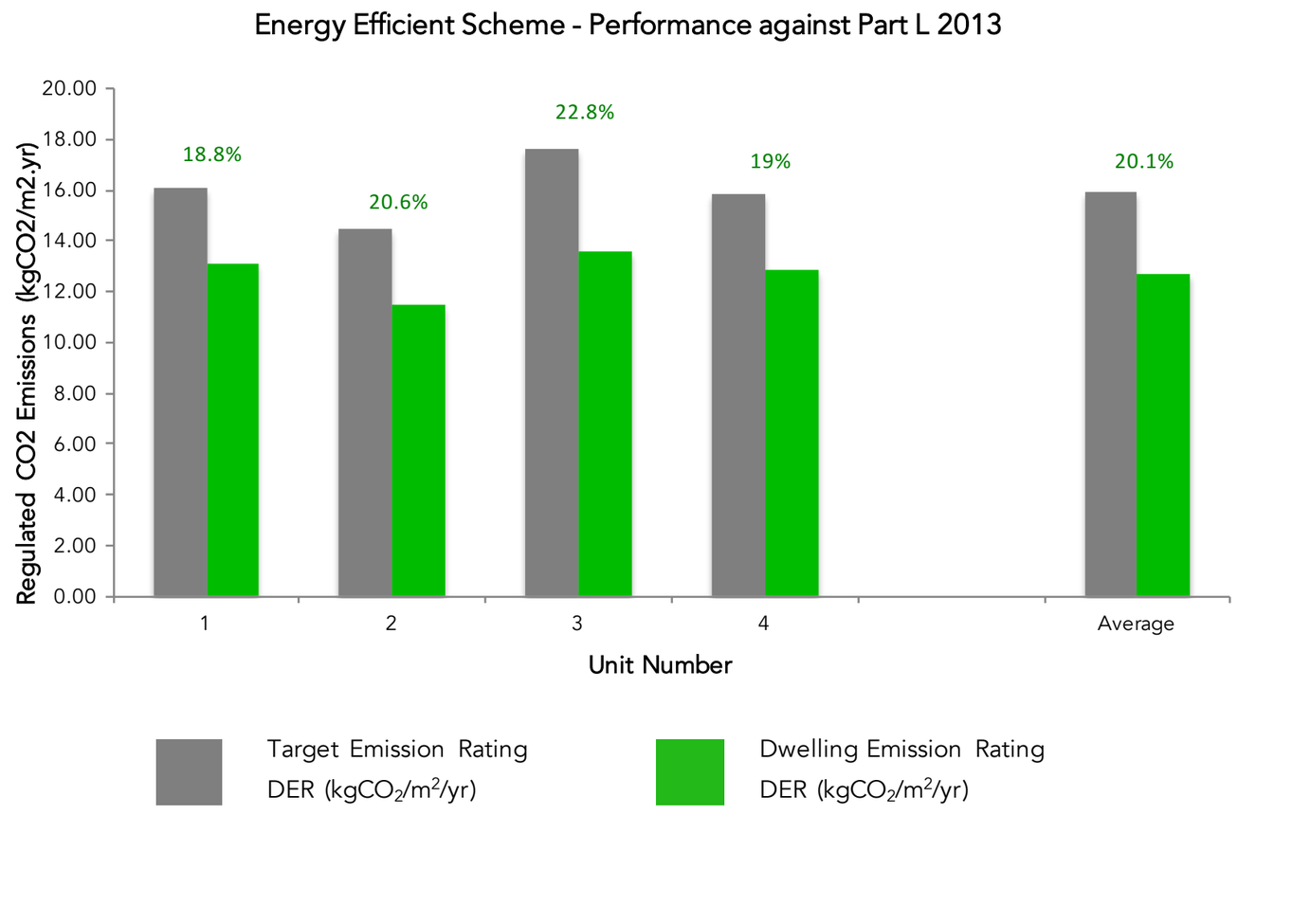
  Specific Fan Power (SFP) = 0.4

  Heat Recovery (HR) efficiency = 90%
- 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 18.8% and 22.8% improvement, with an area weighted average improvement of 20.1%.

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

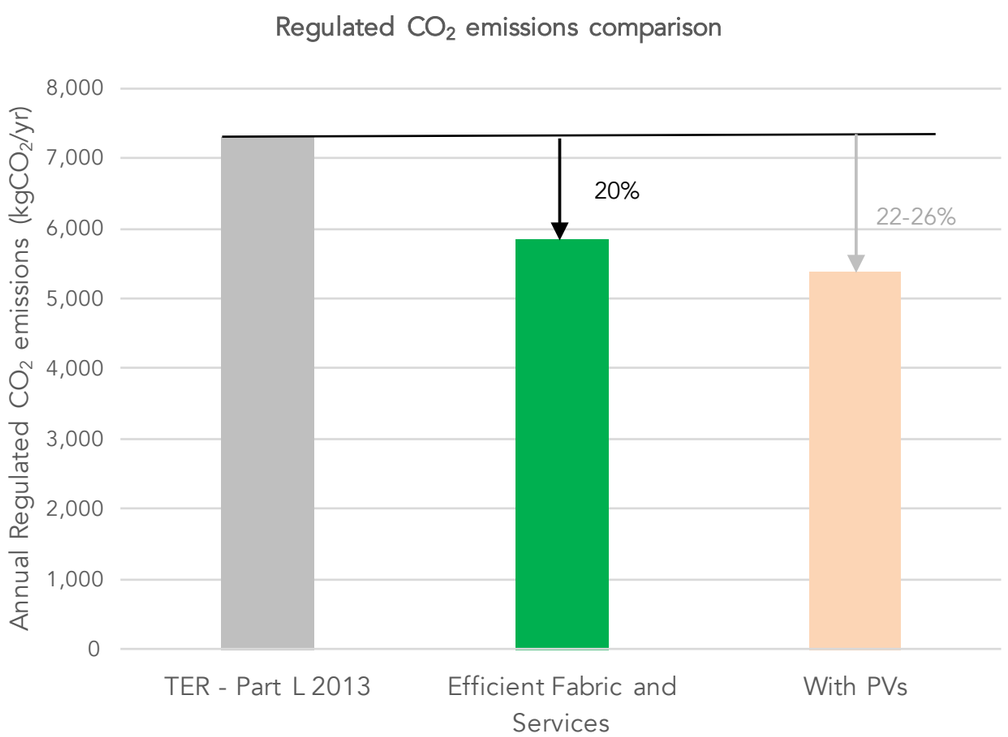
The performance of the 4 tested dwellings against **Part L 2013** gives an area weighted average improvement of 20.1%. Therefore the minimum requirement for Code Level 4 (i.e. 19%) is achieved.



Summary of regulated CO_2 reduction

In summary, the development achieves a 20% improvement over Part L 2013 exclusively through passive design and energy efficiency (e.g. fabric U-values, double-glazed windows, MVHR, efficient boilers). This is the equivalent of a 25% saving over Part L 2010 and is sufficient to meet Code for Sustainable Homes level 4 and satisfy the planning condition requirements.

The feasibility for renewables has been explored with the only viable technology being a PV array. However, with the small roof area available it is not possible to include the 8m2 of PV panels required to achieve 25% savings over Part L 2013. As the savings possible are very small PV panels are not considered feasible for this project.



CO_2 emissions (tonnes / yr)	Regulated	Unregulated
Baseline (Part L 2013)	7.3	8.2
After energy demand reduction	5.8	8.2

CO_2 savings	tonnes / yr	%
from energy demand reduction	1.5	20%