London Borough of Camden

Energy Efficiency and Renewable Energy and Sustainability Plan

S106 Pro-forma v.1 – Part A

(To be submitted prior to implementation: planningobligations@camden.gov.uk)

Scheme address:	3 Camden Square London NW1 9UY
Planning Reference:	2015/6764/P
Related Planning References:	
Scheme Description:	Demolition of the single small, derelict garage to the rear of 3 Camden Square's garden and the erection of a new 4/5 bedroom mews house on Camden Mews in its place built to Passivhaus Standards.
Person/s undertaking review on behalf of applicant *(include organisation name and registration number)***:**	Alex Whitcroft, *certified Passivhaus Designer* bere:architects

This form must be completed by an appropriately qualified independent Energy and Sustainability Consultant, undertaking the review of the Energy Efficiency and Renewable Energy and Sustainability Plans, as required by the S106 Legal Agreement, on behalf of the applicant. Please complete the form in full. If you have any questions please contact planningobligations@camden.gov.uk

S106 CLAUSE DETAILS

Please summarise how the applicant is meeting their planning obligations relating to energy / sustainability as outlined within the S106 agreement (please add/ remove rows as applicable).

S106 clause no.	S106 clause wording	Summary of performance
N/A	Planning permission requirement to discharge condition 9.	

BUILDING SPECIFICATION TARGETS

Energy and Sustainability Statement key targets:

Please outline in the table below the key targets from the Energy and Sustainability Statements submitted at Full Planning stage, and summarise how the detailed design specification compares. Add or delete rows as necessary.

Please clearly outline any reasons for changes to the approved building specification.

	Full Planning: energy and sustainability statement targets	**Detailed Design: performance against targets**
Carbon reduction targets		N/A
Building fabric u-values and air permeability		Building fabric U-values - Ground floor slab: 0.11 W/m^{2}K External walls: 0.091 - 0.145 W/m^{2}K Roofs: 0.138 - 0.093 W/m^{2}K Windows - U_g: 0.6 W/m^{2}K U_w: 0.8 W/m^{2}K Air permeability – <0.6 ach
Low carbon technologies		Ventilation – Operable windows – Generously sizes, fully openable windows in all habitable spaces provide natural ventilation during summer months. Wherever possible cross ventilation in encourage, either via windows located two or more sides of a space or via circulation spaces in single aspect spaces. Heat recovery ventilation – Complimenting the natural ventilation, is a high-efficiency heat recovery ventilation system (MVHR) is provided for the coldest times of year – when most buildings close their windows and are often stuffy or damp, or open the windows which wastes heat. The system supplies fresh air to living rooms and bedrooms, tempered by the air exhaled from kitchens and bathrooms. Typically, a high-quality heat recovery ventilation unit saves 10 times more energy than it uses – reclaiming 80-90% of the heat in outgoing air, while running on only 15 watts of power on supply, and 15 watts of power on extract. Ductwork runs are kept to a minimum and supply ducts to the outside are insulated to minimise heat loss. Heating – The building has been designed, using Passive House techniques as so requires very little heating energy (less than 15kWh/sqm per year). On this project, the core Passive House techniques have been used in combination with insulated shutters on the windows, to not require any mechanical heating system at all (typically a Passive House has a very small heating device with a heat output similar to a hair dryer). The

		building will be heated by 'solar gains' (thermal energy from the sun entering through the windows) and 'internal gains' (thermal energy from the occupants' body heat, electronic devices, lighting, and appliances). Hot Water – A high efficiency air source heat pump (ASHP) will be installed to provide hot water for the house. Lighting and Electrical – High efficiency LED fixtures are used for the lighting throughout. Spaces are designed to provide a good level of daylight and a high quality of light to improve occupant comfort as well as reducing the use of electric lighting. The lighting is also designed to be simple and minimal, to help promote a lower lumens-per-capita use of lighting.
Renewable energy		A Passive House building first and foremost derives a large proportion of its energy requirements passively – from solar and internal heat gains. In addition, because the energy requirements are so small, a significant proportion can be derived from on-site renewable energy systems, like solar panels. On this building, a significant proportion of the home's very low energy requirements will be supplied by a $27m^2$ photovoltaic array on the second floor roof. The home will be all electric, thereby avoiding the use of any fossil fuel on site and being ready for the future all-renewable national electrical grid.
Decentralised energy network connection		On this building, a significant proportion of the home's very low energy requirements will be supplied by a $27m^2$ photovoltaic array on the second floor roof, comprising 22No. 245Wp PV panels. The panels will have a cell efficiency of >22% and a module efficiency of >19%, producing a total output of 5.39kWp.
Metering, monitoring and management		Based on best practice compiled from our previous projects, we will be carefully monitoring the building to assess its performance against our design-stage energy modelling and benchmark values for comfortable, healthy interior environments. This monitoring will be done with a set of electrical submeters and a range of sensors measuring temperature, humidity, CO2, and airborne particulates. Based on our previous low-energy projects we expect to find no performance gap (very rare in the UK construction industry) and exceptionally clean and healthy interior air. We will also carry out post occupancy evaluation, interviewing the occupants to understand their level of satisfaction with the building and gain any insights as to what could be improved on future projects. This process of detailed review and learning is often not done on construction project or done very weakly. However, it is critical to enable design teams to improve the performance of the buildings they deliver in the future.
Code for Sustainable Homes Rating		N/A – The building is designed to meet full Passive House criteria. The term 'Passive House' refers to an advanced low energy construction standard for buildings providing excellent health and comfort - both cool in summer and

		warm in winter - with minimal heating or cooling requirements. Passive House buildings provide - for less than 10% of the energy consumption of a conventional building - a plentiful supply of fresh air, a stable internal temperature, low C02 levels, no drafts or condensation, and perfect air humidity for healthy conditions all year round. To achieve this, Passive House buildings use a combination of thermal bridge free super-insulation, draft-free construction, solar shading, natural and high-efficiency mechanical ventilation, and renewable energy systems. This strategy is so effective, that Passive Houses can result in up to 90% annual cost savings to the occupier, on energy bills, compared to ordinary buildings. Furthermore, the very high standard of construction needed to build a certified Passive House means that common building faults are avoided, resulting in less maintenance.
BREEAM rating		N/A – see above.
Materials, sourcing and waste		All timber and timber products is specified to be from FSC or PEFC accredited sustainable sources. Where possible we have specified UK or EU manufactured products to reduce the environmental impact associated with material transportation and help ensure we support more ethical production practices. These include: plumbing products, ventilation and heating equipment, tiles, structural timber, timber boards products, timber cladding. GGBS cement has been specified for all the in-situ concrete. GGBS is 'ground granulated blast-furnace slag', a processed waste product from steel production. It can be used to replace some of the cement content in concrete, reducing the CO2, NOX, and SO2 emissions of the concrete by around 70%. As a waste material, it also reduces the embodied energy of the concrete by 40%. As in many of our buildings, we extensively use UK and EU sourced timber as a rapidly renewable, low-embodied energy material that is also provides a natural store of CO2. On this project timber is used in structural framing elements, insulation, exterior cladding, and interior finishes. In addition to healthy ventilation year-round, our buildings improve indoor air quality by using non-polluting, natural materials and finishes. Zero-VOC finishes have been specified throughout. Paints will be from Earthborn's VOC-free, organic paint range. Timber products containing glues and resins (such as plywood and OSB) have been specified as zero-added-formaldehyde. The building has been designed to be highly durable while also allowing for straightforward adaptation to the evolving needs of users.

		The concrete and blockwork frame provides a robust, long-lasting structure that is also rodent and fire resistant. The design also incorporates a modern interpretation of a traditional dado rail and panelling arrangement. As well as the general 100mm service cavity throughout, up to dado rail level, the interior walls of most spaces are made up of demountable timber panels, allowing increase services to be easily adjusted or added without redecorating. Wherever possible, constructions are designed to allow for decommissioning and disassembly, avoiding irreversibly glued constructions. Materials are chosen with consideration for recycling or reuse at end of life.
Green infrastructure		N/A
Water efficiency and SuDS		Storm water is increasingly an issue as our cities become denser. The building is designed to attenuate storm water by absorbing water in green roofs, slowly discharging water from roofs using reservoir boards and small outlets, and permeable paving. All fittings in the house have been specified with very low flow restrictors. All toilets have very low flow dual flush cisterns. The result is very low overall water consumption (well beyond what is required by building regulations), including hot water, which has the knock-on benefit of reducing energy used for heating hot water.
Other		Ecology – Native plantings are integrated into the design, providing habitats attractive to birds, bees, and butterflies. Plants are chosen to provide flowers over the course of the year to better support biodiversity. Where flat roofs on the building are not paved/decked terraces, plantings are incorporated. On the second floor roof, a 100-150mm thick extensive green roof will be installed, over the roofing membrane, and planted as a wild flower meadow. On the first and second floor terraces, 900mm deep planters will be installed allowing large plants to be A mixture of shrubs, ground hugging plants, and grasses will be planted in ground floor beds around the paved areas. Larch cladding is fitted on battens creating a ventilated facade to the upper floors. Behind the cladding, the floor are protected breathable wood-fibre board. This board is used instead of a synthetic 'breather membrane' to reduce the use of petroleum-derived products and to avoid bats from getting trapped in a membrane (bats are known to roost behind rain screen cladding and can get their claws trapped in loose membranes). Summer comfort and shading – The building has been designed to minimise the risk of summer overheating (a common problem in many contemporary buildings). Sometimes dedicated exterior shading devices can be used as part of this strategy.

		However, this building has been designed not to require exterior shades for preventing summer overheating. This has been achieved through thermal mass, low-e glazing, effective natural ventilation, careful sizing and positioning of windows, and avoiding very large areas of glazing. Operable windows in all habitable spaces provide natural ventilation for summer cooling. The concrete structure, exposed on the ceilings, provides thermal mass to help maintain stable interior temperature. The secure tilt-and-turn windows can be left ajar overnight to provide purge cooling of this thermal mass, further improving summer comfort. Air Quality – UK towns and cities have very high levels of air pollutants, consistently in breach of EU air quality regulations. The health problems associated with this pollution are serious, even indoors. Passive House homes provide a significant degree of protection against these outdoor pollutants. Studies on a number of our buildings have found consistently high indoor air quality, especially in the winter months when windows are mostly closed. This is achieved through the following: Low-level, mechanical 'hygiene ventilation' providing a healthy supply of air, year-round. Evening in the winter when building occupants don't want to use natural ventilation. High-quality filters on the mechanical ventilation intake ducts prevent insects, pollutants, allergens, and other fine particulates entering the building or the ventilation system. The ventilation system also reduces dust. There are filters on the exhaust air ducts to capture dust and keep it out of the ventilation system. MVHR unit is designed to be assessed easily to encourage regular filter cleaning/changing.

ENERGY HIERARCHY

Please enter in the tables below carbon reductions for the development for each stage of the energy hierarchy (be lean, be clean, be green), following the guidance outlined in the GLAs *Guidance on Preparing Energy Assessments* and *Camden Planning Guidance CPG3*.

Please be aware that where carbon dioxide reduction targets are not met, the applicant will be required to either:

1. Retrofit on-site carbon reduction measures with a view to meeting targets
2. Implement carbon reduction measures elsewhere in the borough (prior agreement with the Council will be sought)

Key targets from Energy and Sustainability Statements:

	New build commercial (includes major refurbishments assessed under Part L2A)		New build residential (includes major refurbishments assessed under Part L1A)		Commercial Refurbishment (assessed under Part L2B)		Residential Refurbishment (assessed under Part L1B)		Overall area weighted reductions	
	Total tCO2	% reduction at each stage	Total tCO2	% reduction at each stage	Total tCO2	% reduction at each stage	Total tCO2	% reduction at each stage	Total tCO2	% reduction at each stage
Baseline		N/A		N/A		N/A		N/A		N/A
Be Lean										
Be Clean										
Be Green										
TOTAL										
Shortfall					N/A	N/A	N/A	N/A		

Detailed design stage targets:

	New build commercial (includes major refurbishments assessed under Part L2A)		New build residential (includes major refurbishments assessed under Part L1A)		Commercial Refurbishment (assessed under Part L2B)		Residential Refurbishment (assessed under Part L1B)		Overall area weighted reductions	
	Total tCO2	% reduction at each stage	Total tCO2	% reduction at each stage	Total tCO2	% reduction at each stage	Total tCO2	% reduction at each stage	Total tCO2	% reduction at each stage
Baseline		N/A		N/A		N/A		N/A		N/A
Be Lean										
Be Clean										
Be Green										
TOTAL										
Shortfall					N/A	N/A	N/A	N/A		

EVIDENCE:

Detailed Design Stage

	Enclosed? Yes	N/A	Notes:
Copies of SAP/ SBEM worksheets	☐		Please submit SAP/SBEM calculations evidencing the CO2 savings for each stage of the energy hierarchy, alongside this report. Pease provide details of which apartments have been

			sampled (if applicable). Results need to reflect the detailed design of the development.
Code for Sustainable Homes Pre-implementation assessment	☐	☒	This will need to be a “Pre-implementation” assessment. Although the Council is no longer able to condition new housing developments to achieve CfSH certification, any application which has already committed to achieving certification through S106 will be required to fulfil this obligation.
BREEAM In Design Review	☐	☒	Please note: this will need to be the “In Design” review and not a copy of the “Pre-Implementation” review. Applicants should also submit Design Stage certificates.
Technical details/ plans/ drawings of installed CHP and other low/ zero carbon technologies (where relevant)	☐	☒	Please submit details where relevant, as outlined in the S106.
CHP Air Quality Assessment	☐	☒	Please follow the Council’s guidance on completing air quality assessments outlined in *CPG6*.
Decentralised Energy Network connection details.	☐	☒	Details should include: plans/drawings demonstrating: adequate plant room space provision; space for future heat exchanger; details of provisions made for connections (capped pipework, pipe routes, and provision of domestic hot water isolation valves); and any further details demonstrating that the connection has been designed in accordance with the CIBSE Heat Networks Code of Practice for the UK .

Please provide any further information relevant to this development – prior to implementation:

The information provided above has been formatted to match Camden Council’s pro-forma for Energy and Sustainability Statements in order to aid the ease of reading.

The building, a single private dwelling, has been designed to meet rigorous Passive House standards, and employs a fabric-first design approach. Passive

House requirements far exceed Code for Sustainable Homes and BREEAM requirements, and maps onto Camden's Energy Hierarchy as follows:

Be Lean:
First and foremost, Passive House buildings take fabric-fist approach to reducing energy use. They have a maximum primary energy demand of 120kWh/m^2/yr and a heating demand of <15kWh/m^2/yr. Passive House buildings are designed to be super-insulated and airtight, with an airtightness of <0.6 air changes per hour. Opaque building fabric elements (walls, floors, roofs) have a heat transfer coefficient of <0.15 W/m^2K. Glazing is also highly efficient, with low-e coated, triple-glazed units with insulated frames. These typically have a U-value of <0.8 W/m^2K. Good interior daylighting and solar gains are ensured by a light transmittance of >50%. All thermal bridges are accounted for or designed out in the detailing of the building.

Be Clean:
Energy is supplied incredibly efficiently throughout the building. A Heat Recovery Ventilation Unit supplies clean air through the house, and recovers >75% of the heat from the exhaust air to be transferred to the fresh supply air. The HRV unit is coupled with natural ventilation from operable windows in each habitable room. In addition, this building uses an air source heat pump to ensure a clean supply of heat for hot water production.

Be Green:
In addition to the Passive House principles employed, this building has a 27m^2 photovoltaic array on the second floor roof, comprising 22No. 245Wp PV panels. The panels will have a cell efficiency of >22% and a module efficiency of >19%, producing a total output of 5.39kWp.

The agreed contents of this Energy Efficiency and Renewable Energy and Sustainability Plan must be complied with unless otherwise agreed in writing by the Council.

Signed:	Alex Whitcroft
Print full name:	Alex Whitcroft
Position:	Associate Director, Bere Architects
Date:	11th September 2017

Please submit to: planningobligations@camden.gov.uk

End of form - A

London Borough of Camden

Energy Efficiency and Renewable Energy and Sustainability Plan

S106 Pro-forma – Part B

(To be completed and submitted post completion)

S106 CLAUSE DETAILS

Please summarise how the applicant is meeting their planning obligations relating to energy / sustainability as outlined within the relevant S106 agreement (please add/remove rows as applicable).

S106 clause no.	S106 clause wording	Summary of performance

BUILDING SPECIFICATION TARGETS

Energy and Sustainability Statement key targets:

Please outline in the table below the key targets from the Energy and Sustainability Statements submitted at Full Planning stage, and summarise how the actual building compares. Add or delete rows as necessary.

Please clearly outline any reasons for changes to the approved building specification.

		Post completion: performance against targets

	Full Planning: energy and sustainability statement targets	
Carbon reduction targets		
Building fabric u-values and air permeability		
Low carbon technologies		
Renewable energy		
Decentralised energy network connection		
Metering, monitoring and management		
Code for Sustainable Homes Rating		
BREEAM rating		
Materials, sourcing and waste		
Green infrastructure		
Water efficiency and SuDS		
Other		

Post completion results:

Please enter in the tables below the carbon reductions for the development for each stage of the energy hierarchy (be lean, be clean, be green), following the guidance outlined in the GLAs *Guidance on Preparing Energy Assessments* and *Camden Planning Guidance CPG3*.

Please be aware that where carbon dioxide reduction targets are not met, the applicant will be required to either:

1. Retrofit on-site carbon reduction measures with a view to meeting targets
2. Implement carbon reduction measures elsewhere in the borough (prior agreement with the Council will be sought)
3. Make a carbon offset payment, where appropriate.

	New build commercial (includes major refurbishments assessed under Part L2A)		New build residential (includes major refurbishments assessed under Part L1A)		Commercial Refurbishment (assessed under Part L2B)		Residential Refurbishment (assessed under Part L1B)		Overall area weighted reductions	
	Total tCO2	% reduction at each stage	Total tCO2	% reduction at each stage	Total tCO2	% reduction at each stage	Total tCO2	% reduction at each stage	Total tCO2	% reduction at each stage
Baseline		N/A		N/A		N/A		N/A		N/A
Be Lean										
Be Clean										
Be Green										
TOTAL										
Shortfall					N/A	N/A	N/A	N/A		

Post Completion Review

	Enclosed? Yes	Enclosed? N/A	Notes:
Copies of SAP/ SBEM worksheets	☐		Please submit SAP/SBEM calculations evidencing the CO2 savings for each stage of the energy hierarchy, alongside this report. Pease provide details of which apartments have been sampled (if applicable). Results will need to reflect the actual constructed building.
Code for Sustainable Homes Assessment and Certificate	☐	☐	This will need to be the final review and certificate. Although the Council is no longer able to condition new housing developments to achieve CfSH certification, any application which has already committed to achieving certification through S106 will be required to fulfil this obligation.
BREEAM Post Completion Review and Certificate	☐	☐	Please note: this will need to be the 'Post Completion" review and not a copy of the "Pre-Implementation" or "Design Stage" review. The Council recognises that formal certification can take several weeks therefore occupation can be permitted before certificates are received, subject to satisfactory Review.
Technical details/ plans/ drawing of installed CHP and other low/ zero carbon technologies (where relevant)	☐	☐	Please provide confirmation/ evidence that approved measures have been implemented.
Decentralised Energy Network connection details.	☐	☐	Please provide confirmation/ evidence that approved measures have been implemented.

Signed:	
Print full name:	
Position:	
Date:	

Please submit to: planningobligations@camden.gov.uk

End of form - B