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Sustainability, Renewable Energy and Compliance Strategy

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Contents

Executive summary

MO-Associates Engineering Ltd have been commissioned by the client to provide an energy statement in support of planning application for the redevelopment and erection of a new 4-storey 1 and 2-bed apartments at 70 Churchway, Camden. Camden Council states that the following is required for the planning application;

Camden Council Sustainability Planning Guidance CPG 3 requires the total baseline energy demand and the carbon dioxide emissions of the development beyond the minimum requirements of Building Regulation. CPG3 advises that Policy 5.2 Minimising carbon dioxide emissions of the Draft Replacement London Plan introduces a carbon dioxide reduction target for new development to make a ***40% reduction on 2010 building regulations between the 2013-2016 period****. An Energy Assessment will show* ***40.75% reduction in CO_2 emissions*** *over PART L of Building Regulations in accordance with London Plan Policies 5.1, 5.2 and 5.3". Solar thermal hot water generation is utilised as renewable energy in order to achieve the CO_2 reduction shown here.*

The Energy Statement should provide details of:

- *The total carbon emissions resulting from this energy use ($kgCO_2$/year) (to convert energy use to carbon emissions, use the Building Regulations current figures)*
- *The likely reduction in carbon emissions resulting from the incorporation of renewable energy equipment in the development ($kgCO_2$/year)*

Specification of the type/s of renewable energy equipment proposed for the development. ‘

The management of the energy consumed by our buildings is a key factor in the government's strategy in handling the threat of climate change. This concern has been raised through the White Paper on Energy, adopted as the basis of the Building regulations Part L1A and its ideals absorbed by Local Council's Unitary Development Plans. This document outlines the requirements and calculation outputs showing compliance with the requirements. The reduction on CO_2 emissions and preliminary SAP calculations has been addressed in this report along with this application.

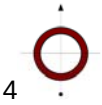
It is incumbent on designers and developers to ensure that any building project considers the long term consequences on its energy performance. This is best achieved by designing a building that is low energy and substitutes at least part of its reliance on fossil fuels with energy supplied by on-site renewable sources.

This report outlines how best to achieve these aims on the new erection/ development. Each component introduces certain challenges, for example the limitation on renewables due to the location and client requirements.

The development focuses on two key areas. The first is the energy savings through efficiencies such as passive solar design (this will require input from the architect), high efficiency plant and improved insulation and air tightness.

The second is the savings through the use of renewable technologies, such as active chilled beams, air source heat pumps, solar water collectors and photo-voltaic.

This report quantifies the anticipated energy consumption figures for the 70 Churchway, Camden erection/ redevelopment using the methodology given in the Building Regulations Part L1A, Approved Documents and also local authority development plans.



1. Introduction

This report analyses the predicted annual CO_2 emissions of the proposed new erection of a 4-storey apartment with individual flats on each floor at 70 Churchway, Camden.

The proposal is to redevelop the existing site comprising:

- Basement floor – Bedroom, hall/ staircase, living room/ dining, kitchen, toilet and garden.
- Ground floor – Bedroom, hall/ staircase, living room/ dining, kitchen and disabled person toilet.
- First floor – Bedrooms hall/ staircase, living room/ dining, kitchen and toilet.
- Second floor – Bedrooms, hall/ staircase, living room/ dining, kitchen and toilet.
- Third floor – Bedrooms, hall/ staircase, living room/ dining, kitchen and toilet.
- Roof - PV panel installation.

This report sets out to demonstrate how the proposal will address building regulations Part L1A and low carbon Plan for the Environment Policy.

Description of Proposed Development

The scheme will comprise of four-storey new part erection. The floor by floor breakdown of the building and net internal floor area is as follows.

Basemen floor	63.1 m^2
Ground floor	48.4 m^2
First floor	64.00 m^2
Second floor	64.00 m^2
Third floor	61.20 m^2
Total	300.7 m^2

2. Approach

The development will be designed in accordance with local planning policies, most notably, the new part erection/ developments will be required to include measures to offset 20% of total predicted baseline carbon dioxide emissions through a combination of suitable design and construction and on-site renewable energy generation. The new building shall also be in compliance with the Code 4 of code for sustainable homes.

The Energy Strategy sets out **the following principles:** using **less energy**, **supplying energy efficiently** and, using **renewable energy**. Part L1A of the Building Regulations (2010) will be used as the minimum benchmark and the starting point for the assessment.

The inference here is the Building Regulations assessment should be used as the basis of energy assessment. The government's Standard Assessment Procedure (SAP) for Energy Rating of Dwellings, 2009 edition would be used for assessing the energy performance of dwellings. The indicators of energy performance are energy consumption per unit floor area, an energy cost rating (ie SAP rating), an Environmental Impact rating based on CO_2 emission and a Dwelling CO_2 Emission Rate (DER).

3. Part L1A and Renewable energy options:

This section details the methodology and results in calculating the annual energy consumption for the elements of the development.

a. The Baseline Scenarios (Part L1A 2010)

The 'Baseline' scenario which details 4-storey covering an internal floor area of approximately 300.07 m^2 which will comply with objectives of Camden Council's planning policy in terms of energy. The energy performance of the building will comply with the current Building regulations.

b. Energy Efficiency (Be lean)

The energy efficiency measures that have been considered for this development are intended, where feasible, to use less energy. These measures should be considered prior to the application of renewable energy to site. The following energy efficiency measures have been considered.

Orientation

The general positioning and orientation of the building in a southerly direction favours solar gain. Wherever possible the internal layouts of the accommodation will be arranged to maximise sunlight where beneficial in winter, but with solar shading where required to limit cooling loads in summer.

Insulation

Consideration has been given to uplifting the insulation in walls, roofs and floors to a standard above the current Building Regulations standards will result in considerable CO_2 reduction saving depending upon the materials selected. The proposals will be in line with the new regulations which will be in force from April 2014.

Glazing

Windows for the development are to comprise double glazed units within metal frames. Windows generally contribute a significant proportion of the heat loss of a building and it is therefore proposed to specify high performance windows for this development to reduce this heat loss. As with the building fabric options (insulation) the U-values of the glazing impacts the overall efficiency of the building envelope. Again, by selecting glazing that exceeds Building Regulations requirements will reduce the CO_2 emissions of the building.

Ventilation

Building Regulations require a ventilation system that extracts moisture from kitchens, showers, toilets and bathrooms, whilst providing a controlled fresh air supply. This is even more important where high standards of air-tightness are proposed and natural infiltration is reduced. The central corridors will be passive mechanically ventilated to prevent unpleasant odours and stuffiness associated with this type of development.

Lighting and Appliances

Low energy lighting is probably one of the cheapest and easiest ways available of producing significant energy reduction and therefore low energy lighting will be specified throughout the residential units wherever possible. We will look to achieve the 80% required by the building Regulations or better.

Provision of the required lighting levels whilst minimising energy consumption could be achieved by effectively controlling the lighting systems through:-

- Using energy efficient lamps and luminaries.
- Having either suitable manual/automatic switching or both.
- Having suitable energy consumption metering.
- Having been appropriately commissioned

Where possible the lighting in communal areas would be controlled using presence-detecting controls, with daylight cut-offs controls where appropriate.

Water Saving

Although not a direct energy saving, reducing cold water consumption will provide an indirect energy saving as treatment of water to drinking water standards is an expensive and energy intensive process. In addition it will reduce demand on already stretched water resources.

In addition reducing hot water consumption provides a direct energy saving as less water has to be heated.
Water saving measures to be considered includes:

- Use of low flush or dual flush toilets
- Use of water saving white goods
- Use of aerated spray taps where appropriate.

In addition the feasibility of incorporating water recycling into scheme will be considered particularly for watering the garden areas.

4. Low Carbon Technology and Renewable Energy Assessment (Be Green)

This section outlines the consideration that has been given to the viability of using each renewable technology type on this site. The following systems have been considered:

- Photovoltaic Panels
- Solar Water Heating
- Biomass Heating
- Wind Turbines

Due to the configuration of the site, a number of technologies were more suitable to be considered. It is assumed that there are no '**shadowing buildings nearby**'.

Ground Source Heat Pump (GSHP)

This option would entail the installation of a ground source heat pump to provide heating water and domestic hot water. GSHP make use of the fact that at below about 1m depth, the earth maintains a virtually constant temperature year round. This heat can be captured using recirculation pipework systems either laid into trenches or sunk in boreholes. This recirculation system is then connected to a heat pump, which can be designed to operate either in heat or chill mode to produce space heating or cooling. This system is not considered for application at this project.

Solar Photovoltaic Panels

Photovoltaic systems use cells to convert solar radiation into electricity rather than heat. The greater the intensity of light, the greater the flow of electricity, although overshadowing by nearby buildings or trees will decrease the output of the system. As with solar thermal heating the building orientation seems favourable for solar PV. However, this technology is more expensive than solar thermal heating, and will meet less of the energy demand for the same roof area.

This option would entail the installation of an array of PV solar panels on the roof. The electricity generated could be used for general purposes within the building or sold to the National Grid. This would help achieve a good score in terms of sustainability. This system is not considered for application at this project.

Solar Water Heating

Solar water heating systems gather energy radiated by the sun and convert solar radiation into useful hot water. Systems are well developed in the UK and can be designed to suit many applications, able to provide almost the entire hot water requirement in the summer and about 50% for the rest of the year. Due to the concealed nature of internal roof slopes giving favourable orientation of ample roofs in southerly direction across in a southerly direction across the site, solar technology will be considered for the site.

Solar water heating would be suitable to provide preheat to the hot water system.
Solar thermal has been maximized to generate the peak amount of solar water for the given demand.

This system is not considered for application at this project.

Biomass and bio oil Heating

A successful bio mass heating system would require an established fuel chain within the local area, provision of storage and plant room spaces, and would require on-going maintenance and facilities management input. As the hot water load is being managed through the use of solar water collectors, the heating demand is further reduced. Given the amount of space and location of plant required for biomass heating we have deleted the solution for this site. This option can be utilised to increase the energy rating and hence obtain further points for the Code for Sustainable Homes assessment. This system is not considered for application at this project.

Wind turbines

The average wind speed on the site is 5-6ms at a height of 25m above ground level, according to the British Wind Energy Association (BWEA) database. The minimum wind speed as recommended by the BWEA is 5-6ms, so wind turbines may be applicable within the development. However, it is considered that other renewable energy technologies may be more appropriate, or capable of meeting a great proportion on the energy demand. In order to consider this option further, extensive wind speed testing at the location would have to be carried out. This system is not considered for application at this project.

5. Shortlist of renewables for further consideration

Early indications are that a solar thermal hot water heating may be able to provide the minimum 10% renewables requirement for the development. The orientation of the buildings across the site increases the viability of this option.

Other options such as solar photovoltaic panels, heat pump, wind technology would need further appraisal before being employed on site. However, it is thought that the options listed above will be able to cater for a greater proportion of the development's energy demands.

6. Energy Demand Assessment

The final total annual energy demand calculated for the development will include energy use for all the following end users where they are known to be present:

- Space heating and hot water
- Gas and/or electric catering
- Refrigeration/cooling
- Lighting

At the time of the energy assessment, the detailed design with respect to the u values of the building envelope had not been finalised but the London Renewables toolkit entitled "Integrating renewable energy into new developments; Toolkits for planners, developers and consultants" was used to predict the energy demand and assess the likely need for renewable energy technologies. All references below relate to the toolkit and tables contained therein.

7. Calculate baseline carbon emissions for the site using SAP modelling tool.

Be Lean & Green Design Criteria:

	Baseline (Part L1A Minimum Values)	'Be Lean & Green (Improved Values)
Building Envelope		
U- Values (W/m²K)		
Wall	0.30	0.17
Floor	0.25	0.13
Roof	0.20	0.13
Windows	2.00	1.2
Personnel Doors	2.00	1.80
Air Permeability at 50pa ($m^3/h/m^2$) :	10	3
M&E Equipment		
Boiler Efficiency	88 %	89.5 %
Energy Efficient Lights	75 %	80 %
Local Fan Specific Fan Power (W/l/s)	0.6	0.6

Table 1: CO_2 Emissions Comparison.

Dwelling	Area 302.03 m^2			

	Target CO_2 Emission Rate (TER)	**Dwelling CO_2 Emission Rate (DER)**	**CO_2 Emissions**	**Notes**
	($KgCO_2/yr/m^2$)	**($KgCO_2/yr/m^2$)**	**% Improvement Over Baseline**	
Annual CO_2 Emission Rate ($KgCO_2/yr/m^2$)	16.22	9.61	40.75%	

Initial analysis has shown that the proposed development would achieve a “PASS” Rating as required by Building Control.

It can be seen that despite a very restricted site, the developer’s proposals meet all the requirements of Camden Council on the reduction of CO_2 emissions.

8. Methodology for Dwellings and Non-Dwellings (Part L 2010)

The new Part L document, issued on October 2010, details the methodology to be applied to the assessment of the energy performance of dwellings and non-dwellings. It establishes that energy consumption is to be measured in CO_2 emissions, calculated from the annual power consumption of the development, given in kWh/annum.

For new residential building it must comply with Part L1A 2010 of the building regulations which stipulates CO_2 emissions calculations based on the Standard Assessment Procedure (SAP) 2009. Part L1A also states that compliance SAP assessment must be submitted to Building Control prior to the start of any works on site.

The Standard Assessment Procedure (SAP) is adopted by Government as the UK methodology for calculating the energy performance of dwellings.
The calculation is based on the energy balance taking into account a range of factors that contribute to energy efficiency:

· materials used for construction of the dwelling
· thermal insulation of the building fabric
· ventilation characteristics of the dwelling and ventilation equipment
· efficiency and control of the heating system(s)
· solar gains through openings of the dwelling
· the fuel used to provide space and water heating, ventilation and lighting
· energy for space cooling, if applicable
· renewable energy technologies

The procedure used for the calculation is based on the BRE Domestic Energy Model (BREDEM), which provides a framework for the calculation of energy use in dwellings. The procedure is consistent with the standard BS EN ISO 13790.

All the measures detailed within this report are focused around reducing energy consumption from the Notional Building figure down to the TER.

To meet this reduction the buildings must be made more energy efficient. This forms the first tier Energy Hierarchy (**Be Lean & Green**). It is followed by the use of renewable, and finally supplying the remaining energy from a less polluting source.

The pros and cons for the different renewables are discussed in, as not all will necessarily be appropriate for the development, and may not achieve the required energy savings.

A notional building is defined by the software with the same shape and size of the proposed building but with the standardised data for building fabric thermal performance, glazing size and level of activity relating to the buildings use.

9. Conclusion;

The toolkit provides an early indication with the improved values of the baseline from Part L1A the 40.75% reduction in Carbon Emissions can be achieved.

It also shows that with solar panels and Photovoltaic panels the dwelling CO_2 emission (DER) rate of 9.61 $KgCO_2/yr/m^2$ is lower than the Target Emission Rate (TER) of 16.22 $KgCO_2/yr/m^2$ which meets Building Control compliance.

Appendix A

Block Compliance Worksheet.

Block Compliance WorkSheet: Churchway

User Details

Assessor Name: **Stroma Number:**

Software Name: Stroma FSAP **Software Version:** Version: 1.5.0.63

Calculation Details

Dwelling	DER	TER	TFA
Basement Floor Flat	10.89	17.52	63.1
Ground Floor Flat	8.25	17.05	48.4
First Floor Flat	9.46	14.67	64
Second Floor Flat	9.46	14.67	64
Third Floor Flat	9.7	17.45	61.2

Calculation Summary

Total Floor Area	300.70
Average TER	16.22
Average DER	9.61
Compliance	Pass
% Improvement	40.75