ENERGY STRATEGY

ENVIRONMENTAL ENGINEERING SERVICES

FOR

THE LONDON BOROUGH OF CAMDEN

AT

HOLLY LODGE - MAKEPIECE MANSIONS

APRIL 2010

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JOB NO. LME 53738
DOCUMENT NO:- LME53738/ES01
REVISION NO. 02
GENERAL ISSUE

RECORD OF AMENDMENTS

AMENDMENT	DATE	REVISION
Amendment following LBC Comment	27 April 2010	Rev 02

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APPENDIX 1 – Sample SAP Calculations

1.0 EXECUTIVE SUMMARY

The Energy Statement has been prepared to support a combined planning application for the former 235-269 Makepeace mansions in Camden, London

The site comprises 15 residential dwellings. The Site has been identified as best served from a community gas fired boiler system.

The following tables provide a comparison of the carbon emissions between the "regulated" and the total emissions. The "regulated" emissions excludes occupational energy use due to such items as computers, washing machines, TV's etc. These summary tables are in the format required by Appendix D of the London Plan Supplementary Planning Guidance. (Sustainable Design and Construction).

The team are committing to achieve EcoHomes 'Very good' rating; the detailed design and material selections are still to be undertaken and tested for affordability.

Dwelling Reference	Proposed Building (Individual Boiler) CO_2 Kg/year	Proposed Building (Boiler House) CO_2 Kg/year	Percentage of improvement
Unit 3	1205	1187	1.5%
Unit 9	1024	994	3.0%
Unit 15	1251	1238	1.1%

The dwelling U values have been made low in order to reduce the emissions from the dwellings as detailed below:

Element	Existing Building U-values	Part L 1B Requirements	Proposed Values for this development	Percentage improvements
Walls	1.58 (W/m²K)	0.35(W/m²K)	0.31 W/m²K	11%
Windows	4.03 (W/m²K)	2.20 (W/m²K)	1.90 W/m²K	14%
External doors	6.00 (W/m²K)	3.00 (W/m²K)	3.00 W/m²K	N/A
Roof	2.41 (W/m²K)	0.25 (W/m²K)	0.25 W/m²K	N/A
Ground Floor	0.25 (W/m²K)	0.25 (W/m²K)	0.22 W/m²K	12%

2.0 INTRODUCTION

This report has been prepared to provide an outline of the proposed energy strategy for the site proposal at 235-269 Makepeace.

This report has been prepared by Julia Cid, a registered low carbon consultant employed by McBains Cooper. Jo Churchill of McBains Cooper has carried out the SAP calculations.

The proposal for Makepeace site comprises of a conversion of 35 non self contained HMO units (sui generis) into 10 (1 bed) and 5 (2 bed) self contained affordable flats (Class 3) and replacement of existing single glazed windows with double glazed windows.

The client London Borough of Camden has asked for this project to be assessed by EcoHomes certification.

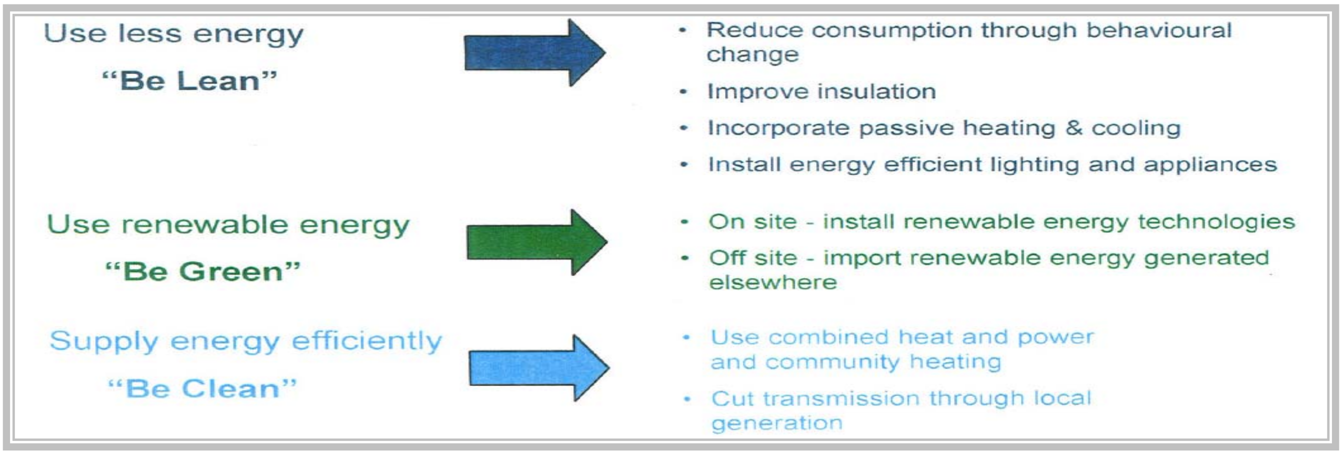
The development comprises of the renovation of a 4 storey apartment block to provide 15 no 1 & 2 bed units, which is required to achieve an EcoHomes 'very good' rating.

The dwellings will be renovated with high efficiency temperature controls, with dedicated low energy light fittings throughout and insulation will be added to the building fabric in order to achieve better u values.

The energy statement standard methodologies described within the GLA Toolkit and sustainable design and construction "The London Plan Supplementary Planning Guidance" May 2006, Appendix D. The energy has been assessed using SAP 2005 energy modelling procedure with 9.82 update April 2009. The energy attributed to occupation has been separately calculated using the BRE domestic energy model formula described within the Code for Sustainable Homes Guidance Document. The calculation methods out lined in the Low or Zero Carbon Energy Sources Strategic Guide (NBS May 2006), has been used to estimate the potential contribution from renewable energy sources.

The energy profiles have been reviewed to determine the viability of each renewable energy option. The results are then compared to determine which options offer the best carbon savings for increased cost.

This report will demonstrate how the design has been optimised to reduce energy before considering renewable energy options, inline within the three-step approach:-



3.0 ENERGY DEMAND ASSESSMENT

3.1 Method Adopted

The development has been modelled using the BRE SAP 2005 energy assessment model for domestic dwellings and the additional energy from equipment and occupational use has been estimated using the BRE Domestic Energy Model Formula 12.

Unregulated energy
BRE DEM 12 Code For sustainable homes guidance documents

$$kgCO_2 = 99.9(TFA \times N)^{0.4714} - (3.267 \times TFA) + (32.23 \times N) + 72.6$$

$$where$$

$$N = 2.84\left[1 - e^{(-0.000391 \times TFA^2}\right]$$

Where TFA is the Total Floor Area and N is the Number of Occupants
For TFA < 43m2; N = 1.46

For full details of the typical dwelling modelled, see the SAP Report in the appendix

Emission Factors	
GAS	0.194 $kgCO_2$/kWh
Electricity	0.422 $kgCO_2$/kWh
Offset Electricity	0.568 $kgCO_2$/kWh

3.2 Energy Breakdown

The energy calculations for each site have been undertaken for the base case, the improved case and the proposed design using the total energy for the sites.

Base

The notional energy calculations have been adjusted to represent improved U values for a building that just passes the building regulations.

Improved

The improved model uses the design air permeability rate and U values from the actual design proposal. The energy from space heating and hot water are the primary energy requirements without the improved boiler efficiencies. This determines the improvement due to energy efficiency without renewable elements.

Design

This is the improve case with the adjustments made for the use of an existing community boiler system and domestic hot water heat exchangers.

These calculations have been undertaken using the total estimated energy consumption of the building. The calculation methods are the same as those described with the SAP 2005 guidance documents and the Low or Zero Carbon Technologies Strategic Guide, NBS May 2006.

3.3 Site

The following table for Site provides the summary of the SAP 2005 calculations and demonstrates the compliance with EcoHomes very good rating.

Dwelling Reference	Existing Building CO2 Kg/year	Proposed Building CO2 Kg/year	Percentage of improvement	SAP Rating
Unit 3	2542	1187	53%	B
Unit 9	1233	994	53%	B
Unit 15	3481	1238	64%	B

The system parameters used in the energy assessment:-

Community Hot Water efficiency: 90%
Thermal efficiency: 86%

4.0 ENERGY EFFICIENT DESIGN

4.1 General Principles

The design adopts the principles of passive design before renewable energy options. Passive measures provide savings for the lifetime of the building.

The building therefore is designed to exceed Part L requirements in the following ways:-

- Improved fabric U-Values.
- Reduced air loss through managed ventilation.
- Reduced solar gains.
- Low energy lighting
- Lighting controls
- Optimised window design to limit heat losses whilst achieving improved daylighting.

4.2 Fabric

Element	Existing Building U-values	Part L 1B Requirements	Proposed Values for this development	Percentage improvements
Walls	1.58 (W/m²K)	0.35(W/m²K)	0.31 W/m²K	11%
Windows	4.03 (W/m²K)	2.20 (W/m²K)	1.90 W/m²K	14%
External doors	6.00 (W/m²K)	3.00 (W/m²K)	3.00 W/m²K	N/A
Roof	2.41 (W/m²K)	0.25 (W/m²K)	0.25 W/m²K	N/A
Ground Floor	0.25 (W/m²K)	0.25 (W/m²K)	0.22 W/m²K	12%

These improved U-Values will be achieved by using the following details.

4.3 Walls

The existing consists of a 360mm of brick wall and achieves a U-value of 1.49 W/m²K. It has been proposed to add a 60 mm Gyproc Thermaline super board incorporating a vapour barrier which achieves a U-value of 0.313.

4.4 Doors

The external doors will be designed to meet with external U values indicated in the above table.

4.5 Floor & Roofs

The construction of these elements will be designed to reduce thermal bridging losses at the intersections and junctions of walls and roofs. These elements will be detailed so that the Builder can achieve the required air permeability.

4.6 Windows

Modern double glazed window units will reduce the thermal losses and solar gains of the room. This is achieved by using composite frames giving the window an overall U-Value of 1.9 W/m^{2}k, the choice of solar reducing outer glass and thermal inner glass benefits by reducing solar gains in the room without compromising the loss of light. Modern window frames are double sealed so that they do not compromise air permeability to the room in the winter. This helps with reducing heat loss from uncontrolled ventilation.

4.7 Ventilation

The ventilation system shall be a continuous Mechanical Extract and Supply Ventilation with Heat Recovery at least 66% efficient according to Part L 1B.

The fan motors used in the ventilation system will be 93% efficient

The system used is “System 4 from Greenwood Air Management HRV2”; this system complies with Part L1A and is SAP Appendix Q eligible which helps to reduce ‘Dwelling Emission Rate’ (DER) in SAP.

Wet rooms will be provided with intermittent extract fans controlled by humidity sensors. This will reduce the risk of condensation on any cold surfaces due to the humidity in the air leaving the bathroom or kitchen areas.

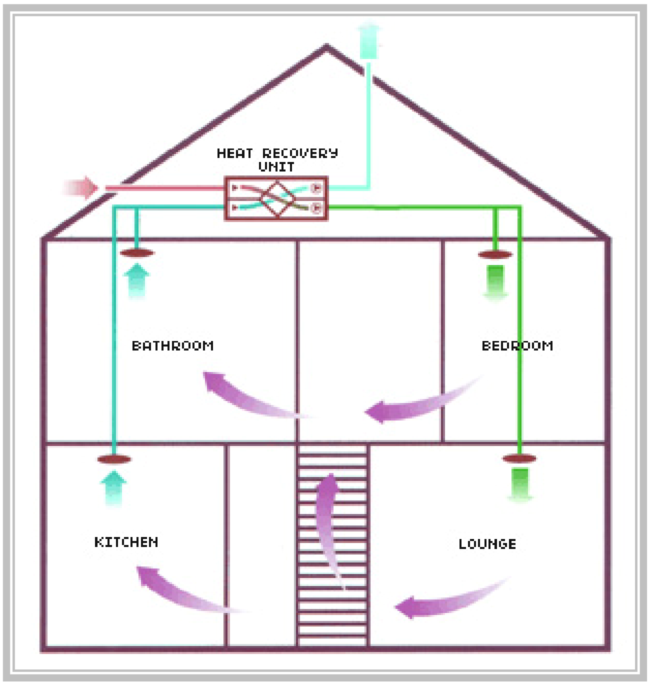


Fig1. Heat Recovery System Schematic

An Independently vented cooker hood extract unit will improve the ventilation of the kitchen and stop smell spreading into the living areas.

The ventilation rates will be designed according to Part F requirements ensuring the dwellings remain fresh and comfortable in winter.

Large window openings provide the means through which summer temperatures can be controlled.

4.8 Daylight

Careful selection of glass type will be undertaken to reduce internal heat gains without reducing daylight. This will help to reduce lighting energy in the summer months.

SAP calculations take into account energy saving due to daylight within the dwelling and the windows will be selected to balance the heat loss, purge ventilation, daylight and solar gains.

4.9 Water Reduction

The dwellings will be designed to meet 105 litres per person / day. This reduces the impact of the development on the waste water systems.

INSTALLATION	DESCRIPTION	WATER USE
WC	DUAL FLUSH CISTERN	6/4 LITRES
WASH HAND BASIN	LOW FLOW REGULATORS OR AIRATING TAPS	3.5 LITRES/MIN
BATH	STANDARD	135 LITRES
SHOWER	LOW FLOW RATE BETWEEN	6 TO 10 LITRES/MIN
KITCHEN SINK	STANDARD MONOBLOCK	3.5 LITRES/MIN
WASHING MACHINE*	BEST PRACTICE	49 LITRES

Sustainable drainage systems will be employed to limit surface water run-off rates and reduce the demand on the local drainage systems.

5.0 HEATING SYSTEM

5.1 Dwelling Heating Proposals

There is an existing community boiler system with spare capacity from which the proposed building will be connected.

The dwelling will be linked by a network of pipework to the community boiler system. This pipework system will deliver hot water for use in each dwelling's heating and domestic hot water systems via a heating interface unit (HIU). Each HIU contains a small plate heat exchanger for the production of domestic hot water and controls for the heating and hot water systems.

The heating will be distributed to the space via underfloor heating fitted with thermostatic valves.

6.0 RENEWABLE ENERGY TECHNOLOGIES

6.1 General

A range of renewable technologies have been considered for this project and are summarised below:-

6.2 Central Boiler House

Consideration has been given to a central boiler house to provide heating and domestic hot water to the dwellings due to the existence of a community boiler system with spare capacity.

Each property will have an individual meter which will monitor the heat used for individual billing.
Heat Exchangers are fitted in each property and connected to the heat main. This means that the water in the heat main stays in the main, but the heat is taken from the main and transferred into the heating systems within individual properties via HIU.

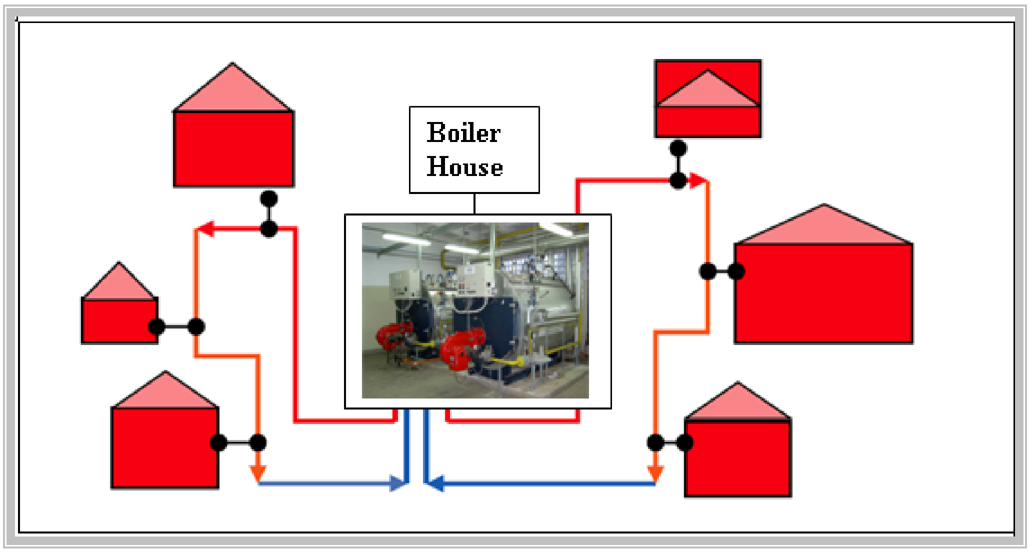


Fig 2.Central Boiler House Schematic

Some of the benefits of community and district heating systems are;

- Huge environmental gain from lower carbon emissions and higher energy conversion rate
- Provides cheaper heating and hot water for residents
- Creates more usable space within each property
- Reduces maintenance costs

- Reliability delivery by system back up.

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6.3 Ground Source Heat Pumps

Ground source heat pumps use the refrigeration cycle to take low grade heat from the ground (a renewable source) and deliver it as higher grade heat to a building.

The Site will benefit of an existing community gas boiler with spare capacity. This technology is therefore considered to be unsuitable.

6.4 Water heating

Solar water heating utilises solar radiation to heat water for use in domestic hot water heating systems serving the building, this is not proposed for this scheme, the hot water provision is via the district heating system..

The production of domestic hot water will be done via a heat exchanger. This system will extract heat from the heating circuit and will produce hot water to serve the dwellings from the district heating system.

However the production of domestic hot water will be done via a heat exchanger. This system will extract heat from the heating system and will produce hot water to serve dwellings.

6.4 Photovoltaic Panels

Photovoltaic (PV) systems convert energy from the sun into electricity through semi conductor.

PV systems may affect the overall look of the building; this will have an impact on the conservation area. This is the reason for not inclusion within this scheme.

6.6 Wind Turbines

Urban buildings suffer from turbulent air conditions, which reduce the efficiency of Wind Turbines. Average urban wind speeds are lower than usually experienced in a rural site, which will increase the size of the rotor required. The most common small scale wind turbines range in size between 5kW to 20kW and still require a relatively large rotor and mast which may not be suitable for all locations. Wind turbines put a considerable structural load on to the building which also has to be accommodated.

The roof areas of the development are used by the occupants, and this limits the location and size of the turbine. Wind turbines are considered to be an inappropriate technology to generate renewable electricity in this site.

6.6 Combined Heat & Power (CHP)

The Mayor of London has an expectation for new developments to include combined heat and power (CHP). The (CHP) provision is attractive because the thermo dynamics involved in the generation of the electricity releases a significant amount of heat energy. Traditionally, the national grid power stations have been located remotely from areas with continuous heating demands and the heat has been allowed to be released to the atmosphere in the very large cooling towers that are a familiar feature of a power station. Generating electricity locally on site can make available the consequentially produced heat for use within the development which makes more efficient use of the embedded energy in the fuel being used.

The proposed building will benefit from an existing community boiler system therefore CHP has been considered as an inappropriate technology for this site.

6.7 Biomass

Biomass heating provides the greatest emission reduction when analysed mathematically. A recent code for sustainable homes briefing document has suggested that biomass boilers provide the most cost effective route to achieving code level 4 emission reductions.

Due to the existence of a community gas boiler with spare capacity. This technology is therefore considered to be unsuitable for this particular urban development.

7.0 CONCLUSION

A sustainable building must follow three basic principles, Be Lean, Be Clean, Be Green.

- **Lean**
  Energy efficiency measure; improve lighting controls and use
- **Clean**
  Use of energy efficient heat recovery system for ventilation and heat exchangers for domestic hot water production.
- **Green**
  Sustainable building materials.

As the target of the team is to achieve a highly energy efficient dwelling with local equipment sized to deal with the local and orientated heat losses.

Further sustainability features have been considered, but these have been deemed as inappropriate for this site and application as the use. However heat recovery systems have been deemed as suitable for the application and to be cost effective for this development.

The CO_2 reduction achieved by the installation is demonstrated below as the proposed building is between 53 % to 64% below the existing building.

Dwelling Reference	Existing Building CO2 Kg/year	Proposed Building CO2 Kg/year	Percentage of improvement	SAP Rating
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APPENDIX 1

Sample SAP Calculations

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