GREENWOOD PLACE AND HIGHGATE ROAD SITE

COMMUNITY RESOURCE CENTRE, CENTRE FOR INDEPENDENT LIVING AND NEW RESIDENTIAL UNITS

ENERGY STATEMENT
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Camden Tibbalds Multidisciplinary Team PCKO

tga CONSULTING ENGINEERS

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GREENWOOD PLACE & HIGHGATE ROAD SITE:

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ENERGY STATEMENT

REVISION B

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1.0 INTRODUCTION

1.1 PREAMBLE

A team of construction professional are developing proposals for the demolition of a number of single storey buildings in Greenwood Place and the construction of a new Community Centre building. The team are also preparing proposals for the demolition of the Highgate Centre building, situated on Highgate Road and the construction of a new residential building.

TGA consulting Engineers LLP has been engaged, as part of the Tibbalds multi-disciplinary team, to provide professional design services associated with the redevelopment of Greenwood Estate. TGA's role includes development of the energy and building engineering services strategies for the development.

Development proposals are currently at RIBA stage D.

1.2 CAMDEN COUNCIL PLANNING POLICIES

All new building developments in the London Borough of Camden are required to meet minimum standards relating to sustainability, energy efficiency and carbon reduction. This is in line with London wide and national aspirations set by the London Mayor and the UK Government.

In the London Borough of Camden area, sustainability, energy efficiency and carbon reduction all feature in the planning process. Planning guidance on these matters is set out in the Local Development Framework and, in particular, in the following inter related policy documents:

- CPG3 - Sustainability
- CS13 - Tackling Climate Change Through Promoting Higher Environmental Standards
- DP22 - Promoting Sustainable Design and Construction
- DP23 - Water
- CS16 - Improving Camden's Health and Wellbeing
- DP32 - Air Quality & Camden's Clear Zone

The formulation of a viable servicing strategy and energy plan for this project, as defined in this Energy Statement, takes into account guidance contained in the above listed documentation.

1.3 THE ENERGY HIERARCHY

It is now customary to consider energy supply and energy efficiency in buildings in a three tier process known as an 'Energy Hierarchy'.

The Energy Hierarchy:

1. Be Lean – *Design and construct a new building to consume less energy*
2. Be Clean – *Deliver and consume energy efficiently*
3. Be Green – *Deliver some or all of the required energy from renewable sources.*

The importance of the 'Energy Hierarchy' is in its drive to ensure that new buildings are designed and constructed to consume only the minimum amount of energy in the first instance.

After this first objective in the hierarchy has been defined, the design of the energy generation and delivery systems can be considered.

The final step in the energy planning process is to identify how much of the buildings energy needs can be met from renewable energy sources.

1.4 CAVEAT

The energy consumption analysis and results, which underpin the recommendations included in this Energy Statement, have been derived by applying the National Calculation Methodology (NCM). This methodology is embedded in the SBEM and SAP calculation procedures.

The energy consumption for the completed buildings may differ from the predictions given by SBEM and SAP.

1.5 THIS REPORT

The purpose of this report is to set out design strategies and performance targets relating to energy conservation, energy efficiency and energy supply, which have been embodied into the development proposals and will be carried forward into the detail design and construction phases of the project.

In the first instance, the information contained in this report is will enable the local authority Planning Team to consider and understand the adopted measures and features, relating to energy, that have been incorporated into the development proposals thus far.

The emphasis in this report is on energy consumption and carbon reduction. Other issues, which come under the general heading of 'sustainability' will be covered in a separate document.

2.0 DEVELOPMENT PROPOSALS

2.1 PROJECT DESCRIPTION

The Greenwood Estate development, located in the Kentish Town area of London, is to redeveloped and will include two new buildings as follows:

- Greenwood Place Community Centre
- A Residential Building in Highgate Road, Providing 42Nr Individual Dwellings

Greenwood Place Community Centre comprises a 3228m^2, 3-storey day centre building with a roof garden area. This building is to be designed to the BRE BREEAM 'Excellent' rating with the building achieving at least 60% of the un-weighted energy credits.

The residential building is set over 5-storeys and includes 42Nr individual dwellings providing 3559m^2 of residential accommodation. A small roof garden area is being considered for this building, also. This building is to be designed to Code for Sustainable Homes (CfSH) level 4 with the building achieving at least 50% of the un-weighted energy credits.

The site is to be developed in two phases with the Community Centre Building being constructed first followed by construction of the Residential Building. To achieve this, redundant building stock on the site will be decommissioned and removed.

The following section of this report describes the strategies that have been adopted, firstly to reduce the energy demand imposed by the new buildings and secondly to identify the principal mode of energy delivery.

Finally, the provision of renewable energy systems is described.

2.2 GREENWOOD PLACE COMMUNITY CENTRE

Reduce Energy Demands

This building is designed to incorporate effective use of passive, internal climate moderating, features. This will result in less reliance of building engineering systems and hence reduced energy consumption.

Passive features that have been included.

- Natural ventilation in summertime to maintain comfortable internal temperature conditions
- Background supplementary mechanical ventilation with heat recovery
- Good day lighting in interior spaces
- Night time ventilation/cooling, coupled with exposed concrete room surfaces in the occupied spaces
- Effective use of winter sunshine on southern elevations
- Effective shading strategies to prevent unwanted solar heat admission in the summertime

The building envelope is to comprise highly insulated elements with improved u-values over minimum statutory standards. The building will be highly air-tight, preventing uncontrolled and wasteful air infiltration.

U values and air permeability standard, adopted for this project, are those values identified in CPG3 and are considered to be current best practice.

Good construction detailing will identify and address the issue of 'cold bridging' which now accounts for a significant proportion of the conducted heat losses through a building envelop.

A green roof feature is to be incorporated onto part of the roof area.

Efficient Energy Generation and Delivery

Thermal energy will be delivered to the community centre building by a central combined heat and power plant (CHP) supported by high efficiency gas-fired condensing boilers. This system will serve the residential building in Highgate Road, also.

Electricity, generated by the CHP unit will be supplied to the building along with grid derived electricity. Surplus electricity, produced by the CHP installation, will be exported and sold back to the Grid for a nominal fixed charge.

Space heating will be delivered to the occupied spaces by a mix of appliances including radiant panels mounted into suspended ceiling 'rafts' and low surface temperature radiators mounted conventionally on wall surfaces.

The use of mechanical ventilation systems will be limited to those spaces that require mechanical ventilation to suit function, such as toilet areas, food prep areas and internal spaces. Some of the deep planned perimeter spaces will be provided with supplementary mechanical supply and extract ventilation. Mechanical supply and extract ventilation systems will include efficient heat recovery equipment.

Mechanical cooling will not be used unless adequate comfort conditions cannot be achieved in summer. Generally, this will be limited to high use IT spaces and IT equipment rooms.

Interior lighting systems will be designed to take full advantage of the natural daylight admitted into the building and will include automatic daylight controls in perimeter spaces.

Energy efficient light sources will be selected and automatic presence and absence detection and switching will be incorporated.

A comprehensive energy metering strategy will be adopted and all meters will be read and logged, automatically.

A building energy management system (BEMS) will be provided to manage and control all of the fixed building services in an energy efficient manner. Systems will be suitably zoned and controlled and individual systems will be automatically set back or switched off when not in use or required.

Renewable Energy

Building integrated photo voltaic (BIPV) panels have been incorporated into elements of curtain walling and into glazed roof lights. Refer to the architects elevation drawings for locations. BIPV has been included so that areas of roof can be developed into green spaces.

BIPV will also act as a shading device thereby limiting the admission of summer sunshine via expansive glazed elements.

2.3 RESIDENTIAL BUILDING

Reduce Energy Demands

This building is designed to incorporate effective use of passive, internal climate moderating, features. This will result in less reliance of building engineering systems and hence reduced energy consumption.

Passive features that have been included:

- Summertime natural ventilation strategies for upper floors
- Good day lighting in interior spaces
- Effective use of winter sunshine on southern elevations

The building envelope is to be composed of highly insulated elements with improved u-values over minimum statutory standards.

The building will be highly air-tight, preventing uncontrolled and wasteful air infiltration.

Good construction detailing will identify and address the issue of 'cold bridging' which now accounts for a significant proportion of the conducted heat losses through a building envelop.

Green roof gardens are to be incorporated onto a proportion of the roof area.

Efficient Energy Generation and Delivery

Thermal energy will be delivered to the residential building by a central combined heat and power plant (CHP) supported by high efficiency gas-fired condensing boilers. This system will serve the community centre building, also.

Electricity, generated by the CHP unit will be supplied to the building along with grid derived electrical energy. Surplus electricity, produced by the CHP installation, will be exported and sold back to the Grid for a nominal fixed charge.

Space heating will be delivered to each dwelling by individual underfloor heating systems.

Mechanical ventilation with heat recovery (MVHR) will be provided in each dwelling for normal background ventilation in winter. MVHR systems will provide automatic boost ventilation when bathrooms or kitchen spaces are being used.

Opening windows in perimeter rooms will be provided in order to moderate peak internal temperatures during summertime. This applies to upper floor dwellings only. Ground floor dwellings will be provided with comfort cooling systems as windows cannot be used for rapid ventilation purposes due to air quality issues arising from Highgate Road.

Interior lighting will be designed to take full advantage of the natural daylight admitted into the occupied spaces.

Energy efficient light sources and switching will be selected.

Each dwelling will be provided with effective programmable central heating user controls.

Renewable Energy

Two areas of roof have been made available for the placement of photo voltaic (PV) panels and flat plate solar thermal panels.

Heat derived from the solar thermal system will be absorbed into the central community heating system via a thermal store located in a ground floor plant room.

2.4 THIRD PARTY ENERGY CONSUMERS

The central energy centre, which is to be established in the Greenwood Centre Building, has been space planned to allow the system to be expanded to serve other potential third party energy consumers.

Localised heat and power infrastructure, which is required to link the two building can be expanded in the future, along with the installed heat energy generating plant capacity, so that other energy consumers can be connected and served by the new community heating system.

The adjacent Deane House, which is a Council owned building, is a prime candidate for future connection into the community heating system.

Space has been planned into to the energy centre for the future introduction of suitable plate heat exchanger assemblies so that advantage can be taken if a large scale municipal heat network is brought into the area in the future.

2.5 TECHNOLOGIES NOT INCLUDED

Consideration has been given to a number of energy supply/energy generation technologies in the early design stages of this project.

Table 2.1, below provides a summary of those technologies that have been considered and excluded.

Table 2.1

Item	Description	Remark
Community and Residential Buildings		
Ground Source Heat Pump (GSHP) Technology	Central GSHP unit in basement plant room and vertical or horizontal ground loop pipework.	In adequate unobstructed ground available to accommodate ground loops.
Air Source Heat Pump Technology	Central ASHP unit mounted on roof plant area and connected pipe systems in the building.	Available roof space limited due to competing requirements to include green spaces and amenity spaces. Building integrated PV adopted so that green roof areas can be maximized.
Biomass	Automatic wood burning boiler incorporated in a community heating system	Air quality issues on and around the site preclude the inclusion of wood burning appliances.
Wind Turbine	Building mounted wind turbine generators.	Poor availability of wind energy in at this site precludes inclusion of this technology.

2.6 UN-REGULATED ENERGY CONSUMPTION

Un-regulated energy use and consumption is concerned with the energy consumed by white goods, household appliances, portable electrical equipment and the like. In essence, by energy consuming products which are not part of the fixed building services.

Energy labelling of electric appliances is regulated under EU Directive 2010/30 EU. All such appliances, which are to be supplied and installed under the building contract, will be specified A-Rated or better.

In the residential building, this applies to clothes washer, dishwashers, domestic cooking appliances and air-conditioners.

In the case of the community building, appliances that will be supplied A-Rated under the contract or by the building occupier includes dishwashers, clothes washers, computers and domestic/commercial cooking appliances.

Replacement lamps in light fittings also comes under the above mentioned EU directive.

Handover documentation provided at the end of the construction project will include a 'User Guide' and this document will include user advice relating to energy efficient product replacements along with general advice about energy efficiency and energy conservation.

3.0 THE ENERGY PLAN

3.1 GENERAL

In order to formulate a viable energy strategy for this development, a 'baseline' energy model has been produced using IES virtual environment software and SBEM/SAP calculation methodologies.

Iterations to the baseline energy model have been performed and a final energy strategy has been derived.

The servicing strategy, described in section 2.0 of this report, is based upon the establishment of a community heating installation which will serve both of the new buildings along with other potential third party consumers in the immediate area.

Heat for the development will be produced by a 65kW$_{th}$ combined heat and power plant supplemented by high efficiency condensing boiler units and distributed via interconnection pipelined routed in the public highway.

Power will also be produced by the CHP plant and this will be supplemented with grid derived electrical energy. Interconnecting electrical cabling will be routed in the public highway, also.

Both buildings will be provided with renewable energy systems.

Renewable energy systems will include:

- Residential Building - Photo Voltaic and Solar Thermal Panels
- Community Centre - Building Integrated Photo Voltaic (BIPV)

This section of the report presents a summary of the results obtained during the model processing.

3.2 BASELINE SOLUTION

Building envelope u-values adopted for this development have been enhanced and exceed the minimum statutory values defined in Building Regulations Approved Document L and the accompanying Compliance Guides.

Table 3.1 below, identifies u-values and an air-permeability value adopted and used in the modelling process.

Table 3.1 Envelope Parameters

Item	value	units
External Wall	0.2	W/m^2/K
Roof	0.13	W/m^2/K
Floor	0.2	W/m^2/K
Window	1.5	W/m^2/K
Glazed Door	1.5	W/m^2/K
Solid Door	1.0	W/m^2/K
Air Permeability	3.0	m^3/h.m^2

Note that the above u-value represent, in aggregate, an 18% improvement over the notional building u-values.

The methodology adopted in the analysis process first generated a baseline solution. From this baseline, further iterations have been produced whereby improvements in energy delivery systems and the finally, the introduction of renewable energy sources have been analysed

The first calculation iteration, using enhances u-value and air permeability values included in table 3.1, is based upon central heating for the two buildings being derived from a community heating installation incorporating high efficiency gas-fired boilers, only. No allowance has been made for CHP or for energy supply from renewable sources.

Results from the next iteration identifies the impact of including a combined heat and power unit. In this solution a 65kWth/43kWe combined heat and power plant is introduced as the lead heat source.

Finally, the last set of results identifies the improvement in performance arising from introducing renewable energy sources. In the case of the Greenwood Community Centre, a building integrated photo voltaic (BIPV) system has been added. The Residential Building includes both solar PV and solar thermal systems.

3.3 CALCULATION RESULTS SUMMARY

Table 3.2 includes the modelling results and identifies energy demand and carbon emissions for the principal iterations.

Table 3.2 – Development Energy Demand and Carbon Emissions

	Energy	Carbon Emissions	Remark
Baseline Case			
Community Building	127.23 kWh/m^2.yr	30.7 kg(CO2)/m^2.yr	Part L Compliant
Residential Building	86.33 kWh/m^2.yr	19.98 kg(CO2)/m^2.yr	Marginal Fail. See note 1, below.
Baseline Case with CHP			
Community Building	132.17 kWh/m^2.yr	25 kg(CO2)/m^2.yr	20% improvement over Part L
Residential Building	93.71 kWh/m^2.yr	15.39 kg(CO2)/m^2.yr	17% improvement over Part L
Baseline Case with CHP and Renewables			
Community Building	132.17 kWh/m^2.yr	23.5 kg(CO2)/m^2.yr	25% improvement over Part L
Residential Building	83.89 kWh/m^2.yr	12.49 kg(CO2)/m^2.yr	32% improvement over Part L

Note 1. The baseline results included in table 3.2 for the Residential Building are marginally below the target emission rates required by Approved Document L.

The **Baseline + CHP + Renewable Energy** solution results a building regulation compliant solution. Both BREEAM excellent and CfSH level 4 mandatory energy credit are achieved with this final solution.

The aggregated reduction in carbon emissions, arising from introduction of renewable energy systems, is calculated as 10.36% for both buildings, combined.

4.0 CONCLUDING REMARKS

As part of a planning submission for this development, an Energy Statement is required to be prepared and submitted. This document is intended to fulfil that requirement.

Development proposals are at RIBA stage D and the measures and features that have been described in this document, relating to energy conservation and energy supply, are a fundamental and integral part of the stage D design solution.

The output from the modelling processes described in this document and the calculated carbon emissions arising, has been assessed under the BREEAM and CfSH assessment tools. In both cases, buildings exceed the mandatory energy credits which are required to achieve the stated ratings of **Excellent** and **Code Level 4,** respectively.

This development is entirely compatible with a long term, London-wide, drive to deliver heat and power via decentralised heat networks incorporating combined heat and power.

Project proposals include producing heat and power for the development by a site based combined heat and power unit supplemented with high efficiency gas fired condensing boilers and grid electricity.

Heat will be distributed to both of the new buildings via a community heating installation. Facility has been included for connection other third party energy consumers to this system.

Buried pipe and cable installations will be required to link the two buildings and other potential third party energy purchasers. These services will be routed in the public highway.

The competing need to provide green spaces and also to provide amenity space for the building users, on the roof areas of both buildings, has meant that a compromise has been made with respect to the amount of space available for renewable energy systems.

Solar PV and solar thermal systems have been included in the proposals and these systems will provide a significant contribution to the developments annual energy needs.

Other renewable technologies have been considered. However, site constraints and issues local air quality have precluded their inclusion into the scheme.

The renewable energy fraction (in terms of improvement over Part L) for this scheme has been estimated to be circa 10%.

Serving the Residential Building with community derived heat and power will require that each dwelling is provided with heat and electric meters. This will put a responsibility for meter reading, billing and payment collection onto the Landlord organisation.

In conclusion, TGA Consulting Engineers believe that the energy conservation and energy supply proposals described in this Energy Statement represents a pragmatic and feasible energy plan for the development.