U13357

ENERGY ASSESSMENT REPORT

Bewlay House, Jamestown Road - M&E Consulting Services
London and Regional Properties Ltd

CONFIDENTIAL

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1 Introduction and Background

1.1 Introduction

1.1.1 Norman Disney Young have been instructed by London and Regional Properties to prepare an energy assessment to support the planning application for the proposed remodelling and extension of 32 Jamestown Road, Camden.

1.2 Purpose of This Report

1.2.1 This report has been prepared to set out the approach to sustainable energy delivery for the proposed development. It considers energy efficiency in site layout. It considers energy efficiency in building form and design. It further considers the opportunities for decentralised energy provision and the feasibility of onsite renewable energy generation.

1.2.2 The report provides a preliminary assessment of site energy demand and considers the development opportunities and constraints. The assessment report finally sets out a number of measures to minimise the whole of life carbon emissions from the development.

1.3 Development Description

1.3.1 The application site is located in the London Borough of Camden at 32 Jamestown Road London NW1 7BY. The property is also known as Bewlay House.

1.3.2 The site comprises a rectangular shape on plan which is currently developed with the full site area occupied by a 1980s office building. The northern boundary immediately abuts the Regents Canal whilst the southern boundary fronts directly onto Jamestown Road. The east and west boundaries abut adjacent buildings with party structures to both sides.

1.3.3 The existing office building comprises a basement, ground floor and three upper floors. These provide a GIA of 6726m^2 with a net office area of 3754m^2. The canal elevation is predominantly of brick construction with punched windows, whilst the Jamestown Road elevation is predominantly curtain walling.

1.3.4 The remodelling proposal includes the reuse of the existing structure to provide a modern office facility which includes an extension to the upper floors. The extension also accommodates nine residential units on the fourth and fifth floors. The proposed office areas including ancillary uses comprise 7,145m^2 with a further residential accommodation of 928m^2 GIA.

1.3.5 The remodelled building provides office space to the basement, ground and first to fourth floors. The fourth floor also accommodates two residential units with the remaining seven units on the fifth floor. A central atrium light well is located within the office floor plate and extends from ground to fourth floor levels. This is isolated from the office floor plates by glazed screening at each level.

1.3.6 The basement plan accommodates plant rooms with cycle and bin storage areas in addition to office areas. The office reception and lift lobby is located on the ground floor and is integral with the central atrium light well space. A second smaller residential entrance is also located on the ground floor.

1.3.7 The building elevations step back at fourth and fifth floor levels to provide roof terrace areas and the central atrium roof is surrounded with a residential walkway forming an external courtyard zone. Lift overruns and a small roof level plant space is also located on the fifth floor level.

1.3.8 The building massing, floor plans and elevational treatments are depicted in the planning submission drawings prepared by Ben Adam Architects.

Table 1: Reference Drawings

Site Plan	
Proposed Basement Floor Plan	Proposed Ground Floor Plan
Proposed Typical Floor Plan (1st, 2nd and 3rd)	Proposed Fourth Floor Plan
Proposed Fifth Floor Plan	
Proposed Section AA	Proposed Section BB

1.4 Abbreviations

1.4.1 The following abbreviations may be used in the preparation of this report:

Table 2: Abbreviations

AQMA	Air Quality Management Area
ASHP	Air Source Heat Pumps
BER	Building emission rate
BRE	Building Research Establishment
BSRIA	Building Services Research and Information Association
CCHP	Combined Cooling Heating and Power
CfSH	Code for Sustainable Homes
CHP	Combined Heating and Power
CIBSE	Chartered Institute of Building Services Engineers
CoP	Coefficient of Performance
DEN	District Energy Network
DER	Dwelling Emission Rate
FiT	Feed in Tariff
GHGs	Green House Gases
GLA	Greater London Authority
GSHP	Ground Source Heat Pumps
GWh	Gigawatt hours (1,000,000,000)
kWh	Kilowatt hours (1,000)
LDF	Local Development Framework
MWh	Megawatt hours (1,000,000)
Ofgem	Office of Gas and Electricity Regulator
PED	Predicted Energy Demand
PV	Photo Voltaic
RHI	Renewable Heat Incentive
ROCs	Renewables Obligation Certificates
SAP	Standard Assessment Procedure
SBEM	Simplified Building Energy Model
TER	Target Emission Rate
UDP	Unitary Development Plan

2 Planning Policy Context

2.1 National Policy

2.1.1 Climate change has been recognised as one of the most immediate environmental challenges we currently face. Government legislation now includes numerous provisions to minimise climate change and mitigate its anticipated effects, including :

- The Kyoto Protocol 2005
- The 2007 Energy White Paper
- The European Directive on the Energy Performance of Buildings (EPBD)
- The National Planning Policy Framework (March 2012)

2.1.2 The National Planning Policy Framework (NPPF) is the over-arching policy which sets out key national objectives to improve quality of life and create sustainable communities. The Framework must be taken into account in the preparation of local and neighbourhood plans, and is a material consideration in planning decisions.

2.1.3 The framework states "The purpose of the planning system is to contribute to the achievement of sustainable development. The policies in paragraphs 18 to 219, taken as a whole, constitute the Government's view of what sustainable development in England means in practice for the planning system". Three criteria strands are noted to meet sustainable development. These are Economic, Social, and Environmental

2.1.4 Paragraph 14 states "At the heart of the National Planning Policy Framework is a presumption in favour of sustainable development, which should be seen as **a golden thread** running through both plan-making and decision-taking." It continues "For decision making this means approving development proposals that accord with the development plan without delay"

2.1.5 Further legislation and national guidance documents relevant to the provision of energy and renewable energy include:

- The Climate Change Act 2008
- The Renewables Obligation Order 2009
- The Low Carbon Transition Plan 2009
- UK Climate projections 2009
- The UK renewable energy strategy 2009
- The Energy Act 2011

2.1.6 This legislation includes legally binding targets for a reduction in CO_2 emissions in the UK, the introduction of the Community Infrastructure Levy (CIL), the introduction of FiTs, and the RHI. All of these are intended to impact directly on the renewable energy market.

2.2 Regional Policy

2.2.1 The London Plan 2011 is the document which sets out current adopted GLA policy in respect of spatial planning in London including energy and climate change policies. It identifies a number of main objectives related to improving London as a workplace and living place and it seeks to reduce the region's exposure and impact to climate change. This is evident in all its policies with reference to topics including energy efficient design and construction, renewable energy, and adaptation to climate change.

2.2.2 Policies in chapter 5 of the plan underpin London's response to climate change and resource management and covers: climate change mitigation, waste, aggregates, contaminated land and hazardous substances. Specific policies are highlighted below.

2.2.3 **Policy 5.2 Minimising carbon dioxide emissions** – "Development proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy: 1) be lean: use less energy; 2) be clean, supply energy efficiency; 3) be green: use renewable energy"

2.2.4 **Policy 5.3 Sustainable design** – "The highest standards of sustainable design and construction should be achieved in London to improve the environmental performance of new developments and to adapt to the effects of climate change over their lifetime"

2.2.5 **Policy 5.5 Decentralised Energy Networks** - "The mayor expects 25 % of the heat and power used in London to be generated through the use of localised decentralised energy systems by 2025": As such the policy states "the Mayor prioritises the development of decentralised heating and cooling networks at the development and area wide level including larger scale heat transmission networks"

2.2.6 **Policy 5.6 Decentralised Energy in Development Proposals** – Three specific requirements are noted within this policy, these are "A : Development proposals should evaluate the feasibility of Combined Heat and Power systems, B : Major development proposals should select energy systems in accordance with the following hierarchy, connection to existing networks/ site wide CHP network/ communal heating and cooling. C : Where future network opportunities are identified proposals should be designed to connect to these networks"

2.2.7 **Policy 5.7 Renewable Energy** - "Within the framework of the energy hierarchy, major development proposals should provide a reduction in carbon dioxide emissions through the use of onsite renewable energy generation, where feasible." A presumption is stated to seek to reduce site emissions by 20 % where feasible.

2.2.8 **Policy 5.9 Overheating and cooling** – "The Mayor seeks to reduce the impact of the urban heat island effect in London and encourages the design of places and spaces to avoid overheating and excessive heat generation, and to mitigate overheating due to the impacts of climate change and the urban heat island effect on an area wide basis".

2.2.9 The policy states "major development proposals should reduce potential overheating and reliance on air conditioning systems and demonstrate this in accordance with the following cooling hierarchy: 1) minimise internal heat generation through energy efficient design; 2) reduce the amount of heat entering a building in summer through shading, albedo, fenestration, insulation and green roofs and walls; 3) manage the heat within the building through exposed internal thermal mass and high ceilings; 4) passive ventilation; 5) mechanical ventilation; 6) active cooling systems (ensuring they are the lowest carbon options)."

2.3 Local Policy

2.3.1 The site is located within the London Borough of Camden (LBC). The LBC Core Strategy was adopted in November 2010 and is the primary strategic document in the LDF. The LBC adoption statement confirms "*The Core Strategy is the principal document in the Local Development Framework and provides the vision, objectives and spatial policies to guide development in the borough up to 2025*."

2.3.2 Core Strategy policy CS13 relates to energy provision and carbon emissions and states :

CS POLICY

CS13 – Tackling climate change through promoting higher environmental standards

Reducing the effects of and adapting to climate change

The Council will require all development to take measures to minimise the effects of, and adapt to, climate change and encourage all development to meet the highest feasible environmental standards that are financially viable during construction and occupation by:

a) ensuring patterns of land use that minimise the need to travel by car and help support local energy networks;

b) promoting the efficient use of land and buildings;

c) minimising carbon emissions from the redevelopment, construction and occupation of buildings by implementing, in order, all of the elements of the following energy hierarchy:

1. ensuring developments use less energy,
2. making use of energy from efficient sources, such as the King's Cross, Gower Street, Bloomsbury and proposed Euston Road decentralised energy networks;
3. generating renewable energy on-site; and

d) ensuring buildings and spaces are designed to cope with, and minimise the effects of, climate change.

The Council will have regard to the cost of installing measures to tackle climate change as well as the cumulative future costs of delaying reductions in carbon dioxide emissions

Local energy generation

The Council will promote local energy generation and networks by:

e) working with our partners and developers to implement local energy networks in the parts of Camden most likely to support them, i.e. in the vicinity of:

- housing estates with community heating or the potential for community heating and other uses with large heating loads;
- the growth areas of King's Cross; Euston; Tottenham Court Road; West Hampstead Interchange and Holborn;
- schools to be redeveloped as part of Building Schools for the Future programme;
- existing or approved combined heat and power/local energy networks (see Map 4);

and other locations where land ownership would facilitate their implementation.

f) protecting existing local energy networks where possible (e.g. at Gower Street and Bloomsbury) and safeguarding potential network routes (e.g. Euston Road);

Water and surface water flooding

We will make Camden a water efficient borough and minimise the potential for surface water flooding by:

g) protecting our existing drinking water and foul water infrastructure, including Barrow Hill Reservoir, Hampstead Heath Reservoir, Highgate Reservoir and Kidderpore Reservoir;

h) making sure development incorporates efficient water and foul water infrastructure;

i) requiring development to avoid harm to the water environment, water quality or drainage systems and prevents or mitigates local surface water and down-stream flooding, especially in areas up-hill from, and in, areas known to be at risk from surface water flooding such as South and West Hampstead, Gospel Oak and King's Cross (see Map 5).

Camden's carbon reduction measures

The Council will take a lead in tackling climate change by:

j) taking measures to reduce its own carbon emissions;

k) trialling new energy efficient technologies, where feasible; and

l) raising awareness on mitigation and adaptation measures.

2.3.3 Paragrapgh 13.9 which supports Policy CS13 refers to development works in conservation areas and states “Camden’s existing dense built form with many conservation areas and other heritage assets means that there are often limits to the contribution that orientation, height and footprint can make towards the energy efficiency of a building. This dense character, along with the varying heights of buildings in central London, can also make the installation of various technologies, including renewable energy technologies more difficult. For example, the efficient use of photovoltaics in Central London can be constrained by overshadowing from taller buildings. We will expect high quality and innovative design to help combat these constraints. Energy efficiency measures relating to heritage assets will be welcomed provided that they do not cause harm to the significance of the heritage asset and its setting. The refurbishment of some existing properties in the borough, such as Camden’s EcoHouse in Camden Town and a home in Chester Road in Highgate have demonstrated how Victorian properties can be upgraded to meet Level 4 of the Code for Sustainable Homes energy performance standards. Given the large proportion of development in the borough that relates to existing buildings, we will expect proportionate measures to be taken to improve their environmental sustainability, where possible. Further details on this can be found in our Camden Planning Guidance supplementary document.”

2.3.4 Paragraph 13.11 which also supports Policy CS13 refers to renewable energy provision and states “Generating renewable energy on-site - Buildings can also generate energy, for example, by using photovoltaic panels to produce electricity, or solar thermal panels, which produce hot water. Once a building and its services have been designed to make sure energy consumption will be as low as possible and the use of energy efficient sources has been considered, the Council will expect developments to achieve a reduction in carbon dioxide emissions of 20% from on-site renewable energy generation (which can include sources of site-related decentralised renewable energy) unless it can be demonstrated that such provision is not feasible. Details on ways to generate renewable energy can be found in our Camden Planning Guidance supplementary document.“

2.3.5 The LBC Core Strategy is supported by a series of Development policies. The LBC adoption statement confirms "The Development Policies contribute towards delivering our Core Strategy by setting out detailed planning policies that the Council will use for determining planning applications".

2.3.6 Development Policy DP22 refers to energy performance and states:

DP POLICY

DP22 – Promoting sustainable design and construction

The Council will require development to incorporate sustainable design and construction measures. Schemes must:

a) demonstrate how sustainable development principles, including the relevant measures set out in paragraph 22.5 below, have been incorporated into the design and proposed implementation; and

b) incorporate green or brown roofs and green walls wherever suitable.

The Council will promote and measure sustainable design and construction by:

c) expecting new build housing to meet Code for Sustainable Homes Level 3 by 2010 and Code Level 4 by 2013 and encouraging Code Level 6 (zero carbon) by 2016.;

d) expecting developments (except new build) of 500 sq m of residential floorspace or above or 5 or more dwellings to achieve "very good" in EcoHomes assessments prior to 2013 and encouraging "excellent" from 2013;

e) expecting non-domestic developments of 500sqm of floorspace or above to achieve "very good" in BREEAM assessments and "excellent" from 2016 and encouraging zero carbon from 2019.

The Council will require development to be resilient to climate change by ensuring schemes include appropriate climate change adaptation measures, such as:

f) summer shading and planting;

g) limiting run-off;

h) reducing water consumption;

i) reducing air pollution; and

j) not locating vulnerable uses in basements in flood-prone areas.

2.3.7 LBC have also produced a number of Supplementary Planning Guidance Documents. Camden Planning Guidance 3 (CPG 3) relates to sustainability and includes the following chapters on energy and carbon emissions.

- Chapter 2 -The Energy Hierarchy
- Chapter 3 – Energy efficiency : New Buildings
- Chapter 4 - Energy efficiency : Existing Buildings
- Chapter 5 – Decentralised energy networks and combined heat and power
- Chapter 6 – Renewable energy

2.3.8 CPG3 provides more detailed technical guidance on the above issues. The LBC state "This guidance ……. forms a Supplementary Planning Document (SPD) which is an additional "material consideration" in planning decisions". The document includes the following statements

WHAT WILL THE COUNCIL EXPECT?

All new developments are to be designed to minimise carbon dioxide emissions by being as energy efficient as is feasible and viable

EXISTING BUILDINGS - KEY MESSAGES

As a guide, at least 10% of the project cost should be spent on environmental improvements

Potential measures are bespoke to each property

Sensitive improvements can be made to historic buildings to reduce carbon dioxide emissions

2.3.9 Paragraph 5.11 states "Once a development has been designed to be as energy efficient as possible (Energy hierarchy - Stage 1), developments will be required to consider the following steps, in the order listed, to ensure energy from an efficient source is used, where possible:

1. investigating the potential for connecting into an existing or planned decentralised energy scheme and using heat
2. installing a Combined (Cooling) Heat and Power Plant (CHP or CCHP), including exporting heat, where appropriate
3. providing a contribution for the expansion of decentralised energy networks
4. strategic sites are to allow sufficient accessible space for plant equipment to support a decentralised energy network
5. designing the development to enable its connection to a decentralised energy network in the future"

RENEWABLE ENERGY - WHAT DOES THE COUNCIL EXPECT?

All developments are to target at least a 20% reduction in carbon dioxide emissions through the installation of on-site renewable energy technologies. Special consideration will be given to heritage buildings and features to ensure that their historic and architectural features are preserved.

When assessing the feasibility and viability of renewable energy technology, the Council will consider the overall cost of all the measures proposed and resulting carbon savings to ensure that the most cost-effective carbon reduction technologies are implemented in line with the energy hierarchy.

2.3.10 In addition to adopted planning policy there are a number of documents published by the LBC which relate to local environmental management. Green Action for change for example is "Camdens Environmental Sustainability Plan (2011 – 2020). We understand this document was adopted by cabinet on 6th April 2011.

2.3.11 The document sets out the local authority plan to reduce borough wide carbon emissions and adapt to climate change. It draws upon a report prepared in September 2010 by Carbon Descent titled "Cutting Camdens CO_2 by 2020". These documents confirm the aspiration to reduce borough wide CO_2 emissions by 40% by 2020 from a 2005 baseline.

2.3.12 The report provides useful data in respect of existing borough emissions confirming 65% of CO_2 emissions arise from non-domestic building energy use, with 26% from domestic buildings. The 2020 target is anticipated as achievable and suggests reductions from the following sources are a likely solution to the challenge.

Table 2 – Key measures for achieving a 40% CO_2 reduction in Camden

Measure	% of total CO_2 saving
Government targets to green the National Grid	43%
CHP led energy networks	19%
Behaviour change	12%
Solid wall insulation for homes	11%
Road transport efficiencies	7%
Other energy efficiency measures in buildings	6%
Renewables	2%
	100%

3 Utilities and Building Services

3.1 Building Services Strategy

3.1.1 In order to accurately assess the energy demand of a proposed development, the proposed use of the buildings and the building services strategy should be developed where possible. The ability to provide practicable and/or efficient renewable technologies within an energy assessment can be dictated by the scope of the building services to be provided.

3.1.2 The Mechanical and Electrical consultants have been appointed on this project and a RIBA Stage C Building Services report is available. This sets out the full scope of the building services to both the office refurbishment and the residential apartments.

3.1.3 The proposed Building Services have therefore been assessed in the preparation of this energy statement and energy demand efficiencies considered within the Services strategy.

3.2 Utilities

3.2.1 Utilities requirements have also been considered in the Stage C Building Services report including provision of electricity, gas, potable water, waste water and communications requirements. The adaption of the mains utilities required for this development has therefore been considered in conjunction with the energy assessment report.

3.2.2 The enhanced building design measures included within the refurbishment proposals provide for improved standards of thermal performance, efficient lighting provision and the provision of renewable energy generation. These allow the development's energy demand from the statutory supply networks, particularly electricity and gas, to be significantly reduced.

4 Energy Hierarchy

4.1 Approach

4.1.1 The energy hierarchy has been adopted from The London Plan thus a three stage approach has been taken as follows:

- Be lean: Minimise energy demand
- Be clean: Provide energy efficiently via CCHP and district heating systems
- Be green: Utilise renewable energy sources

4.1.2 All three stages of this energy hierarchy will play a significant role in striving towards minimising site emissions for 32 Jamestown Road.

5 Reducing Energy Demand - Be Lean

5.1 General

5.1.1 The energy hierarchy requires that measures are adopted in the building design to reduce energy demand requirements from the building uses. These measures can be split into two categories: passive and active measures. The passive measures are design features from architectural and building fabric selection that inherently reduce the building energy requirement. The active measures are design features from building services design that will increase the efficiency of the energy used, hence reducing the building energy requirements.

5.2 Site Layout

5.2.1 The proposed layout is dictated by the site plan form, the boundary conditions and the existing building structure. However within these constraints the refurbishment and extension have been arranged to allow both building uses to benefit from natural daylight, and south facing roof areas.

5.2.2 The proposals include a central courtyard area to the residential floors allowing dual aspect units with day lighting to all apartments from a number of elevations. The individual residential units have been arranged in terraces to make use of party walls and being located on the upper floors these avoid heat loss through the party floor and wall structures.

5.2.3 Internal layouts to the residential apartments have also been considered to maximise the use of natural daylight with bedrooms and living rooms where possible located to appropriate elevations and to suit the orientation of the apartment concerned.

5.2.4 The main office floors are provided with a large centrally placed glazed atrium allowing natural daylight into the building. Both main elevations are also detailed with large window zones thus day light has been allowed into the building from all available external zones. The central atrium extends through the full height of the building to serve the ground floor reception area also. To control internal air movements and hence heat gains and losses the atrium space is to be isolated from the office floors using glazed screening.

5.2.5 The main plant areas are located within the basement and at roof level. These have therefore been arranged to limit the impact of heat gains both on the plant rooms and on the occupied building zones. The plant spaces therefore avoid excess heat build-up and maximise plant efficiencies.

5.3 Passive Design Measures

5.3.1 The following passive design measures have been considered for incorporation into the design of the buildings:

- Enhancements to the building fabric by providing additional insulation, a reduced air permeability rate and reduced thermal bridging coefficient;
- Enlarged window areas to maximize the use of natural daylight;
- Passive shading including balcony features and recessed windows to southern office elevations
- Provision of thermal mass via exposed concrete ceilings to office areas (with night time air purging)
- Increased ceiling heights to residential areas to mitigate against summer overheating
- Solar control blinds to office areas and specific apartments where required
- Opening windows to office perimeters to allow mid-season natural ventilation where possible
- Tenant/occupier information provided to office users in the form of a building user guide
- Resident information to the residential apartments in the form of a CfSH compliant home user guide

5.4 Active Design Measures

5.4.1 The following active design measures have been considered for incorporation into the buildings' design:

- High efficiency low NOx boilers to offices and residential units
- Efficient heating and hot water distribution with zonal controls to all areas served
- Modular plant to centralised office heating and cooling systems
- High efficacy lighting throughout
- Lighting controls to include DALI system with daylight and passive infra-red motion detection to ensure lights are only operated as and when required
- External lighting to be energy efficient including timer and photocell control to avoid unnecessary use (CfSH level 4 where required)
- Electrical white goods will be suitably rated to meet CfSH requirements.
- Displacement ventilation system to offices with variable air volume flow and 75 % recirculated air to provide heat recovery
- Ventilation system with night time purging facility (and thermal mass) with potential for free cooling during other times where suitable external temperature conditions prevail

- Whole house ventilation with heat recovery to residential apartments
- Pumps and fans fitted with variable speed drives
- Open protocol BMS system to offices to permit central monitoring and automatic adjustment of controls to suit user requirements
- Energy display devices to inform residential tenants and modify future behaviour
- Office metering strategy to CIBSE TM39 to permit monitoring and auditing of office energy demands, with 90% minimum of the annual energy consumption recorded
- Separate metering of renewable energy systems to allow monitoring and auditing of these technologies

6 Providing Energy Efficiently - Be Clean

6.1 General

6.1.1 The second priority of the energy hierarchy sets out to ensure heating, cooling and power supply is provided from efficient decentralized sources, where feasible. As highlighted earlier, policy 5.6 in The London Plan sets out the selection priorities for these systems. (See section 2.2.6)

6.1.2 Combined heat and power (CHP) technology can provide an efficient supply of both power and heat. Systems are typically employed to meet a base energy demand profile which allows the engines to run for long periods uninterrupted. This allows the high system efficiencies possible with CHP to be realised.

6.1.3 The majority of CHP systems being installed today are run on mains gas but this technology could be run on biogas where this is available and it is possible to operate with biomass and even liquid biofuels. Alternative technologies, such as hydrogen fuel cells, could also be utilised in the future but are not yet available at a commercial scale.

6.1.4 A desktop review has been carried out to identify any opportunity to connect the proposed building into an existing CCHP/CHP district energy network. This includes a review of the London Heat Map tool operated by the GLA, and the existing and emerging networks within the LBC as noted in CPG 3.

Figure 4. Developments within 1km radius of an existing or emerging network.

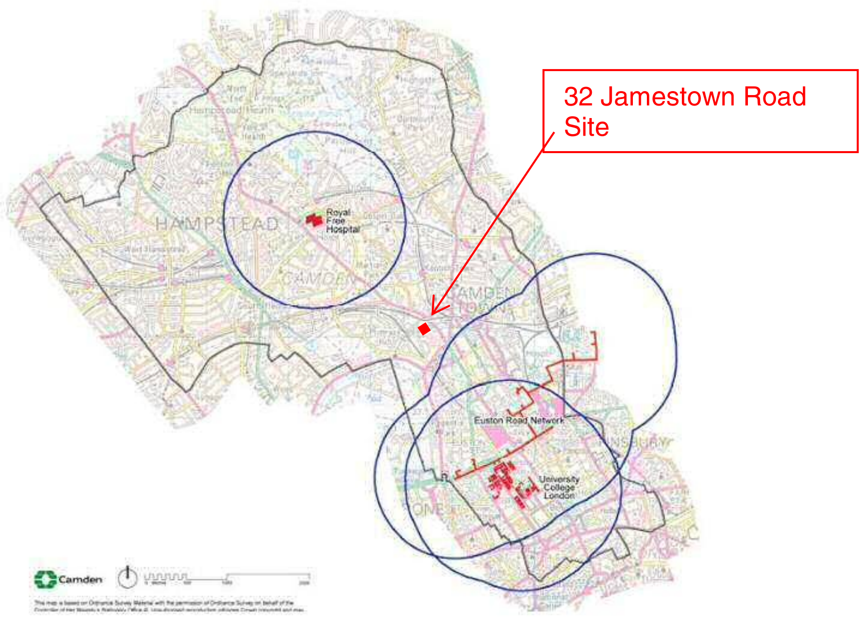


Figure 1: Existing or Emerging DEN areas in Camden

Figure 5. Developments within 500m radius of a potential network

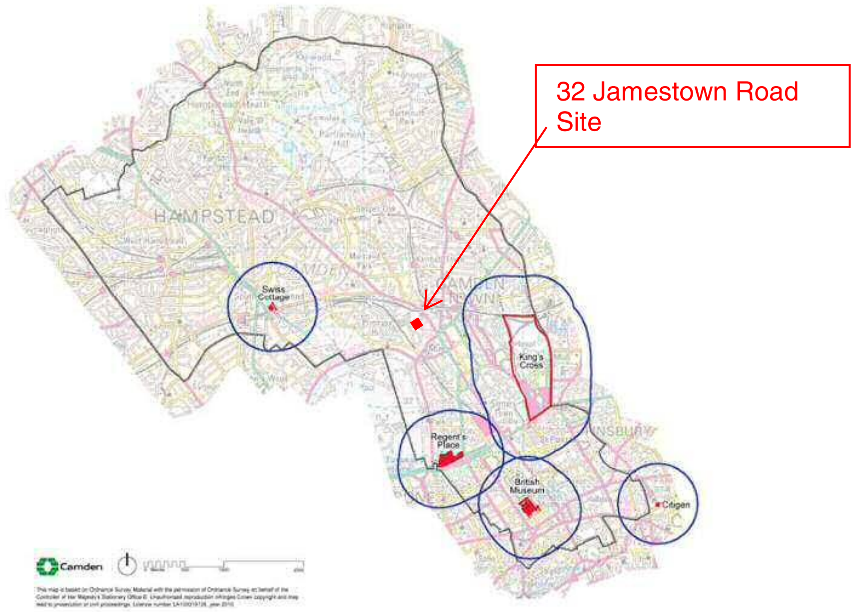


Figure 2: Potential DEN areas in Camden

6.1.5 It can be seen that the application site lies beyond a 1km radius of the existing and emerging district networks and also beyond a 500m radius from the potential identified networks. Whilst a number of heat networks are in operation in Camden and further opportunity areas have been identified no suitable DEN opportunity is available in the vicinity of Jamestown Road.

6.1.6 Future network opportunities appear to be focussed in other areas of the Borough and hence from a review of these opportunity areas it is unlikely that a network will become available to connect to the site within the next three years.

6.2 Site wide CHP Network

6.2.1 Consideration has been given to the provision of an on-site CHP system. This technology is reliant on a base heat load, for viability and efficiency, to ensure the system is run for long periods of time throughout the year. Commercial offices do not however require a significant domestic hot water demand and therefore provide a small base heat load only.

6.2.2 The relatively small scale of this development along with the limited base heat load at, 10.2kWh/m^2 or 63mWh/annum, do not provide a sufficient heat demand to justify the provision of a dedicated CHP system on the site.

6.2.3 The potential for the identified district heat networks within the Borough to be extended to the Jamestown Road area however cannot be ruled out. The refurbished office building will therefore be designed to operate from centralised plant areas and service routes will be considered from the public road to these plant rooms to facilitate the retrofitting of the building to a district heating and cooling energy network in the future.

6.2.4 It is understood that where neither a district energy connection is possible nor a site based CHP system viable that a financial contribution maybe sought by LBC "*to enable expansion of the network and future connection*". It has been shown above that it is not practicable to meet either of these technical requirements on the application site. However future flexibility is to be provided within the development proposal to allow these requirements to be met immediately any third party network becomes commercially available.

7 Supplying Energy from Renewable Sources

7.1 Be Green

7.1.1 To improve the site carbon emission levels, a further contribution can be obtained from the use of on-site renewable energy generation. The London Plan, policy 5.7 states developments should provide a reduction in carbon dioxide emissions through the use of onsite renewable energy generation, where feasible. The Plan includes a presumption to seek to reduce site emissions by 20 %.

7.1.2 LBC Policy guidance also states "All developments are to target at least a 20% reduction in carbon dioxide emissions through the installation of on-site renewable energy technologies. Special consideration will be given to heritage buildings and features to ensure that their historic and architectural features are preserved". "When assessing the feasibility and viability of renewable energy technology, the Council will consider the overall cost of all the measures proposed and resulting carbon savings to ensure that the most cost-effective carbon reduction technologies are implemented in line with the energy hierarchy"

7.1.3 It is anticipated the office refurbishment proposal and extension will meet and exceed the emissions targets set out in LBC policy by achieving a CfSH level 4 standard and compliance with Building Regulations 2010 Part L2B with in excess of a 10% financial contribution towards works falling within consequential improvements.

7.1.4 The proposal will however also be supported by appropriate renewables technologies. In line with regional and local planning policy their contribution to whole site energy has been based on practicality and feasibility taking into account the constraints of the scheme.

7.1.5 There is a range of building scale technologies that can be considered to provide on-site generation. These integrated technologies include:

- Photovoltaic panels
- Solar thermal collectors
- GSHPs
- ASHPs

7.1.6 The basic technology involved in each of these is set out in Appendix C along with their physical and technical constraints.

7.1.7 In addition to these building mounted systems consideration has been given to the potential for canal water cooling to contribute to the summer cooling demand from the offices.

7.1.8 The suitability of these options when applied to the proposed development is discussed below. Indicative cost budgets are mentioned in certain cases, but due to the range of factors that can affect the final cost of the system it is highlighted that they provide an initial early guidance cost only, and should be verified through a suitably qualified consultant prior to financial commitments being confirmed.

7.2 Solar Photo-voltaic

7.2.1 The roof areas to the extended building, excluding the plant enclosures, are to be formed as flat roofs. These are not overshadowed by the adjacent properties and may therefore offer a south facing aspect and the opportunity for roof mounted PV panels. The site is however located in a conservation area and views are an important element of the development considerations. The refurbished property can therefore benefit from roof mounted PV panels subject to aesthetic considerations.

7.2.2 PV panels for optimum generation should be mounted due South at around 35 degrees to the horizontal. Where used care must be taken to ensure that no significant over shadowing is allowed to occur from either future neighbouring building construction or tree growth.

7.2.3 The SAP and SBEM assessments have been considered with the use of PVs to improve the energy performance of the office and residential units and to reduce the overall site carbon emissions. However as there is little opportunity for a district heat network to serve the residential uses solar thermal technology is preferred to these units. To achieve the CfSH level 4 standard this is supplemented where necessary with PV panels. The office areas have been designed to operate from a central boiler plant system and thus can be retrofitted to a DEN for low carbon heat in the future. The office area will therefore be supported by PV technology alone.

7.2.4 The PV provision varies dependant on each residential unit and for the office is dependent on available roof area and aesthetic considerations. A total PV provision is proposed of 62 m^2. Of this approximately 40 m^2 will be directed to the residential units with the remainder directed to the office area. This PV provides around 7,000 kWh/year of electricity. This equates to a CO_2 saving of approximately 3,600 kg per annum.

7.2.5 In addition to the savings in annual fuel bills that would accrue the energy generated by the PV systems would also benefit from FiT payments that were introduced by government legislation in April 2010. The value of the FiT now fluctuates throughout the year and is dependent on system size, export contributions and system registration date. These are therefore difficult to anticipate accurately but can only be assessed on current FiT values which would confirm a development wide income of around £ 1,050 per annum.

7.3 Solar Thermal Collectors

7.3.1 As with PV, there is suitable roof area available to provide an opportunity for roof mounted solar thermal panels to be employed to meet part of the development's hot water demand. However, if solar thermal collectors were installed, these would compete with any district heat system that may become available in the future. These are not therefore proposed for the offices which are designed to facilitate a retrofit to a DEN low carbon heat supply in the future, and where the domestic hot water demand is relatively low in any case.

7.3.2 Solar thermal collectors have however been assessed for the residential units as these are able to provide up to 60 % of the annual hot water demand to each unit. An average of $4m^2$ per dwelling is therefore proposed to maximise the use of this technology. This provides a total solar thermal provision for the site of $36m^2$ which from the sample SAP analyses would offset around 11,000 kWh/year of gas usage. This equates to a site wide CO_2 saving of approximately 2,100 kg per annum.

7.3.3 In addition to the savings in annual fuel bills that would accrue the energy generated by the solar thermal systems is likely to benefit from RHI payments. Tariffs have yet to be determined for residential schemes. The period the tariffs will cover is also subject to confirmation but current expectations are for a 7 year payment period to cover the anticipated 20 year life of the system. On this basis the value of the RHI is currently expected to be around 17.3p/kWh but may fluctuate in the future. Based on this RHI a development wide income of around £1,900 per annum for a seven year period would be expected.

7.4 Ground Source Heat Pumps

7.4.1 The existing site is completely covered by the foot print of the existing building and no substructure construction works are anticipated. There is therefore no opportunity to install a ground source heat pump system. It is also noted that the capital cost of these systems is prohibitive when compared to other technologies.

7.4.2 Were GSHPs a viable option a detailed study of the groundwater regime and hydrology at the site location would also be required to determine whether such a system is technically feasible for the development.

7.4.3 The limited spatial area however and lack of any significant ground works requirement prohibit the use of GSHPs on this development.

7.5 Air Source Heat Pumps

7.5.1 ASHPs currently provide a limited environmental benefit when compared to gas fired systems for a development of this scale as the technology requires electricity to pump the coolant fluid around the system. The spatial requirement of the plant, and possible environmental noise considerations, would also be prohibitive on this project and hence this technology has not been considered further.

7.6 Canal Water Cooling

7.6.1 The British Waterways Board has been keen to develop the use of the London canal system for energy benefits and canal water cooling systems have been installed in the past. The cooling load on this development is limited to the office use and represents less than 3 % of the predicted building energy demand. The cooling load is also anticipated within a three or four month period only each year.

7.6.2 Where canal water cooling has been installed the cooling loads and generally much greater than those anticipated for this development and also include an all year round requirement. The limited cooling load along with the seasonal load profile from the offices would not therefore be viable for canal water cooling. This option is not therefore considered further for this development.

8 Energy Demand Assessment

8.1 Energy Use in Buildings

8.1.1 Building energy use is split into regulated and unregulated uses. The regulated uses include space heating, water heating, lighting and ventilation, and are assessed and controlled under the Building Regulations Part L: Conservation of Fuel and Power. The unregulated uses include power for cooking and appliances and are not controlled by the Building Regulations.

8.1.2 The proposed development will be required to meet the 2010 Building Regulations. The residential units, being new construction, will be required to comply with Part L1A as such their performance will be assessed against a 2010 baseline emissions standard. As the units will also be required to meet a CfSH level 4 standard they will be required to exceed the building regulations requirements by a minimum of 25 %.

8.1.3 The offices will also be required to meet the 2010 building regulations but as the relevant works involve refurbishment of an existing building these will be assessed against Part L 2B. This does not require an assessment against a 2010 baseline emissions standard, and hence whilst all London Plan criteria are applicable to the building design the emissions assessment procedure is not applicable.

8.1.4 The residential energy demands have therefore been assessed in accordance with the London Plan and the results are confirmed below. The office building performance has also been considered using building regulation approved methodology and The London Plan energy hierarchy. The development emissions have then been considered and compared to the existing building emissions to consider the impact of the proposed works.

8.1.5 It should be noted the energy assessment requires consideration of residential, office and landlord areas and therefore relevant building areas stated may vary from those quoted in the Architects accommodation schedules.

8.2 Existing Development Carbon Footprint

8.2.1 The existing site emissions have been assessed using CIBSE benchmark data for offices. CIBSE Guide F provides data for the whole energy use in offices split into electricity and gas demands per m^2 of treated floor area. Benchmark data for offices is provided for "typical" and "good" practice buildings as well as for standard or prestige office types.

8.2.2 Given the age of the existing development benchmark energy demands have been selected based on a standard office building using typical practice criteria. The carbon factors used to calculate the CO2 emissions have been taken from the current 2010 building regulations Part L to allow comparison with the predicted energy demand results.

Table 3: Existing Carbon Footprint

Description	TFA (m2)	Total Existing Energy Demand (MWh)			Total CO2 Emissions (Tonnes)		
		Gas	Electric	Total	Gas	Electric	Total
Offices	4,269	760	977	1,737	150.5	505	656
Subtotal	4,269	760	977	1,737	150.5	505	656

8.2.3 The existing "whole energy" site demand has been assessed as 1,737 MWh per annum. This provides an existing carbon footprint of 656 Tonnes of CO_2 per annum.

8.3 Baseline Energy Demand – Residential

8.3.1 In order to address London Plan energy policy and the building regulations the predicted energy demand of a new development needs to be assessed against a 2010 building regulations baseline. The carbon factors used to calculate the CO_2 emissions have been taken from the current 2010 BRAD Part L as they will be applicable to the development.

Table 4: Baseline Energy Demand - Residential

Residential Baseline					
Units Modelled	**Total Area (m2)**	**Total Energy Use (kWh/year)**		**Total CO2 Emissions (kg/year)**	
		Regulated	**Unregulated**	**Regulated**	**Unregulated**
Flats	776	63,715	29,930	14,601	14,145
Offices		N/A	N/A	N/A	N/A
Total	**776**	**93,646**		**28,746**	

8.3.2 The anticipated baseline "whole energy" demand from the residential units has been assessed as 93.6 MWh electric and gas per annum. This provides a total baseline carbon emission of 28.7 Tonnes of CO_2 per annum.

8.4 Predicted Energy Demand - Residential

8.4.1 The calculation method used to assess energy consumption and CO_2 emissions is SAP as adopted and approved under Part L of the Building Regulations. This method provides a TER and DER for each dwelling modelled.

8.4.2 The approved SAP 2009 software used for this assessment is provided by Elmhurst Energy Systems version 3.08r12. BRAD Part L1A clauses 4.2 to 4.27 explain how the TER and DER are calculated.

8.4.3 The SAP calculation reports on regulated energy uses but also makes an assessment of unregulated energy demands. The London Plan requires all energy uses (regulated and unregulated) to be assessed, and hence the "whole" baseline and predicted energy demand has been considered for the development.

8.4.4 All nine residential units have been modelled using SAP. The principal parameters adopted in the calculations are presented below:

Table 5: SAP Design Parameters

Parameter	Standard
U value – external wall	0.15
U value – glazing units	1.5
U value – roof	0.1
U value – party floor	0.15
Air permeability	6 m^3/hm^2 at 50 Pa
Y – factor	Accredited construction details – 0.08
Fuel for space heating and part hot water	Condensing low NOx Gas boiler (91% efficient)
Controls	Room thermostat and TRVs
Energy efficient luminaires	Throughout
Ventilation	MVHR at 70% eff.
Cooking	Electric

8.4.5 The sample modelling results are attached in Appendix A and summarised below.

Table 6: SAP Results

Unit	TER (kgCO2/m2/a)	DER (kgCO2/m2/a)	Improvement over Part L minimum requirement (%)
Unit 4.01	16.1	11.9	25 %
Unit 4.02	16.8	12.6	25 %
Unit 5.01	16.8	12.4	25 %
Unit 5.02	23.2	16.5	25 %
Unit 5.03	23.3	17.4	25 %
Unit 5.04	21.5	16.1	25 %
Unit 5.05	21.5	16.1	25 %
Unit 5.06	21.7	15.9	27 %
Unit 5.07	18.2	12.4	25 %

8.4.6 As can be seen in the above table a 25% reduction over 2010 Part L requirements has been achieved for each of the modelled units thus satisfying the energy requirement for a Level 4 standard under the CfSH.

8.4.7 The predicted whole energy demand from the residential uses has been extracted from the SAP calculations as shown below.

Table 7: Predicted Energy Demand - Residential

Residential Predicted						
Units Modelled	**Total Area (m2)**	**Total Energy Use (kWh/year)**		**Total CO2 Emissions (kg/year)**		
		Regulated	**Unregulated**	**Regulated**	**Unregulated**	
Flats	776	61,942	28,434	13,972	13,438	
Offices		n/a	n/a	n/a	n/a	
Total	**776**	**90,376**		**27,410**		

8.4.8 The predicted "whole energy" residential demand, as a result of energy efficient design only, has been assessed as 90.4 MWh per annum. This provides a total predicted carbon emission of 27.4 Tonnes of CO_2 per annum.

8.5 Predicted Energy Demand - Office

8.5.1 The calculation method used to assess the energy demand requirements and CO2 emissions for commercial buildings is SBEM as adopted and approved under Part L of the Building Regulations. This method provides a TER and BER for each building modelled.

8.5.2 The approved SBEM software used for this assessment is provided by IES Apache version 6.4.0.12.

8.5.3 The SBEM calculation, like SAP, reports on regulated energy uses, but also assesses unregulated building energy demands. The figures for both are therefore extracted from the calculation to provide the predicted "whole" energy demand for the office use.

8.5.4 The modelling results are attached in Appendix B and confirm the predicted building energy demand results in a BER of 29.5 $kgCO_2/m^2$.

Table 8: Predicted Energy Demand - Office

Office Predicted						
Units Modelled	Total Area (m2)	Total Energy Use (kWh/year)		Total CO2 Emissions (kg/year)	
		Regulated	Unregulated	Regulated	Unregulated
Flats		n/a	n/a	n/a	n/a
Offices		464,815	216,585	181,348	111,974
Total		**711,400**		**293,322**	

8.5.5 The predicted "whole energy" office demand, as a result of energy efficient design only, has been assessed as 711 MWh per annum. This provides a total predicted carbon emission of 293 Tonnes of CO_2 per annum.

8.6 Predicted Development Energy Demand

8.6.1 The predicted energy demand from the proposed development, based on energy efficient design only, is confirmed below.

Table 9: Predicted Development Energy Demand

Development Predicted					
Units Modelled	Total Area (m2)	Total Energy Use (kWh/year)		Total CO2 Emissions (kg/year)	
		Regulated	Unregulated	Regulated	Unregulated
Flats	776	61,942	28,434	13,972	13,438
Offices	6,213	464,815	216,585	181,348	111,974
Total		**771,776**		**320,732**	

8.6.2 The predicted "whole energy" demand for the proposed development, as a result of energy efficient design only, has been assessed as 772 MWh per annum. This provides a total predicted carbon emission of 321 tonnes of CO_2 per annum. These emissions will be reduced by a further 5 tonnes by the use of the on site generated renewable energy from solar thermal and photovoltaic panels.

8.6.3 The development proposals, whilst providing additional office floor space and nine new residential apartments, will result in a 51 % reduction in the annual site CO_2 emissions.

9 Conclusions

9.1.1 This energy assessment has been prepared to reduce the “whole” site carbon emissions from the proposed refurbishment and extension of Bewlay House to the practicable minimum. The works include an increase in the office area accommodation and nine new build residential units. The whole site carbon emissions however have been reduced by 51 % each year from their current level.

9.1.2 The assessment process has followed The London Plan 2011 energy hierarchy and provides proposals for passive and active design measures to reduce energy demand, considers the opportunity for decentralised energy production, and includes proposals for the provision of on-site renewable energy generation.

9.1.3 The passive design measures included in this strategy are:

- Consideration of residential unit aspects and internal layout requirements
- Enhancements to the building fabric by providing additional insulation, a reduced air permeability rate and reduced thermal bridging coefficient;
- Enlarged window areas to maximize the use of natural daylight;
- Passive shading including balcony features and recessed windows to southern office elevations
- Provision of thermal mass via exposed concrete ceilings to office areas (with night time air purging)
- Increased ceiling heights to residential areas to mitigate against summer overheating
- Solar control blinds to office areas and specific apartments where required
- Opening windows to office perimeters to allow mid-season natural ventilation where possible
- Tenant/occupier information provided to office users in the form of a building user guide
- Resident information to the residential apartments in the form of a CfSH compliant home user guide

9.1.4 The active design measures included are:

- High efficiency low NOx boilers to offices and residential units
- Efficient heating and hot water distribution with zonal controls to all areas served
- Modular plant to centralised office heating and cooling systems
- High efficacy lighting throughout

- Lighting controls to include DALI system with daylight and passive infra-red motion detection to ensure lights are only operated as and when required
- External lighting to be energy efficient including timer and photocell control to avoid unnecessary use (CfSH level 4 where required)
- Electrical white goods will be suitably rated to meet CfSH requirements.
- Displacement ventilation system to offices with variable air volume flow and 75 % recirculated air to provide heat recovery
- Ventilation system with night time purging facility (and thermal mass) with potential for free cooling during other times where suitable external temperature conditions prevail
- Whole house ventilation with heat recovery to residential apartments
- Pumps and fans fitted with variable speed drives
- Open protocol BMS system to offices to permit central monitoring and automatic adjustment of controls to suit user requirements
- Energy display devices to inform residential tenants and modify future behaviour
- Office metering strategy to CIBSE TM39 to permit monitoring and auditing of office energy demands, with 90% minimum of the annual energy consumption recorded
- Separate metering of renewable energy systems to allow monitoring and auditing of these technologies

9.1.5 Sample SAP and SBEM calculations have been prepared to assess the development predicted energy demands.

9.1.6 The heating and cooling provision has been assessed in the priorities set out by The London Plan. Consideration has been given to the London Heat Map and LBC studies for the potential of connecting the site to a district network. At this stage no suitable network is in operation. There are no current proposals for a DEN in this area however this cannot be ruled out in the future. The office space is therefore to be designed with building services to facilitate the retrofit installation to a low carbon heat and cooling main.

9.1.7 The reduction in site carbon emissions from energy efficient design will be improved by the provision of up to 36 m^2 of roof mounted solar thermal panels, along with approximately 62 m^2 roof mounted photovoltaic panels. These would replace approximately 17.6 MWh of the residual gas and electricity demand, providing a 5 tonnes CO_2 saving per annum. This saving equates to a reduction in the development's predicted total emissions of 1.6%.

9.1.8 Although the London Plan presumes that 20% of a development's total emissions should be offset through the use of zero carbon energy technologies, this target is not feasible for The Jamestown Road redevelopment. Although the 20% aspiration has not been met, the proposed energy performance target for new build residential units within Camden Development Policies Policy DP 22 will be met, whilst policy requirement in LBC CPG 3 chapter 4 will also be met for the refurbishment works to the offices.

9.1.9 The impact achieved by the proposed improvements to the existing building fabric and building services efficiencies are of higher importance in the energy hierarchy than renewable technologies.

9.1.10 The residential element of the scheme has been assessed against the London Plan procedure and the the overall CO_2 reductions obtained are presented and displayed graphically below.

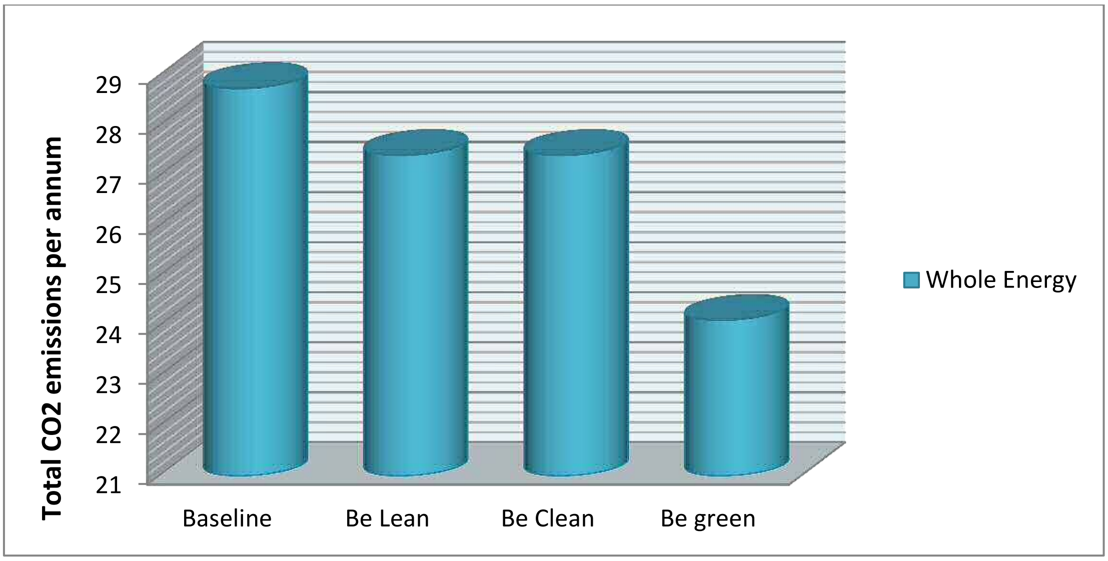
Table 10: Residential Carbon Dioxide Emissions after each stage of the Energy Hierarchy

Case	Carbon Dioxide Emissions (Tonnes CO2 per annum)		
	Regulated	Unregulated	Total
2010 Baseline emissions	15	14	29
From base build design	14	13	27
After CHP – retrofit not included	14	13	27
After renewable energy	11	13	24

Table 11: Summary of Residential CO2 Savings

Case	Carbon Dioxide Savings (Tonnes CO2 per annum)		Carbon Dioxide Savings (%)	
	Regulated	Total	Regulated	Total
Savings from energy demand reduction	1	1	4%	5%
Savings from CHP- retrofit not included	0	0	0%	0%
Savings from renewable	3	3	21%	12%
Total Cumulative Savings			**25%**	**16%**

Figure 3: Calculation of Residential CO_2 savings according to the 'energy hierarchy' of The London Plan



9.1.11 This energy assessment sets out how the proposed refurbishment and extension at 32 Jamestown Road will minimise site CO_2 emissions. The total carbon emissions associated with the proposed development have been assessed as 316 tonnes CO_2 per year.

9.1.12 The proposal will meet a CfSH Level 4 standard for the residential units. It has also addressed The London Plan energy hierarchy and local planning policy in the LBC CPG 3 document.

9.1.13 The proposed redevelopment provides an increase in office floor area and nine new residential units whilst reducing the current site CO_2 emissions by over 50% each year. The proposals therefore comply with the regional and local planning policy requirements.

Appendix A : Sample SAP Calculations

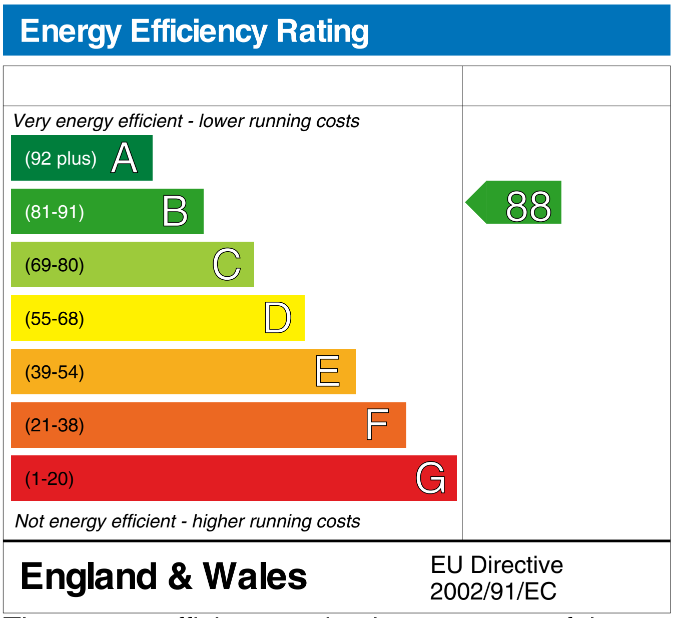
Predicted Energy Assessment

Flat 4.01, 32 Jamestown Road,
Camden

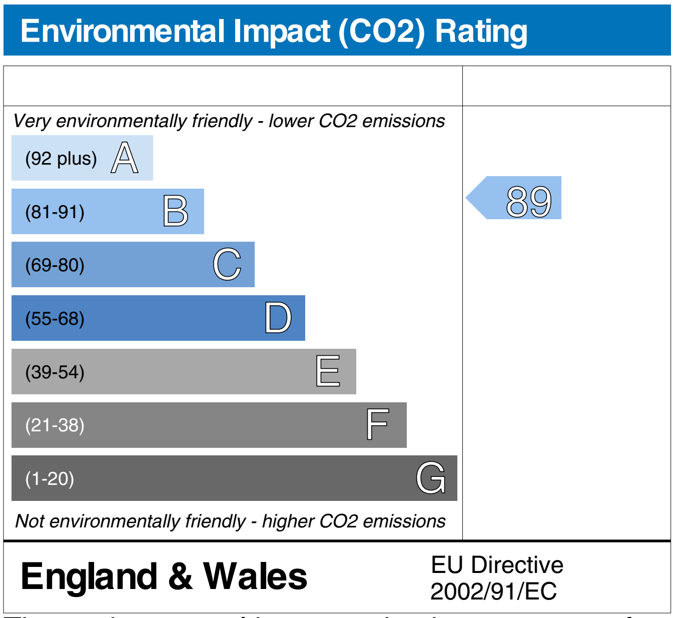
Dwelling type:	Flat, End-Terrace
Date of assessment:	26.Jul.2013
Produced by:	Mark Sheehan Building Consultancy
Total floor area:	147.74 m^2

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2009 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2010 Edition
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.08r12

New Build (As Designed)

1 TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.14 kg/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.85 kg/m²OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	OK
Floor	0.25 (max. 0.25)	0.25 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings and curtain wall	1.49 (max. 2.00)	1.50 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated using user-specified y-value of 0.080

3 Air permeability

Air permeability at 50 pascals:	4.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
Not Known Not Known at this stage

Efficiency: 91.0% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 1.82 kWh/day	
Permitted by DBSCG 2.10	OK	
Primary pipework insulated:	Yes	OK
Solar water heating		
Dedicated solar storage volume:	180 litres	
Minimum:	83 litres	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK
Boiler interlock	Yes	OK

7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation
Continuous supply and extract system

Specific fan power:	0.71	
Maximum	1.5	OK
MVHR efficiency:	70%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley):	Slight	OK
Based on:		
Overshading:	Average	
Windows facing North:	19.20 m², No overhang	
Windows facing South:	28.32 m², No overhang	
Ventilation rate:	6.00	
Blinds/curtains:	None	

10 Key features

External wall U-value	0.15 W/m²K
Roof U-value	0.10 W/m²K
Door U-value	1.40 W/m²K
Party wall U-value	0.00 W/m²K
Air permeability	4.0 m³/m²h
Solar water heating	
Photovoltaic array	

SAP 2009 OVERHEATING ASSESSMENT FOR New Build (As Designed)   BRE SAP Worksheet 9.90
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.08r12

Overheating Calculation Input Data

Dwelling type	EndTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
Region	Thames Valley
Front of dwelling faces	South
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	702.06	(P1)
Transmission heat loss coefficient	144.55	(37)
Summer heat loss coefficient	846.61	(P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
North	0.000	1.000	None
South	0.000	1.000	None

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer	
North	1.000	0.90	1.000	0.900	(P8)
South	1.000	0.90	1.000	0.900	(P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North	19.2000	85.3441	0.6300	0.7000	0.9000	585.3270
South	28.3200	110.5233	0.6300	0.7000	0.9000	1118.0743
					total:	1703.4013

	Jun	Jul	Aug	
Solar gains	1790	1703	1551	(P3)
Internal gains	580	556	567	
Total summer gains	2370	2259	2118	(P5)
Summer gain/loss ratio	2.80	2.67	2.50	(P6)
Summer external temperature	15.40	17.80	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	18.45	20.72	20.55	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

Assessment of likelihood of high internal temperature: Slight

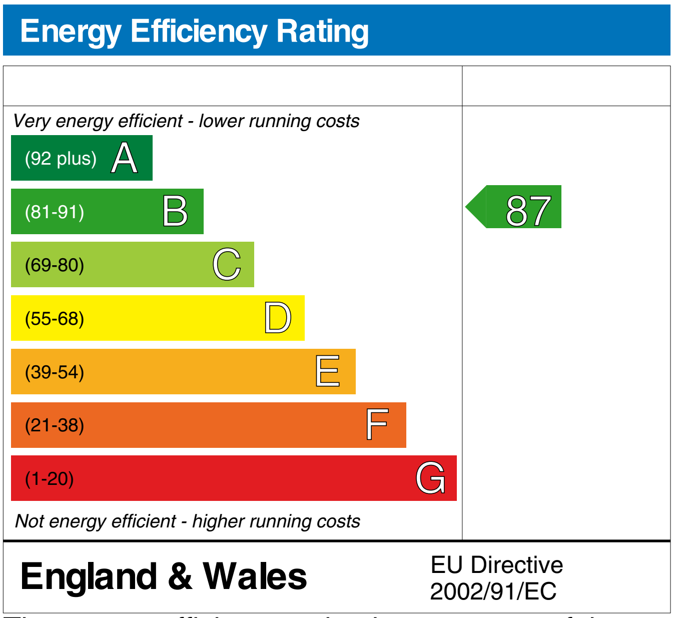
Predicted Energy Assessment

Flat 4.02, 32 Jamestown Road,
Camden

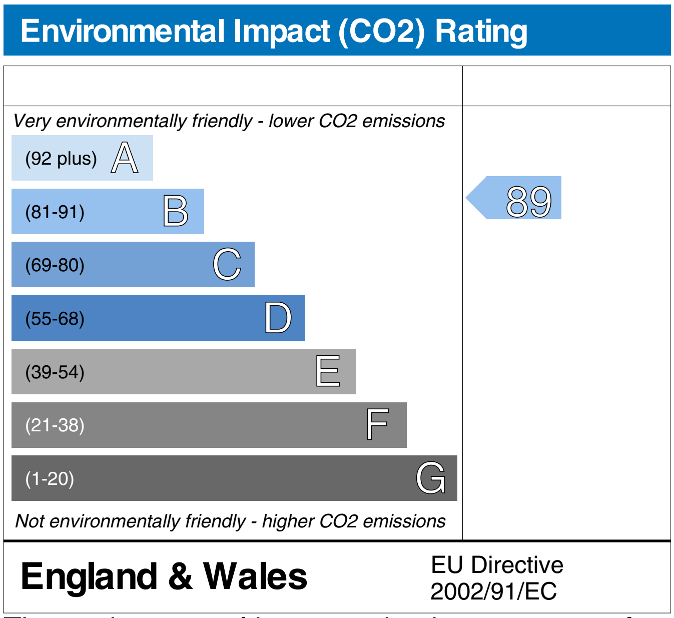
Dwelling type:	Flat, End-Terrace
Date of assessment:	26.Jul.2013
Produced by:	Mark Sheehan Building Consultancy
Total floor area:	131.1 m^2

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2009 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2010 Edition
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.08r12

New Build (As Designed)

1 TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.78 kg/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.58 kg/m²OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	OK
Floor	0.25 (max. 0.25)	0.25 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings and curtain wall	1.50 (max. 2.00)	1.50 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.080

3 Air permeability

Air permeability at 50 pascals:	4.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
Not Known Not Known at this stage

Efficiency: 91.0% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 1.82 kWh/day	
Permitted by DBSCG 2.10	OK	
Primary pipework insulated:	Yes	OK
Solar water heating		
Dedicated solar storage volume:	180 litres	
Minimum:	82 litres	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK
Boiler interlock	Yes	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.71	
Maximum	1.5	OK
MVHR efficiency:	70%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley):	Medium	OK
Based on:		
Overshading:	Average	
Windows facing South:	19.20 m², No overhang	
Windows facing West:	48.00 m², No overhang	
Ventilation rate:	6.00	
Blinds/curtains:	None	

10 Key features

External wall U-value	0.15 W/m²K
Roof U-value	0.10 W/m²K
Door U-value	1.40 W/m²K
Party wall U-value	0.00 W/m²K
Air permeability	4.0 m³/m²h
Solar water heating	
Photovoltaic array	

SAP 2009 OVERHEATING ASSESSMENT FOR New Build (As Designed) BRE SAP Worksheet 9.90
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.08r12

Overheating Calculation Input Data

Dwelling type	EndTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
Region	Thames Valley
Front of dwelling faces	South
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	622.99 (P1)
Transmission heat loss coefficient	160.09 (37)
Summer heat loss coefficient	783.08 (P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
South	0.000	1.000	None
West	0.000	1.000	None

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
South	1.000	0.90	1.000	0.900 (P8)
West	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
South	19.2000	110.5233	0.6300	0.7000	0.9000	758.0165
West	48.0000	117.7842	0.6300	0.7000	0.9000	2019.5372
					total:	2777.5537

	Jun	Jul	Aug	
Solar gains	2894	2778	2536	(P3)
Internal gains	555	532	543	
Total summer gains	3449	3309	3078	(P5)
Summer gain/loss ratio	4.40	4.23	3.93	(P6)
Summer external temperature	15.40	17.80	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	20.05	22.28	21.98	(P7)
Likelihood of high internal temperature	Not significant	Medium	Slight	

Assessment of likelihood of high internal temperature: Medium

Predicted Energy Assessment

Flat 5.01, 32 Jamestown Road,
Camden

Dwelling type:	Flat, End-Terrace
Date of assessment:	26.Jul.2013
Produced by:	Mark Sheehan Building Consultancy
Total floor area:	108.43 m^2

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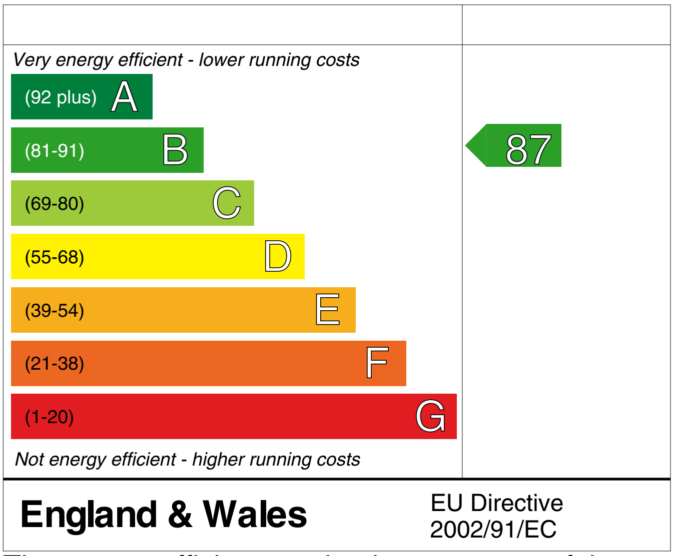
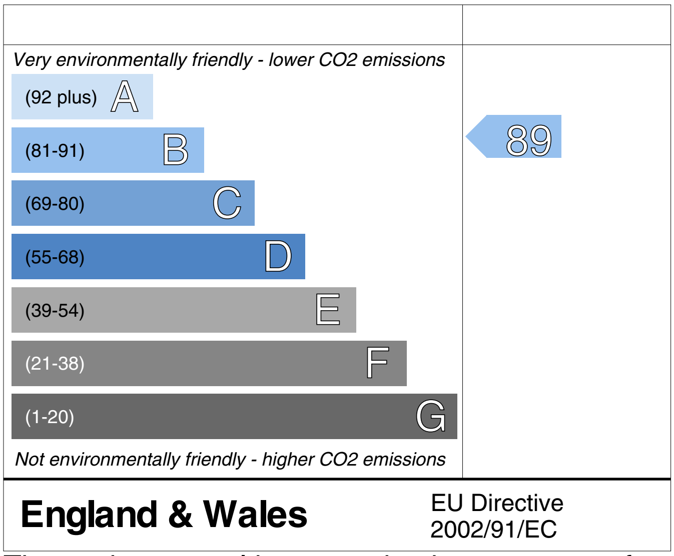
The energy performance has been assessed using the Government approved SAP2009 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2010 Edition
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.08r12

New Build (As Designed)

1 TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.75 kg/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.40 kg/m²OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings and curtain wall	1.50 (max. 2.00)	1.50 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated using user-specified y-value of 0.080

3 Air permeability

Air permeability at 50 pascals:	4.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
Not Known Not Known at this stage

Efficiency: 91.0% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 1.82 kWh/day	
Permitted by DBSCG 2.10	OK	
Primary pipework insulated:	Yes	OK
Solar water heating		
Dedicated solar storage volume:	180 litres	
Minimum:	68 litres	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK
Boiler interlock	Yes	OK

7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation
Continuous supply and extract system

Specific fan power:	0.71	
Maximum	1.5	OK
MVHR efficiency:	70%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley):	Medium	OK
Based on:		
Overshading:	Average	
Windows facing South:	19.20 m², No overhang	
Windows facing West:	48.00 m², No overhang	
Ventilation rate:	6.00	
Blinds/curtains:	None	

10 Key features

External wall U-value	0.15 W/m²K
Roof U-value	0.10 W/m²K
Door U-value	1.40 W/m²K
Party wall U-value	0.00 W/m²K
Air permeability	4.0 m³/m²h
Solar water heating	
Photovoltaic array	

SAP 2009 OVERHEATING ASSESSMENT FOR New Build (As Designed) BRE SAP Worksheet 9.90
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.08r12

Overheating Calculation Input Data

Dwelling type	EndTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
Region	Thames Valley
Front of dwelling faces	South
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	515.26 (P1)
Transmission heat loss coefficient	129.13 (37)
Summer heat loss coefficient	644.39 (P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
South	0.000	1.000	None
West	0.000	1.000	None

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
South	1.000	0.90	1.000	0.900 (P8)
West	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
South	19.2000	110.5233	0.6300	0.7000	0.9000	758.0165
West	48.0000	117.7842	0.6300	0.7000	0.9000	2019.5372
					total:	2777.5537

	Jun	Jul	Aug	
Solar gains	2894	2778	2536	(P3)
Internal gains	514	493	503	
Total summer gains	3408	3270	3039	(P5)
Summer gain/loss ratio	5.29	5.08	4.72	(P6)
Summer external temperature	15.40	17.80	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	20.94	23.13	22.77	(P7)
Likelihood of high internal temperature	Slight	Medium	Medium	

Assessment of likelihood of high internal temperature: Medium

Predicted Energy Assessment

Flat 5.02, 32 Jamestown Road,
Camden

Dwelling type:	Flat, End-Terrace
Date of assessment:	26.Jul.2013
Produced by:	Mark Sheehan Building Consultancy
Total floor area:	46.73 m^2

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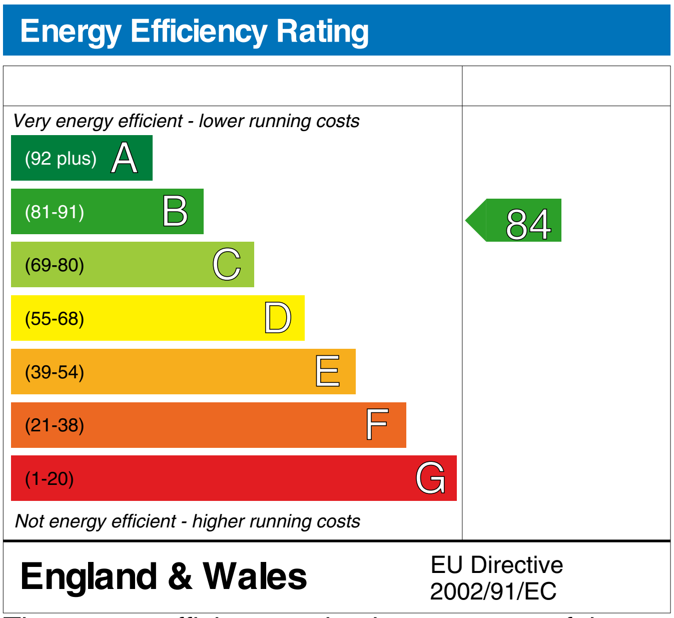
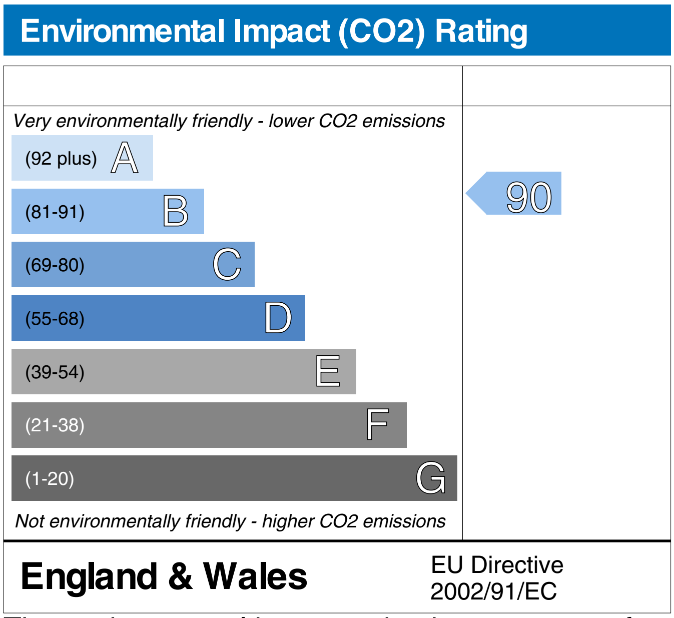


The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2010 Edition
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.08r12
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New Build (As Designed)

1 TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 23.19 kg/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.49 kg/m²OK

2 Fabric U-values
Element         Average                 Highest
External wall   0.20 (max. 0.30)        0.20 (max. 0.70)          OK
Floor           (no floor)
Roof            0.10 (max. 0.20)        0.10 (max. 0.35)          OK
Openings and
curtain wall    1.49 (max. 2.00)        1.50 (max. 3.30)          OK

2a Thermal bridging
Thermal bridging calculated using user-specified y-value of 0.080

3 Air permeability
Air permeability at 50 pascals:         4.00 (design value)
Maximum                                 10.0                                                OK

4 Heating efficiency
Main heating system:                    Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
Not Known Not Known at this stage

Efficiency: 91.0% SEDBUK2009
Minimum: 88.0%                                    OK

Secondary heating system:               None

5 Cylinder insulation
Hot water storage                       Nominal cylinder loss: 1.82 kWh/day
Permitted by DBSCG 2.10                           OK
Primary pipework insulated:             Yes                                                 OK
Solar water heating
Dedicated solar storage volume:         180 litres
Minimum:                                58 litres                                           OK

6 Controls
Space heating controls:                 Time and temperature zone control                   OK


Hot water controls:                     Cylinderstat                                        OK
                                       Independent timer for DHW                           OK

Boiler interlock                        Yes                                                 OK

7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum                                 75%                                                 OK

8 Mechanical ventilation
Continuous supply and extract system
Specific fan power:                     0.71
Maximum                                 1.5                                                 OK
MVHR efficiency:                        70%
Minimum:                                70%                                                 OK

9 Summertime temperature
Overheating risk (Thames Valley):       Medium                                              OK
Based on:
Overshading:                            Average
Windows facing South:                   2.40 m², No overhang
Windows facing West:                    18.48 m², No overhang
Ventilation rate:                       4.00
Blinds/curtains:                        Dark-coloured curtain or roller blind, closed 39% of daylight hours

10 Key features
External wall U-value                   0.15 W/m²K
Roof U-value                            0.10 W/m²K
Door U-value                            1.40 W/m²K
Party wall U-value                      0.00 W/m²K
Air permeability                        4.0 m³/m²h
Solar water heating
Photovoltaic array
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SAP 2009 OVERHEATING ASSESSMENT FOR New Build (As Designed) BRE SAP Worksheet 9.90
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.08r12

Overheating Calculation Input Data

Dwelling type	EndTerrace Flat
Number of storeys	1
Cross ventilation possible	No
Region	Thames Valley
Front of dwelling faces	South
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	4.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	148.04	(P1)
Transmission heat loss coefficient	55.35	(37)
Summer heat loss coefficient	203.39	(P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
South	0.000	1.000	None
West	0.000	1.000	None

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
South	1.000	0.90	1.000	0.900 (P8)
West	0.942	0.90	1.000	0.847 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
South	2.4000	110.5233	0.6300	0.7000	0.9000	94.7521
West	18.4800	117.7842	0.6300	0.7000	0.8474	732.0368
					total:	826.7888

	Jun	Jul	Aug	
Solar gains	862	827	744	(P3)
Internal gains	303	291	298	
Total summer gains	1165	1118	1042	(P5)
Summer gain/loss ratio	5.73	5.49	5.12	(P6)
Summer external temperature	15.40	17.80	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	21.38	23.54	23.17	(P7)
Likelihood of high internal temperature	Slight	Medium	Medium	

Assessment of likelihood of high internal temperature: Medium

Predicted Energy Assessment

Flat 5.03, 32 Jamestown Road,
Camden

Dwelling type:	Flat, End-Terrace
Date of assessment:	26.Jul.2013
Produced by:	Mark Sheehan Building Consultancy
Total floor area:	50.47 m^2

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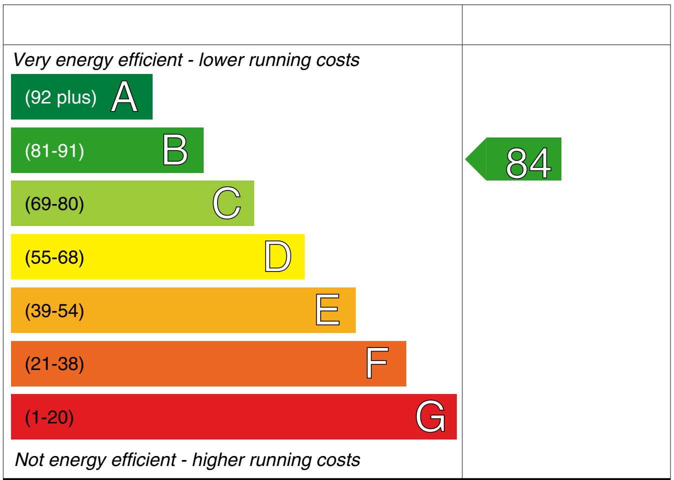
The energy performance has been assessed using the Government approved SAP2009 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

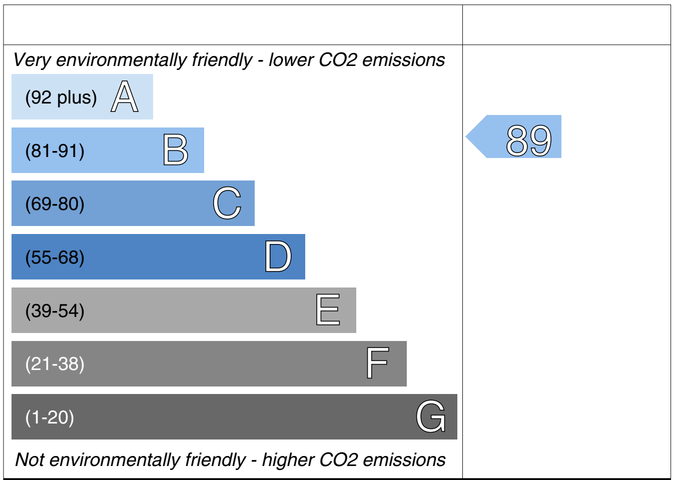
Energy Efficiency Rating



England & Wales EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO2) Rating



England & Wales EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2010 Edition
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New Build (As Designed)

1 TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 23.33 kg/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.42 kg/m²OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	OK
Floor	0.25 (max. 0.25)	0.25 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings and curtain wall	1.49 (max. 2.00)	1.50 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated using user-specified y-value of 0.080

3 Air permeability

Air permeability at 50 pascals:	4.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
Not Known Not Known at this stage

Efficiency: 91.0% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 1.82 kWh/day	
Permitted by DBSCG 2.10	OK	
Primary pipework insulated:	Yes	OK
Solar water heating		
Dedicated solar storage volume:	180 litres	
Minimum:	60 litres	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK
Boiler interlock	Yes	OK

7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation
Continuous supply and extract system

Specific fan power:	0.71	
Maximum	1.5	OK
MVHR efficiency:	70%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley):	Slight	OK
Based on:		
Overshading:	Average	
Windows facing North:	11.52 m², No overhang	
Windows facing South:	9.12 m², No overhang	
Ventilation rate:	6.00	
Blinds/curtains:	None	

10 Key features

External wall U-value	0.15 W/m²K
Roof U-value	0.10 W/m²K
Door U-value	1.40 W/m²K
Party wall U-value	0.00 W/m²K
Air permeability	4.0 m³/m²h
Solar water heating	
Photovoltaic array	

SAP 2009 OVERHEATING ASSESSMENT FOR New Build (As Designed) BRE SAP Worksheet 9.90
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.08r12

Overheating Calculation Input Data

Dwelling type	EndTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
Region	Thames Valley
Front of dwelling faces	North
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	239.83	(P1)
Transmission heat loss coefficient	66.45	(37)
Summer heat loss coefficient	306.28	(P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
North	0.000	1.000	None
South	0.000	1.000	None

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
North	1.000	0.90	1.000	0.900 (P8)
South	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North	11.5200	85.3441	0.6300	0.7000	0.9000	351.1962
South	9.1200	110.5233	0.6300	0.7000	0.9000	360.0578
					total:	711.2540

	Jun	Jul	Aug	
Solar gains	752	711	628	(P3)
Internal gains	319	307	314	
Total summer gains	1071	1018	942	(P5)
Summer gain/loss ratio	3.50	3.32	3.08	(P6)
Summer external temperature	15.40	17.80	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	19.15	21.37	21.13	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

Assessment of likelihood of high internal temperature: Slight

Predicted Energy Assessment

Flat 5.04, 32 Jamestown Road,
Camden

Dwelling type:	Flat, Mid-Terrace
Date of assessment:	26.Jul.2013
Produced by:	Mark Sheehan Building Consultancy
Total floor area:	50.35 m^2

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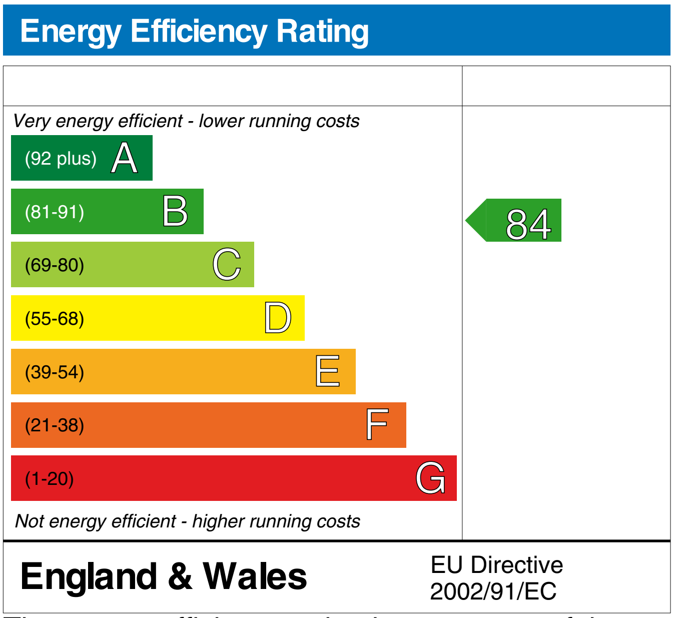

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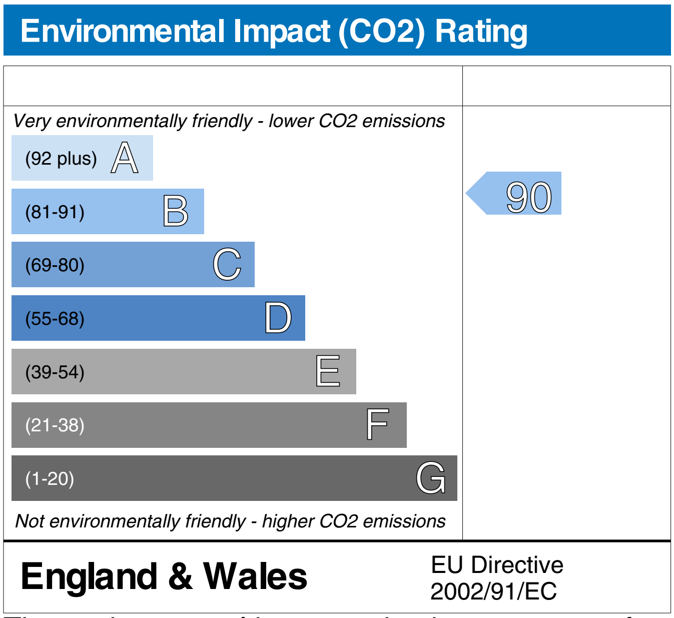

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2010 Edition
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.08r12

New Build (As Designed)

1 TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 21.46 kg/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.09 kg/m²OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	OK
Floor	0.25 (max. 0.25)	0.25 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings and curtain wall	1.49 (max. 2.00)	1.50 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated using user-specified y-value of 0.080

3 Air permeability

Air permeability at 50 pascals:	4.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
Not Known Not Known at this stage

Efficiency: 91.0% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 1.82 kWh/day	
Permitted by DBSCG 2.10	OK	
Primary pipework insulated:	Yes	OK
Solar water heating		
Dedicated solar storage volume:	180 litres	
Minimum:	60 litres	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK
Boiler interlock	Yes	OK

7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation
Continuous supply and extract system

Specific fan power:	0.71	
Maximum	1.5	OK
MVHR efficiency:	70%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley):	Slight	OK
Based on:		
Overshading:	Average	
Windows facing North:	12.96 m², No overhang	
Windows facing South:	9.60 m², No overhang	
Ventilation rate:	6.00	
Blinds/curtains:	None	

10 Key features

External wall U-value	0.15 W/m²K
Roof U-value	0.10 W/m²K
Door U-value	1.40 W/m²K
Party wall U-value	0.00 W/m²K
Air permeability	4.0 m³/m²h
Solar water heating	
Photovoltaic array	

SAP 2009 OVERHEATING ASSESSMENT FOR New Build (As Designed) BRE SAP Worksheet 9.90
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.08r12

Overheating Calculation Input Data

Dwelling type	MidTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
Region	Thames Valley
Front of dwelling faces	North
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	239.26	(P1)
Transmission heat loss coefficient	62.56	(37)
Summer heat loss coefficient	301.82	(P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
North	0.000	1.000	None
South	0.000	1.000	None

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
North	1.000	0.90	1.000	0.900 (P8)
South	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North	12.9600	85.3441	0.6300	0.7000	0.9000	395.0957
South	9.6000	110.5233	0.6300	0.7000	0.9000	379.0082
					total:	774.1039

	Jun	Jul	Aug	
Solar gains	819	774	682	(P3)
Internal gains	319	306	314	
Total summer gains	1137	1080	995	(P5)
Summer gain/loss ratio	3.77	3.58	3.30	(P6)
Summer external temperature	15.40	17.80	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	19.42	21.63	21.35	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

Assessment of likelihood of high internal temperature: Slight

Predicted Energy Assessment

Flat 5.05, 32 Jamestown Road,
Camden

Dwelling type:	Flat, Mid-Terrace
Date of assessment:	26.Jul.2013
Produced by:	Mark Sheehan Building Consultancy
Total floor area:	50.7 m^2

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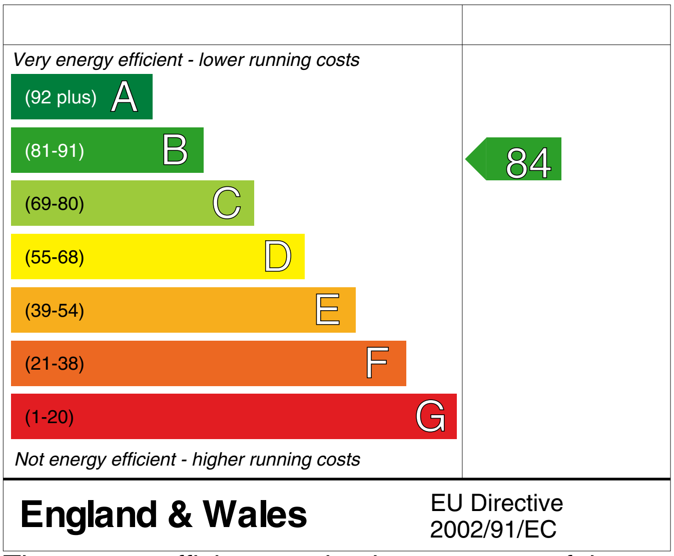
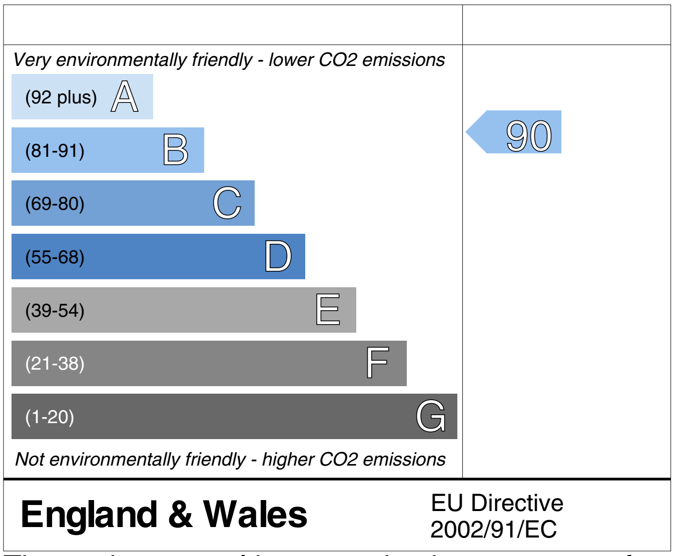
The energy performance has been assessed using the Government approved SAP2009 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2010 Edition
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.08r12

New Build (As Designed)

1 TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 21.51 kg/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.13 kg/m²OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	OK
Floor	0.25 (max. 0.25)	0.25 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings and curtain wall	1.49 (max. 2.00)	1.50 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated using user-specified y-value of 0.080

3 Air permeability

Air permeability at 50 pascals:	4.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
Not Known Not Known at this stage

Efficiency: 91.0% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 1.82 kWh/day	
Permitted by DBSCG 2.10	OK	
Primary pipework insulated:	Yes	OK
Solar water heating		
Dedicated solar storage volume:	180 litres	
Minimum:	60 litres	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK
Boiler interlock	Yes	OK

7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation
Continuous supply and extract system

Specific fan power:	0.71	
Maximum	1.5	OK
MVHR efficiency:	70%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley):	Slight	OK
Based on:		
Overshading:	Average	
Windows facing North:	14.40 m², No overhang	
Windows facing South:	11.28 m², No overhang	
Ventilation rate:	6.00	
Blinds/curtains:	None	

10 Key features

External wall U-value	0.15 W/m²K
Roof U-value	0.10 W/m²K
Door U-value	1.40 W/m²K
Party wall U-value	0.00 W/m²K
Air permeability	4.0 m³/m²h
Solar water heating	
Photovoltaic array	

SAP 2009 OVERHEATING ASSESSMENT FOR New Build (As Designed) BRE SAP Worksheet 9.90
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.08r12

Overheating Calculation Input Data

Dwelling type	MidTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
Region	Thames Valley
Front of dwelling faces	North
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	240.93	(P1)
Transmission heat loss coefficient	67.40	(37)
Summer heat loss coefficient	308.33	(P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
North	0.000	1.000	None
South	0.000	1.000	None

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
North	1.000	0.90	1.000	0.900 (P8)
South	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North	14.4000	85.3441	0.6300	0.7000	0.9000	438.9952
South	11.2800	110.5233	0.6300	0.7000	0.9000	445.3347
					total:	884.3299

	Jun	Jul	Aug	
Solar gains	935	884	781	(P3)
Internal gains	320	307	315	
Total summer gains	1255	1192	1096	(P5)
Summer gain/loss ratio	4.07	3.87	3.55	(P6)
Summer external temperature	15.40	17.80	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	19.72	21.92	21.60	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

Assessment of likelihood of high internal temperature: Slight

Predicted Energy Assessment

Flat 5.06, 32 Jamestown Road,
Camden

Dwelling type:	Flat, End-Terrace
Date of assessment:	26.Jul.2013
Produced by:	Mark Sheehan Building Consultancy
Total floor area:	84 m^2

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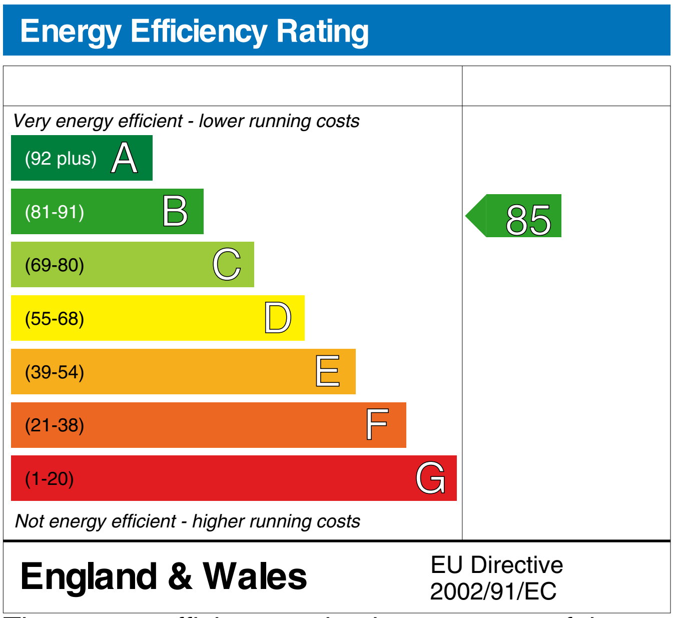
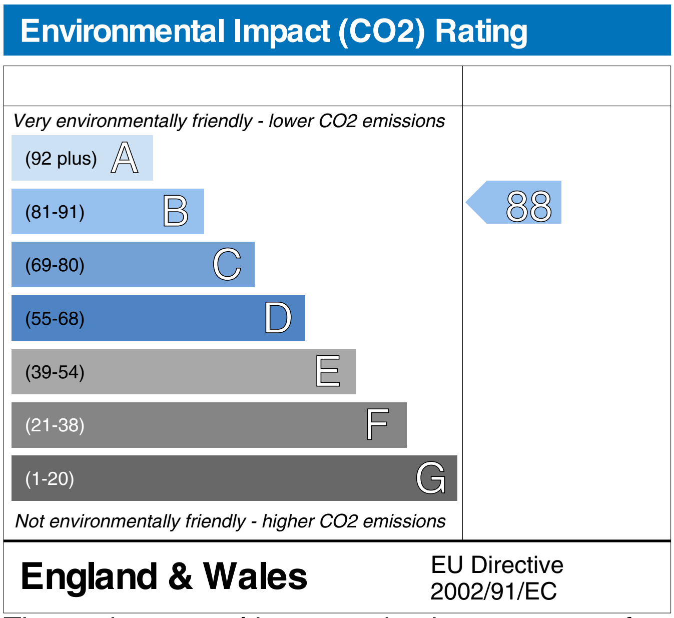
The energy performance has been assessed using the Government approved SAP2009 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2010 Edition
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.08r12

New Build (As Designed)

1 TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 21.70 kg/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.90 kg/m²OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	OK
Floor	0.25 (max. 0.25)	0.25 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings and curtain wall	1.49 (max. 2.00)	1.50 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated using user-specified y-value of 0.080

3 Air permeability

Air permeability at 50 pascals:	4.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
Not Known Not Known at this stage

Efficiency: 91.0% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 1.82 kWh/day	
Permitted by DBSCG 2.10	OK	
Primary pipework insulated:	Yes	OK
Solar water heating		
Dedicated solar storage volume:	180 litres	
Minimum:	68 litres	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK
Boiler interlock	Yes	OK

7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%

Minimum	75%	OK

8 Mechanical ventilation
Continuous supply and extract system

Specific fan power:	0.71	
Maximum	1.5	OK
MVHR efficiency:	70%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley):	Slight	OK
Based on:		
Overshading:	Average	
Windows facing North:	16.80 m², No overhang	
Windows facing South:	15.84 m², No overhang	
Ventilation rate:	6.00	
Blinds/curtains:	None	

10 Key features

External wall U-value	0.15 W/m²K
Roof U-value	0.10 W/m²K
Door U-value	1.40 W/m²K
Party wall U-value	0.00 W/m²K
Air permeability	4.0 m³/m²h
Solar water heating	
Photovoltaic array	

SAP 2009 OVERHEATING ASSESSMENT FOR New Build (As Designed) BRE SAP Worksheet 9.90
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.08r12

Overheating Calculation Input Data

Dwelling type	EndTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
Region	Thames Valley
Front of dwelling faces	North
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	399.17	(P1)
Transmission heat loss coefficient	111.79	(37)
Summer heat loss coefficient	510.96	(P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
North	0.000	1.000	None
South	0.000	1.000	None

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
North	1.000	0.90	1.000	0.900 (P8)
South	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North	16.8000	85.3441	0.6300	0.7000	0.9000	512.1611
South	15.8400	110.5233	0.6300	0.7000	0.9000	625.3636
					total:	1137.5247

	Jun	Jul	Aug	
Solar gains	1200	1138	1014	(P3)
Internal gains	451	433	442	
Total summer gains	1651	1570	1456	(P5)
Summer gain/loss ratio	3.23	3.07	2.85	(P6)
Summer external temperature	15.40	17.80	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	18.88	21.12	20.90	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

Assessment of likelihood of high internal temperature: Slight

Predicted Energy Assessment

Flat 5.07, 32 Jamestown Road,
Camden

Dwelling type:	Flat, End-Terrace
Date of assessment:	26.Jul.2013
Produced by:	Mark Sheehan Building Consultancy
Total floor area:	106.76 m^2

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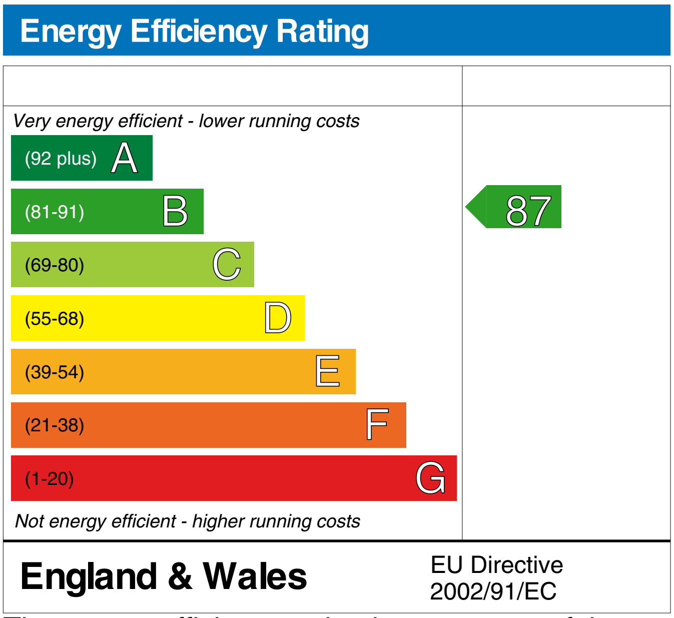
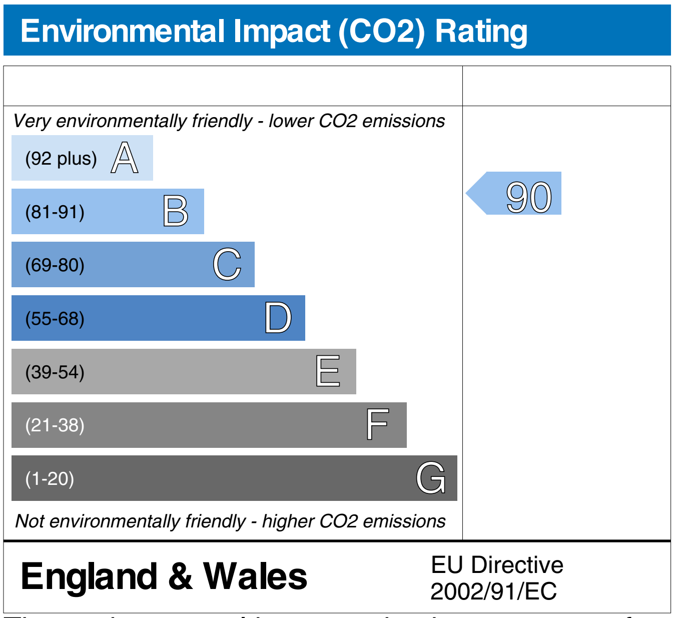
The energy performance has been assessed using the Government approved SAP2009 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2010 Edition
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.08r12

New Build (As Designed)

1 TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.22 kg/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.35 kg/m²OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	OK
Floor	0.23 (max. 0.25)	0.25 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings and curtain wall	1.49 (max. 2.00)	1.50 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated using user-specified y-value of 0.080

3 Air permeability

Air permeability at 50 pascals:	4.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system:	Boiler system with radiators or underfloor - Mains gas	
Data from manufacturer		
Not Known Not Known at this stage		
Efficiency: 91.0% SEDBUK2009		
Minimum: 88.0%	OK	
Secondary heating system:	None	

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 1.82 kWh/day	
Permitted by DBSCG 2.10	OK	
Primary pipework insulated:	Yes	OK
Solar water heating		
Dedicated solar storage volume:	180 litres	
Minimum:	68 litres	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK
Boiler interlock	Yes	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%		
Minimum	75%	OK

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.71	
Maximum	1.5	OK
MVHR efficiency:	70%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley):	Slight	OK
Based on:		
Overshading:	Average	
Windows facing South:	17.76 m², No overhang	
Windows facing West:	17.04 m², No overhang	
Ventilation rate:	6.00	
Blinds/curtains:	None	

10 Key features

External wall U-value	0.15 W/m²K
Roof U-value	0.10 W/m²K
Floor U-value	0.15 W/m²K
Door U-value	1.40 W/m²K
Party wall U-value	0.00 W/m²K
Air permeability	4.0 m³/m²h
Solar water heating	
Photovoltaic array	

SAP 2009 OVERHEATING ASSESSMENT FOR New Build (As Designed) BRE SAP Worksheet 9.90
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.08r12

Overheating Calculation Input Data

Dwelling type	EndTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
Region	Thames Valley
Front of dwelling faces	North
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	507.32	(P1)
Transmission heat loss coefficient	104.46	(37)
Summer heat loss coefficient	611.78	(P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
South	0.000	1.000	None
West	0.000	1.000	None

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
South	1.000	0.90	1.000	0.900 (P8)
West	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
South	17.7600	110.5233	0.6300	0.7000	0.9000	701.1653
West	17.0400	117.7842	0.6300	0.7000	0.9000	716.9357
					total:	1418.1010

	Jun	Jul	Aug	
Solar gains	1475	1418	1320	(P3)
Internal gains	510	489	500	
Total summer gains	1986	1907	1820	(P5)
Summer gain/loss ratio	3.25	3.12	2.97	(P6)
Summer external temperature	15.40	17.80	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	18.90	21.17	21.02	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

Assessment of likelihood of high internal temperature: Slight

Appendix B : Sample SBEM Calculation

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L 2010

Project name

Revised model design

As designed

Date: Fri Aug 09 11:26:25 2013

Administrative information

Building Details

Address: Bewlay House, LONDON,

Certification tool

Calculation engine: Apache

Calculation engine version: 6.4.0.12

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 6.4.0.12

BRUKL compliance check version: v4.1.e.5

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name: Nathan Williams Crofton Design

Telephone number: 01273 615066

Address: Newhaven Enterprise Centre, Denton Island, Newhaven, BN9 9BA

Criterion 1: The calculated CO_2 emission rate for the building should not exceed the target

The building does not comply with England and Wales Building Regulations Part L 2010

1.1	CO_2 emission rate from the notional building, $kgCO_2/m^2$.annum	20.3
1.2	Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	20.3
1.3	Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	29.5
1.4	Are emissions from the building less than or equal to the target?	BER > TER
1.5	Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services should achieve reasonable overall standards of energy efficiency

2.a Building fabric

Element	$U_{a-Limit}$	U_{a-Calc}	U_{i-Calc}	Surface where the maximum value occurs*
Wall**	0.35	0.2	0.2	GRDF0003:Surf[2]
Floor	0.25	0.21	0.21	GRDF0004:Surf[0]
Roof	0.25	0.15	0.15	1STF0020:Surf[0]
Windows***, roof windows, and rooflights	2.2	1.51	1.57	3RDF0005:Surf[0]
Personnel doors	2.2	1.51	1.51	GRDF0015:Surf[1]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a-Limit}$ = Limiting area-weighted average U-values [W/(m²K)]

U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]

U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]

* There might be more than one surface where the maximum U-value occurs.

** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

*** Display windows and similar glazing are excluded from the U-value check.

N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	6

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	6213.3	6213.3
External area [m²]	10263.7	10263.7
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	6	5
Average conductance [W/K]	2954.8	3030.56
Average U-value [W/m²K]	0.29	0.3
Alpha value* [%]	10.12	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
96	**B1 Offices and Workshop businesses**
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Inst.: Hospitals and Care Homes
	C2 Residential Inst.: Residential schools
	C2 Residential Inst.: Universities and colleges
	C2A Secure Residential Inst.
4	**Residential spaces**
	D1 Non-residential Inst.: Community/Day Centre
	D1 Non-residential Inst.: Libraries, Museums, and Galleries
	D1 Non-residential Inst.: Education
	D1 Non-residential Inst.: Primary Health Care Building
	D1 Non-residential Inst.: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others - Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	27.41	23.44
Cooling	2.15	0.73
Auxiliary	25.74	11.91
Lighting	13.84	16.45
Hot water	10.18	2.6
Equipment*	34.86	34.86
TOTAL**	**79.32**	**55.13**

* Energy used by equipment does not count towards the total for calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0.3	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Indicative Target
Heating + cooling demand [MJ/m²]	93.2	79.27
Primary energy* [kWh/m²]	163.93	111.54
Total emissions [kg/m²]	29.5	20.3

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

Belway House_revised model_2013_08_09

UK Part L2 Building Energy Performance and CO_2 emissions

Report created 09/Aug/2013

INTEGRATED ENVIRONMENTAL SOLUTIONS LTD

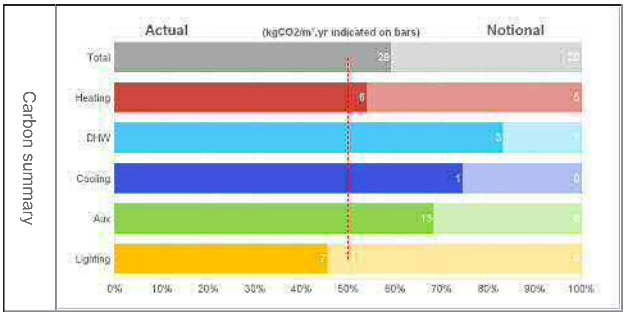
Project detail

Building type:	NCM OfficeOrWorkshop (Office)	No of Rooms:	109
Climate:	London	Total building floor area:	7,404.26 m^2
Air permeability:	6.0 m^3 / m^2.hr @ 50Pa	Actual conditioned floor area:	6,213.34 m^2
Assessor:	Nathan Williams Crofton Design	Notional conditional floor area:	6,213.34 m^2

Part L2 (2010) England / Wales results

BER:	**29.5** kg.CO_2/m^2.yr	✗ **Fail**	Management feature (power factor):	1.000
TER:	**20.3** kg.CO_2/m^2.yr			

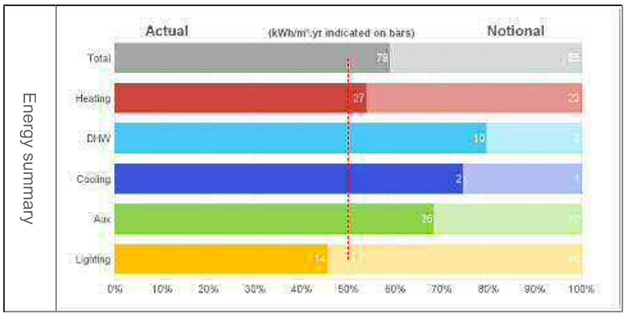
Carbon summary (kgCO_2/m^2.yr)



kgCO_2/m^2.yr	Actual	Notional
Heating	5.51	4.69
DHW	2.56	0.51
Cooling	1.11	0.38
Aux	13.31	6.16
Lighting	7.15	8.51
Renewables	(-0.16)	(0.00)
Total	**29.48**	**20.25**

Results represent total CO_2 output. BER rating includes applicable adjustment factors.

Energy summary (kWh/m^2.yr)



kWh/m^2.yr	Actual	Notional
Heating	27.41	23.44
DHW	10.18	2.60
Cooling	2.15	0.73
Aux	25.74	11.91
Lighting	13.84	16.45
Renewables	(-0.30)	(0.00)
Total	**79.02**	**55.13**

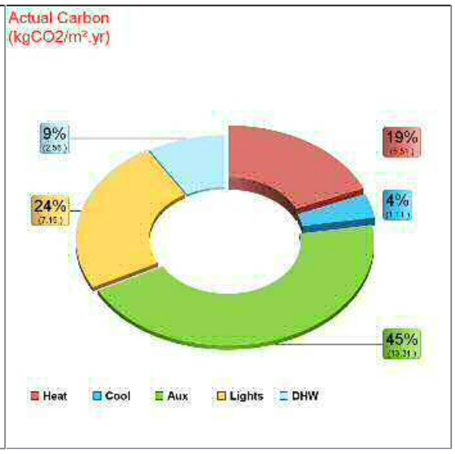
Actual building - carbon breakdown ($kgCO_2/m^2.yr$) *Conditioned area: 6,213 m^2*

Carbon breakdown

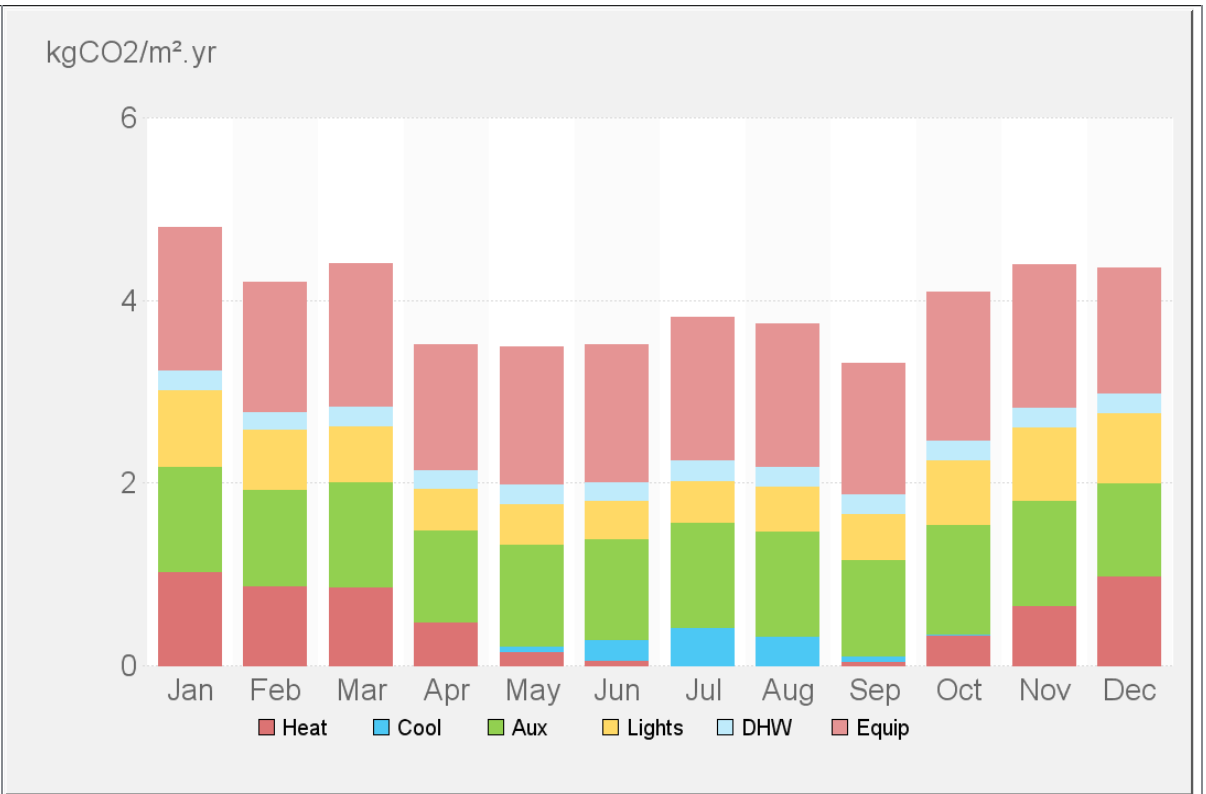
$kgCO_2/m^2$.yr	Heat	Cool	Aux	Lights	DHW	Renew - ables	Equip*
Jan	1.04	0.00	1.15	0.83	0.22	0.00	1.56
Feb	0.88	0.00	1.05	0.66	0.20	-0.01	1.42
Mar	0.86	0.00	1.15	0.61	0.22	-0.01	1.56
Apr	0.48	0.00	1.01	0.45	0.21	-0.02	1.37
May	0.16	0.06	1.11	0.45	0.22	-0.02	1.50
Jun	0.05	0.24	1.10	0.41	0.21	-0.03	1.49
Jul	0.00	0.42	1.15	0.46	0.22	-0.02	1.56
Aug	0.01	0.32	1.15	0.48	0.22	-0.02	1.56
Sep	0.04	0.06	1.06	0.51	0.21	-0.01	1.43
Oct	0.34	0.00	1.20	0.71	0.22	-0.01	1.62
Nov	0.66	0.00	1.15	0.81	0.21	0.00	1.56
Dec	0.99	0.00	1.01	0.77	0.21	0.00	1.38
Total	**5.51**	**1.11**	**13.31**	**7.15**	**2.56**	**-0.16**	**18.02**

*-Equipment excluded when producing rating

Carbon breakdown



Carbon breakdown



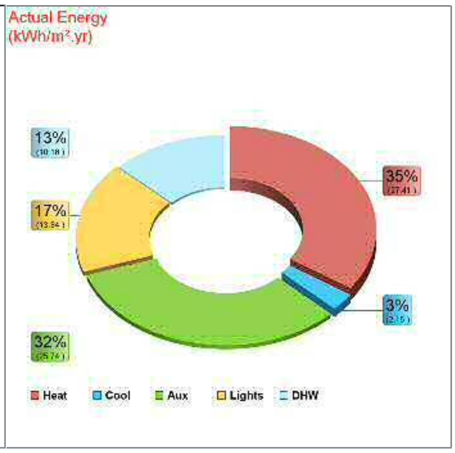
Actual building - energy breakdown (kWh/m^2.yr) *Conditioned area: 6,213 m^2*

Energy breakdown

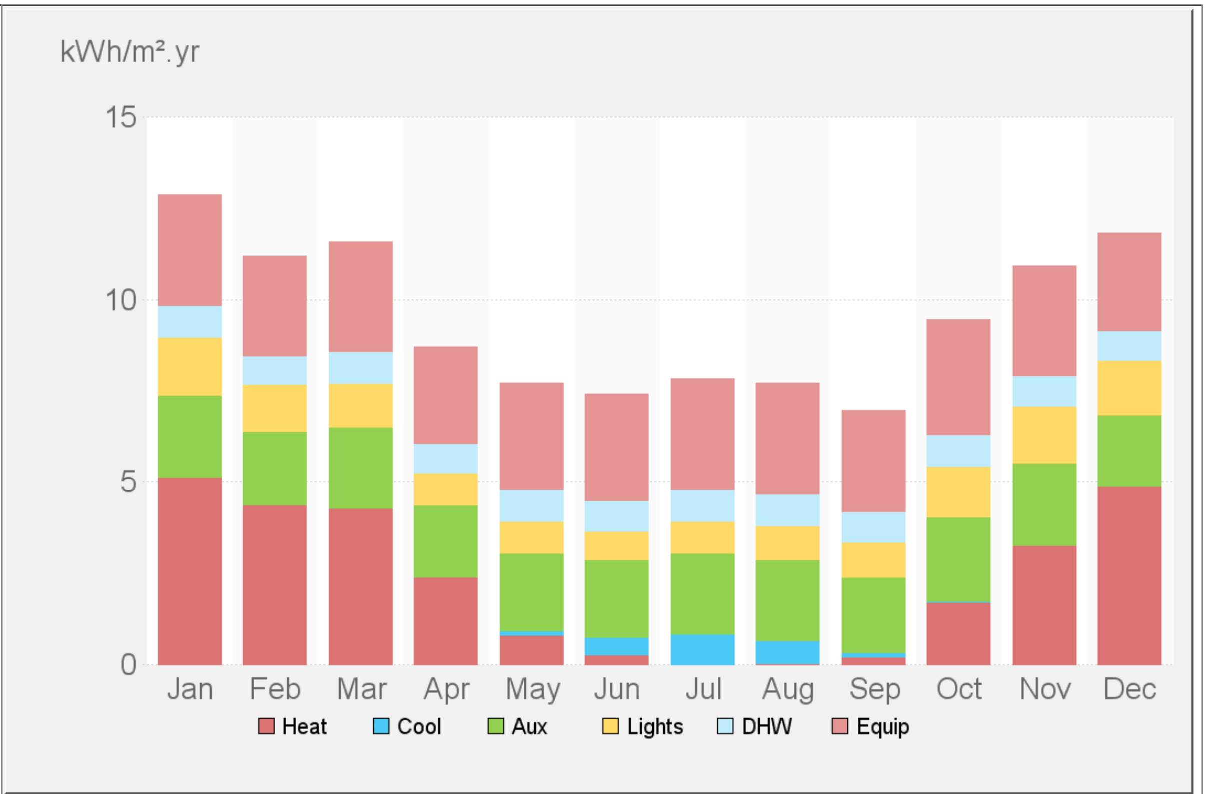
kWh/m^2.yr	Heat	Cool	Aux	Lights	DHW	Renew - ables	Equip*
Jan	5.13	0.00	2.23	1.61	0.87	-0.01	3.02
Feb	4.37	0.00	2.03	1.27	0.79	-0.01	2.74
Mar	4.28	0.00	2.23	1.19	0.87	-0.02	3.02
Apr	2.40	0.01	1.95	0.87	0.82	-0.03	2.65
May	0.82	0.12	2.14	0.87	0.86	-0.04	2.90
Jun	0.28	0.46	2.13	0.80	0.84	-0.05	2.89
Jul	0.01	0.82	2.23	0.88	0.87	-0.05	3.02
Aug	0.03	0.62	2.23	0.94	0.87	-0.04	3.02
Sep	0.22	0.12	2.04	0.99	0.83	-0.03	2.77
Oct	1.72	0.01	2.32	1.37	0.88	-0.02	3.14
Nov	3.28	0.00	2.22	1.57	0.85	-0.01	3.01
Dec	4.88	0.00	1.96	1.49	0.84	0.00	2.67
Total	**27.41**	**2.15**	**25.74**	**13.84**	**10.18**	**-0.30**	**34.86**

*-Equipment excluded when producing rating

Energy breakdown



Energy breakdown



Appendix C : Renewable Technologies

Appendix C : Renewable Technologies

1. Solar Photovoltaic Panels

Solar photovoltaic (PV) cells transform the photons within sunlight into useful electrical energy. They are made from semi-conductor material and can be integrated into the fabric of the building, as a roof covering or as glazing, or simply mounted on the building.

To achieve optimum electrical generation throughout the year, the PV arrays should be approximately south facing and inclined at an angle of 35º to the horizontal. However, should planning restrictions prohibit this due to the visual impact, or the system selected directly replaces a roofing element, the PV system can be laid flat. This results in a reduction in the efficiency of the system. The specific risks and constraints for Solar Photovoltaic Panels are:

- Lifetime of 25 years.
- Will not supply constant electrical energy for the building therefore a back up electrical supply is required from the grid.
- Solar Photovoltaic Panels are an expensive investment but are a more traditional renewable energy technology which is visible.
- There is a risk that if there is not enough sunlight or they are shaded by other buildings that they may not generate the anticipated energy outputs.
- Requires a south facing elevation to operate at optimum output.
- PV systems require little maintenance. Regular inspection of the PV arrays for damage or dirt and annual servicing of inverters (power conditioners) and electric controls is required.

They can be used to supply the electricity needed to run external services for instance lighting to car parking areas or signage or small scale machines such as pay stations to pay and display parking areas.

Energy payback periods for PV systems can be shown to be relatively short at between two to five years whilst the life of the system is in excess of 25 years. Financial payback periods are now a complex calculation however PV systems are usually substantially more expensive to install than other forms of renewable electricity generation.

A typical 1 KWp PV array would include a panel area of around 8 m^2 but require up to double this area of roof for mounting them inclined and south facing without creating overshadowing. In the UK climate this could be expected to provide an energy contribution of around 900 kWh per annum. As a guide to capital expenditure this system would cost in the region of £ 3,600 to supply but cost is dependent on a number of factors.

Current government policy is to encourage small scale generation via PV technology using a “Feed in Tariff”. Payments made under this system are intended to ensure energy generation whether used on site or fed back into the national grid will provide a reasonable financial return. The financial case for PV systems may require a whole of life assessment to consider the overall position.

Appendix C : Renewable Technologies

2. Solar Thermal Collectors

A solar thermal collector system provides hot water by using the energy present in sunlight to heat a collector. This energy is then transferred to a circulating fluid and used to heat hot water. A large twin coil hot water cylinder will be required with around 170 litres capacity for an average house.

Solar thermal collectors generate the highest volume of hot water in the summer months, due to the longer daylight hours and more intense insolation. They can generate between 40 % and 60 % of annual domestic hot water needs when incorporated to a south facing inclined roof of a typical house. The inclusion of solar thermal collector systems to meet part of the hot water requirements does not obviate the need for another hot water generating system, since the winter hot water demand will only be partially met by the solar thermal collectors.

There are two main types of solar thermal collector. The lowest cost type, flat plate collectors, must be mounted at 35° to the horizontal, within 45 degrees of south and these are usually on roof mounted A frames. This type of collector produces around 300 kWh/m^2/year in the UK.

A vacuum tube system can be mounted on any surface with a south facing aspect, including walls, although they will operate at a lower efficiency when vertically mounted. These collectors are more efficient than the flat plate type typically producing up to 450 kWh/m^2/year for small systems and in excess of 600 kWh/m^2/year for large scale systems orientated approximately south facing and inclined at an angle of 35° to the horizontal. However, they tend to have a significantly reduced collector area to gross area ratio and so can be expected to give in the region of 400 – 500 kWh/m^2 of gross area per year. The specific risks and constraints for Solar Thermal Panels are:

- Lifetime of 25 years
- Can deliver up to 60% of domestic house annual hot water needs, but in winter months will require back up boiler to supplement the hot water generation system
- An expensive investment but well known and reliable where properly installed.
- There is a risk that if there is not enough light or that the panels are shaded by other buildings etc. that they may not produce the anticipated energy outputs.
- Requires a south facing elevation to operate at optimum output.
- Requires compatible hot water cylinder.
- Require little maintenance. Regular inspection and servicing are required including checks to the collector glazing for damage or dirt, electric controls and temperature sensors, and the pump sets. This maintenance is over and above maintenance required to the standard water heating installation.

The use of solar thermal technologies would compete with any proposals to supply hot water and/or space heating via a district wide system. It is therefore unlikely to prove beneficial to incorporate this technology into any residential units or buildings where a district system is available. However solar thermal technology is practicable should this be used in isolation on individual buildings.

Appendix C : Renewable Technologies

Current government policy is to encourage small scale generation via solar collectors using the " Renewable Heat Incentive". Phase One of this scheme was launched late in November 2011 and is intended to impact upon larger scale schemes. Phase two is intended to impact upon smaller scale schemes including the domestic market but will not be in place until Summer 2013.

Through this system the energy generated would provide a revenue which is intended to allow a reasonable financial return on capital investment. Details of the scheme continue to be under review however and therefore the revenue on new systems is subject to confirmation.

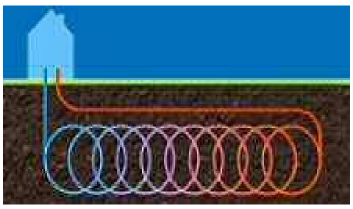
3. Ground Source Heat Pumps

GSHPs upgrade low value energy in the ground using the natural ground temperature which is typically at 10°C below 10m depth. Through the use of an electrical pump a fluid is moved through the ground and using a vapour compression refrigeration cycle the heat in the ground can be used to provide heating at 40 - 45°C in the winter months and cooling at 6 - 9°C in the summer months.

There are two main types of ground source heat pump system, open loop and closed loop. Open loop systems or Aquifer Thermal Storage systems rely on the temperature of ground water, or water contained within wells. The presence of an aquifer or well is therefore essential and an abstraction licence would be required from the Environment Agency to utilise such a system. A detailed study of the groundwater regime and hydrology at the site location would be required to determine whether such a system is feasible for a particular development.

Closed loop systems may be vertical or horizontal in configuration and where vertical in configuration can comprise of dedicated boreholes, energy piles, or a combination of both. A dedicated borehole is a borehole which is used purely for a ground source heat pump system. An energy pile is where a structural pile is additionally utilised to accommodate pipework for a ground source heat pump system. Energy pile systems are more complex in construction terms and less efficient since structural piles are usually buried to a shallower depth, typically only 20 – 35 m deep, and heat cannot as easily be dissipated through the concrete, however, they may be more cost effective than dedicated boreholes and do not require additional land to locate.

In a vertical closed loop ground source heat pump system, a water based solution is pumped through vertical U-loop pipes drilled approximately 110 m in the ground. Horizontal loop configurations are available but as these are used at shallow depth their use is restricted to buildings with large open areas in close proximity.



The output of closed loop systems is much dependent on the hydrogeology of the ground in which they are sunk. Generally however, where practicable, the efficiency or coefficient of performance (CoP) of a dedicated loop GSHP is approximately 350 – 400 % hence for every unit of electrical input there will be approximately 3.5 - 4 units of heat output. For cooling the CoP can be expected to be around 5. This compares with 2.8 for a vapour compression chiller. The relative advantages and disadvantages of a GSHP are outlined in the table below.

GSHP systems are supported by the Renewable Heat Incentive, which is intended to encourage their development by providing an additional revenue stream to support the financial viability of the systems. Phase one of this subsidy scheme was launched late in November 2011, with a second phase of the RHI to be rolled out later this year 2013. The details of the second phase are subject to final confirmation.

Advantages	Disadvantages
▪ Long operational life	▪ Performance dependent on the location's ground conditions
▪ Lower capital cost if energy piles are utilised, but with lower efficiencies.	▪ High capital cost if dedicated systems
▪ Ability to provide heating and cooling	▪ Large land take required to locate boreholes if dedicated systems used
▪ Suited to provide under floor heating due to low temperature output (or large radiators)	▪ Requires additional peak supply system
▪ Low maintenance requirement	▪ Slow start up, not amenable to rapid heating

4. Air Source Heat Pumps

Air Source Heat Pumps utilise low grade natural ambient heat and upgrade it to useful heat energy. They take in air at the ambient temperature and cool it down via a heat pump evaporator and the energy extracted can be used to heat air or water. ASHPs can heat hot water effectively at high outdoor temperatures and give an effective output to the heating system at low outdoor temperatures. Modern ASHPs can provide heating even when the outside temperature is well below freezing although as the outside air temperature drops, the efficiency of the system decreases, just as the requirement for space heating increases.

The heat pump includes an outside module and an advanced control system for optimal control. This is started by a signal from another controller, return line sensor or thermostat. Although the majority of the energy supplied is renewable, being extracted from the environment and replenished by the sun, as with GSHPs they do require electrical input to power the pumping component of the process. The efficiency or coefficient of performance (CoP) of the system is usually around 3.5 i.e. for each 1 kW of electrical energy input, 3.5kW of useful heat is obtained.

Like other heat pump technologies ASHPs work with the highest efficiency when the delivered temperature is as close to the ambient temperature as possible. For this reason they work best with warm air heating, under floor heating or large area radiators.

A good ASHP should be almost silent in operation. However these should be carefully sited to avoid noise nuisance to building occupiers and neighbours. A typical domestic module is 1200 mm in width, 500 mm in depth and 1100 mm in height. They require a clearance of 300 mm at the back of the unit and 1000 mm at the front of the unit. As well as the air pump itself a twin coil hot water cylinder is required along with associated controls and ancillaries.

Regular inspection and servicing are required including checks to the refrigerant levels electric controls, temperature sensors, and the pump sets. The specific risks and constraints for the ASHP are:

- Life time is around 15 years.
- Spatial requirements may result in smaller accommodation for user.
- Maintenance requirements can be onerous compared to other renewable technologies.
- Siting of ASHP to be outdoors and away from windows of occupied units.
- Outside units could be vulnerable to vandalism.

The use of ASHP technology would compete with any proposals to supply hot water and/or space heating via a district wide heating system. It is therefore unlikely to prove beneficial to incorporate this technology into any residential units or buildings where a district system is available. However ASHP technology may prove practicable should this be used in isolation on individual buildings.

Current government policy is to encourage small scale generation via other technologies, but ASHPs are under review and may be included in the second phase of the RHI now due for implementation in Summer 2013. Through this system any energy generated may provide a revenue which allows a reasonable financial return on capital investment.

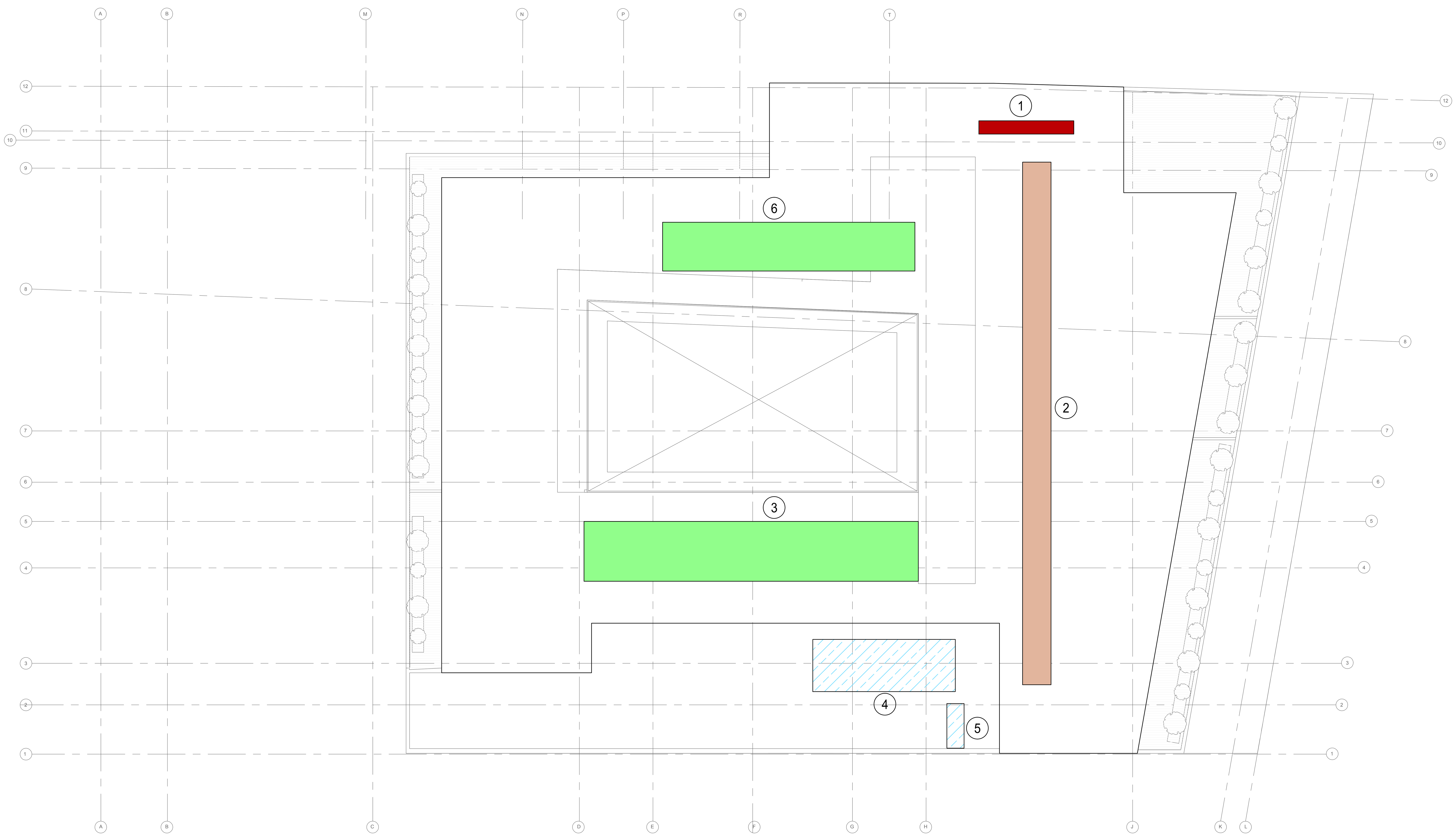
Appendix D : Proposed Roof Plan

RISER / PLANT KEY

- MECHANICAL SERVICES
- ELECTRICAL & COMMS SERVICES
- PUBLIC HEALTH SERVICES
- FIRE SERVICES
- FUTURE TENANT SPACE

INDICATIVE SERVICE DISTRIBUTION

- VENTILATION SUPPLY DUCTWORK ROUTE
- VENTILATION EXTRACT DUCTWORK ROUTE
- TOILET/BIN EXTRACT DUCTWORK ROUTE
- PUBLIC HEALTH DRAINAGE ROUTE
- DOMESTIC WATER DISTRIBUTION ROUTE
- ELECTRICAL DISTRIBUTION ROUTE
- FIRE DISTRIBUTION ROUTE
- COMMS DISTRIBUTION ROUTE
- GAS DISTRIBUTION ROUTE
- CONDENSER WATER PIPE DISTRIBUTION ROUTE



DESCRIPTION

1. FIRE FIGHTING STAIR PRESSURISATION FAN SYSTEM (4m x 1m x 1m HIGH)
2. RESIDENTIAL SOLAR HOT WATER PANELS CONSISTING OF 2 No. PANELS PER APARTMENT
3. PHOTOVOLTAIC PANELS SERVING RESIDENTIAL APARTMENTS SUPPLIES
4. OUTLINE OF COOLING TOWER ON LEVEL 5 PLANT DECK BELOW. COOLING TOWER TO BE 4m HIGH FROM LEVEL 5 PLANT DECK BELOW
5. BOILER FLUES TO EXTEND 1m ABOVE ROOF LEVEL
6. PHOTOVOLTAIC PANELS SERVING LANDLORDS SUPPLIES

Rev.	Description	Date	Rev.	Description	Date	Rev.	Description	Date
P01	STAGE C ISSUE	21.06.13						
P02	PLANNING ISSUE	12.08.13						

A1 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 When reproduced at correct scale this line measures 150mm

NDY QA SYSTEM
REASON FOR ISSUE
STAGE C
AUTHORISATION
By: DT : 12 Aug 2013
VERIFICATION OF LATEST AMENDMENT
By: RP : 12 Aug 2013

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This drawing is diagrammatic and shows the general arrangement of equipment. Any information involving measurement of the works shall be taken from architectural and structural drawings, workshop drawings by others and conditions at the site. The works shall comply with the contract conditions and Statutory Regulations.

Project. BEWLAY HOUSE

Title. COMBINED SERVICES ROOF LEVEL

Scale.	Date.	Drawn.	Designed.	Project No.
1:100 @ A1	JUN 2013	CD	RP	u13357-001A

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Set Of

Cad No. P02

Drawing No. CS-0R-001 P02