De Metz Forbes Knight Architects

44 Westbere Road
Camden, London NW2

Sustainability Statement

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Report Name	Sustainability Statement	1010898

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-	11/12/2014	Issued for comments
A	11/12/2014	Revised to incorporate architects comments
B	03/06/2015	Number of small amendments made as per e-mail from DMFK

Document Validation (latest issue)

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-	3/06/2015	Issued for comments			
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		Name	RB	CT	
		Signature			

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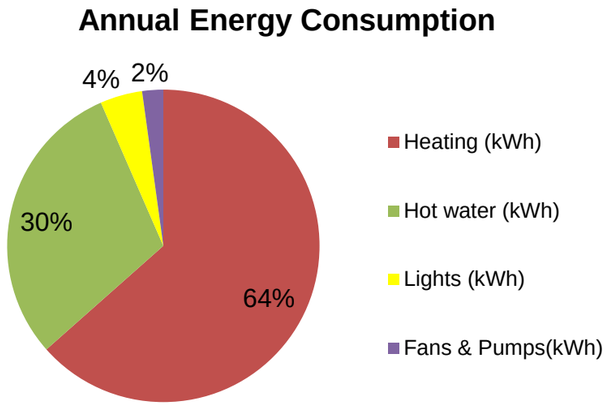


Figure 1.01 - Annual Energy Consumption

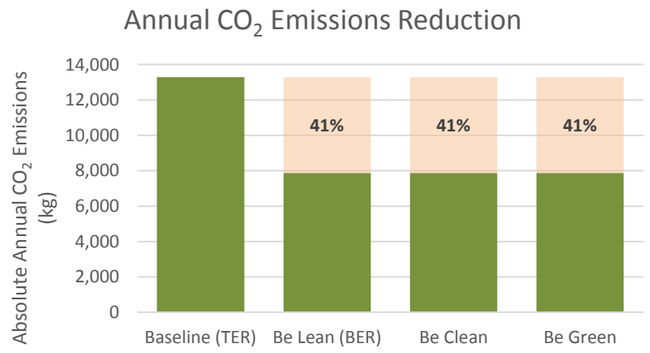


Figure 1.0.2 – Estimated Annual Energy Consumption

	kg CO_2 pa	kgCO2/m2	Reduction	Cumulative % Reduction
Baseline (TER)	13286	46.1		-
Be Lean (BER)	7877	27	5409	41%
Be Clean	7877	27.4	5409	41%
Be Green	7877	27.4	5409	41%

Figure 1.0.3 - Annual CO_2 Emissions

1. Executive Summary

Low environmental impact will be an essential feature of the design of the proposed 44 Westbere Road development. This Statement outlines the development's approach to sustainability, energy efficiency and renewable energy strategies in order to meet the targets set out in the guidance from Camden Borough Council.

The planning application proposals at 44 Westbere Road are to increase the existing unit into a total of four units, comprising of one, two and three bedrooms.

To demonstrate the wider sustainability of the scheme, the Building Research Establishment's assessment methodologies have been applied to the proposed redevelopment. The BREEAM Domestic Refurbishment scheme was recently introduced by the BRE and replaces Ecohomes. It considers the broad environmental concerns of climate change, pollution, impact on occupants and the wider community.

A preliminary assessment has been conducted for the development, showing how the 'Very Good' standard can be achieved. The key sustainable features identified for the redevelopment and included in the preliminary BREEAM assessment are:

- passive design measures and efficient systems will reduce the development's energy consumption rates
- thermal insulation and air tightness levels will be improved beyond the Building Regulation standards
- the dwellings will be naturally ventilated, reducing the need for comfort cooling and mechanical systems
- natural day lighting will improve occupancy comfort and reduce the requirement for lighting
- The London heat map indicates that there is currently no opportunities for connection to an existing or proposed district heating network
- the limited size of the development thermal load and the mismatch with its electrical profile suggest that CHP is not viable for this development
- an extensive range of low and zero carbon technologies have been considered in terms of providing a proportion of the development's energy demand. The results indicated that for planning and operational reasons, none of the investigated technologies are viable for meet a proportion of the building's energy demands.
- the combination of proposed energy efficient measures result in a reduction in CO_2 emission of 41%
- all timber used on site will be purchased from responsible sources such as FSC approved vendors
- materials selection to take into account their overall environmental impacts. Achieving "A" ratings from the BRE Green Guide to Specification, where possible.
- recycling facilities will be provided for all occupants to reduce waste during operation
- water use will be minimised by the specification of efficient taps, shower heads, dual flush toilets and low water use appliances
- water metering will be installed to identify consumption and reduce wastage
- all construction on site will be managed in an environmentally sound manner in terms of resource use, storage, waste management, and potential sources of nuisance or pollution
- cycling will be encouraged by providing dedicated cycle storage spaces for residents.

Figure 2.0.1. – Existing Building

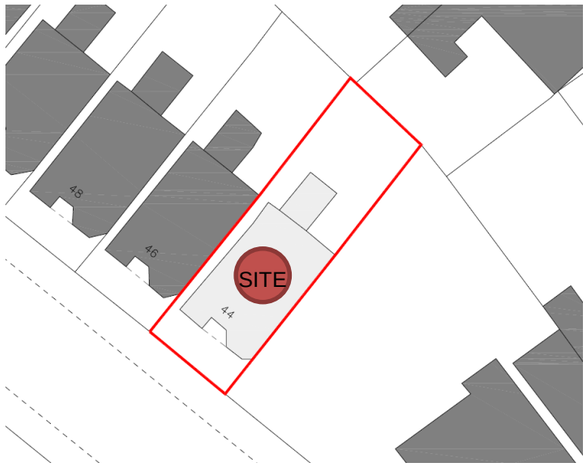


Figure 2.0.2. – Proposed Site Location

2. Introduction

This Sustainability Statement has been prepared in support of the planning application for the proposed residential redevelopment at 44 Westbere Road, London, NW2. It aims to meet the energy and climate change requirements of the London Borough of Camden and the Greater London Authority.

The format of the statement is intended to reflect and respond to the issues raised in the GLA's 'Spatial Development Strategy for Greater London' - the 'London Plan'.

The principal objectives are to reduce the site's contribution to the causes of climate change by minimising the emissions of CO_2, by reducing the site's needs for energy and providing some of the requirement by renewable/sustainable means. Issues such as water, waste, biodiversity, etc. have also been addressed in the study.

To guide and benchmark this process, the Building Research Establishment's BREEAM Domestic Refurbishment methodology has also been used to assess the development. A preliminary assessment indicating that as a minimum a "Very Good" rating will be achieved (see appendix B). BREEAM considers the broad environmental concerns of climate change, pollution, impact on residents and the wider community. It balances these with the need for high-quality, safe and healthy internal living and working environment. These standards go beyond the requirements of the Building Regulations.

This Sustainability Statement forms a checklist of the sustainable initiatives considered for the proposed development. Each of the proposed initiatives is assessed on the relative sustainability potential, in addition to a "rule of thumb" financial/pay back implication, and suitability to this particular site.

2.1 Outline Description of Development

The proposals for the redevelopment of Westbere Road involve changing the existing house into four new residential flats.

The site is located in central London within close proximity to the local shops and tube stations. The development is to provide a number of one and two bedroom apartments.

The accommodation schedule has been used as the basis for the energy assessment:

UNITS	Beds	People	NIA (m^2)
Flat 1	3	5	109
Flat 2	1	3	61
Flat 3	1	1	37
Flat 4	1	2	51
TOTAL	**6**	**11**	**258**

3. Planning Policy

The National Planning Policy Framework (NPPF) was published in March 2012, which states a clear presumption in favour of sustainable development. The NPPF supports the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change, and encourage the reuse of existing resources, including conversion of existing buildings, and encourages the use of renewable resources.

The NPPF replaces PPS22 and in Section 10 outlines its energy and climate change policies. To support the move to a low carbon future, local planning authorities should:

- Plan for new development in locations and ways which reduce greenhouse gas emissions;
- Actively support energy efficiency improvements to existing buildings; and
- When setting any local requirement for a building's sustainability, do so in a way consistent with the Government's zero carbon buildings policy and adopt nationally described standards.

In determining planning applications, local planning authorities should expect new developments to:

- comply with adopted Local Plan policies on local requirements for decentralised energy supply unless it can be demonstrated that this is not feasible or viable; and
- take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption;
- have a positive strategy to promote energy from renewable and low carbon sources;
- identify opportunities where development can draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.

The key focus of the NPPF is to support local and regional planning authorities.

3.1 The London Plan

London Plan policy 5.2 requires that major developments meet carbon dioxide emissions reduction. Up to 2016 this emissions reduction is 35% against Part L Building Regulations. Where evidence demonstrates that this target cannot be achieved on-site, the policy allows for any shortfall to be provided off-site or through a cash in lieu contribution. Contributions to the borough will secure the delivery of carbon dioxide savings elsewhere in the borough.

The Mayor's Sustainable Design and Construction SPD states that boroughs should develop and publish a price for carbon dioxide based on either: a nationally recognised carbon dioxide pricing mechanism; or the cost of reducing off-setting carbon dioxide emissions across the borough.

The key requirements of the London Plan (2011) for new developments are:

Policy 5.2 - requires that major developments achieve a 35% improvement over the 2013 Building Regulation CO_2 Emission Target

Policy 5.6 - requires all major developments to evaluate the feasibility of connecting to existing or proposed district heating networks and where no opportunity existing consider a site wide Combined Heat and Power (CHP) systems.

Policy 5.7 - requires that all major developments seek to reduce their CO_2 emissions by at least 20% through the use of onsite renewable energy generation wherever feasible.

3.2 London borough of Camden

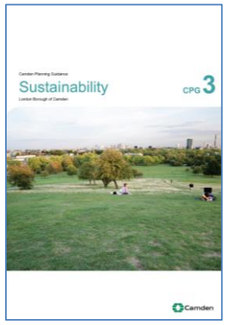
Camden Planning Guidance 3 Sustainability, states that where the London Plan carbon reduction target cannot be met on-site, they may accept the provision of measures elsewhere in the borough or a financial contribution which will be used to secure the delivery of carbon reduction measures elsewhere in the borough.

Camden Council's planning guidance addresses sustainable development through a number of policies. These policies coincide with the areas addressed through the BREEAM benchmarking process, which will be discussed in subsequent sections. The relevant Camden Council policies are:

- CS13 – Tackling climate change through promoting higher environmental standards
- DP22 – Promoting sustainable design and construction
- DP23 – Water

Promote low- and zero-carbon energy generation through:

- Safeguarding existing renewable energy decentralised energy systems.
- Implementing a network of decentralised heat and energy facilities that connect into a heat and power network.
- Promoting the development of new decentralised energy facilities that have the potential to link into a wider sub-regional network.
- Exploring the use of waste-to-energy facilities, particularly in the east of the borough, to support the borough's waste management and recycling targets.
- Working with partners inside and outside the borough to explore ways of implementing decentralised energy systems.
- Supporting development that uses intelligent design to make use of renewable-energy technologies.



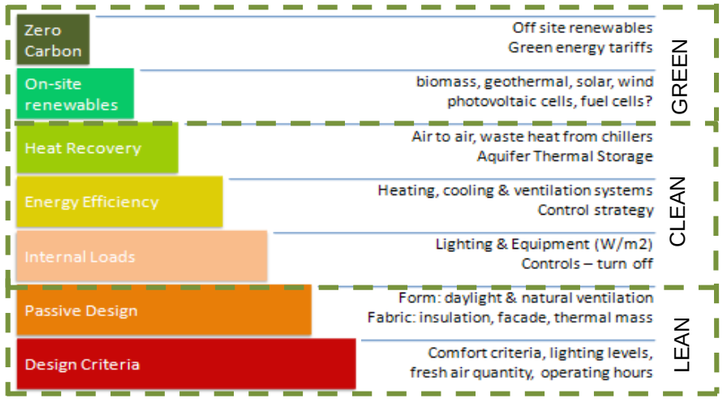


Figure 4.0.1 – Cundall's "Steps to low carbon"

4. Energy Strategy

The designs of the proposed dwellings have been developed to reduce their annual energy consumption, whilst providing energy in the most environmentally friendly way to reduce their annual CO_2 footprints. In order to achieve this, Cundall's "Steps to low carbon" methodology has been applied.

4.1 Passive Design

Substantial reductions in energy usage for the scheme have been achieved through consideration of the passive elements of the design, together with improved occupancy comfort. The aim for the design of the proposed development is to optimise the passive building elements, where practical and hence reduce the energy consumption associated with the mechanical systems, whilst maintaining a balance between a range of requirements and accounting for factors such as site constraints and acoustic considerations.

4.1.1 Building Envelope

As the existing building is being converted into a number of new dwellings, the existing facades will be thermally enhanced where possible. New internal dry lining to the external walls, increased insulation levels in the roofs and floors and new energy efficient windows will be considered.

All enhanced and new thermal elements will therefore be specified to achieve the following area weighted U-values to reduce the heat losses though the building's fabric:

Detail	Design	Base case
Ground floor average U-value	0.22W/m^2K	0.60W/m^2K
External wall average U-value	0.28W/m^2K	1.00W/m^2K
Roof average U-value	0.18W/m^2K	1.00W/m^2K
Window U-value (including frame)	1.80W/m^2K	5.60W/m^2K
Glazing total solar transmission	60%	60%
Y-value	0.15	0.15
Air permeability @ 50 Pascals	7.0m^3/hr/m^2	15.0m^3/hr/m^2

4.1.2 Accredited Construction Details

All new architectural details will ideally be assessed with their thermal bridging Ψ values calculated. Where this is not possible, all architectural details should be in accordance with the enhanced construction details listed on the Energy Trust's website or as an absolute minimum as per the requirements of Accredited Construction Details document.

Accredited Construction Details (ACD's) have been developed to assist the construction industry to comply with the performance standards in Part L of the Building Regulations. They focus on issues concerning insulation continuity and airtightness and suggest a common approach to design, construction and testing methodology, and general improvements of the process.

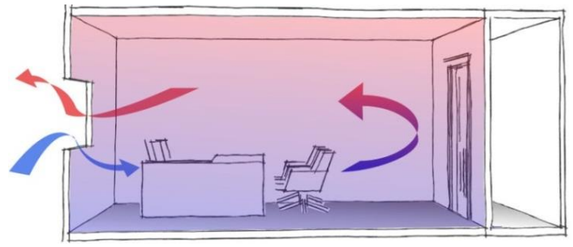
4.1.3 Air Permeability

Although not required by the regulations an air pressure test will be carried out on the new dwellings in order to determine their air leakage rates and any remedial actions taken to improve it. An air leakage rate of 7m^3/hr/m^2 at 50Pa will be targeted for the development in comparison with the Building Regulation minimum standards for new dwellings of 10m^3/hr/m^2 at 50Pa.

Good air tightness will be achieved by prefabrication of a number of key building components under factory conditions, robust detailing of junctions, good building practices on site and making good of any existing details.

4.1.4 Ventilation

The new dwellings will be naturally ventilated via the existing window openings. By providing fresh air all year around, this will mitigate heat gains in summer, save energy related to fans and pumps that would otherwise be required, and removes the associated annual CO_2 emissions.



4.2 Energy Efficient Systems & Appliances

After assessing the contribution of the passive elements to the overall energy balance, the aim is to further reduce CO_2 emissions by selecting efficient mechanical and electrical systems and efficient controls to manage the energy used during operation. On the basis of good practice the following principles will be adopted throughout the proposed development where possible:

4.2.1 Eco-Labelled Goods

As lights and appliances account for about a third of the CO_2 emissions in dwellings, where domestic appliances are installed energy efficient units will be incorporated, including A and A+ rated appliances.

Above: White goods efficiency rating

4.2.2 Low-Energy Lighting

To reduce the energy consumption associated with artificial lighting, 100% of all internal lighting fittings in each dwelling will be dedicated energy efficient light fittings*:

** Fittings that comprise the lamp, base, control gear, and an appropriate housing, reflector, shade or diffuser. The fitting must be dedicated in that it must be capable of only accepting lamps having a luminous efficacy greater than 40 lumens per circuit Watt. The fixing must be permanently fixed to the ceiling or wall.*

4.2.3 External Lighting

All external lighting within the development will be provided by dedicated energy efficient fittings.

All security light fittings will be designed for energy efficiency and will be adequately controlled such that all burglar security lights have a maximum wattage of 150W, movement detecting control devices (PIR) and daylight cut-off sensors.

4.2.4 HVAC Plant Efficiencies

The design team have exceeded the minimum requirements of the domestic HVAC guide. It provides guidance on the means of complying with the requirements of both Part L1b of the Building Regulations for conventional space heating systems, hot water systems ventilation systems.

4.2.5 Waste Water Heat Recovery

The showers in the development will be specified with waste water heat recovery units that allow a proportion of the heat that is usually lost along with the discharged shower water to be recovered and used to heat the incoming cold mains into the shower inlet. This will be integrated into the shower tray.

Above: Shower water heat recovery

This reduces the amount of hot water produced by the boiler required for each shower, reducing the energy consumption of the hot water boiler.

4.2.6 Energy metering

Metering of the energy uses within the development separately, will help the building users identify areas of increased consumption and highlight potential energy-saving measures for the future, hence reducing the associated annual CO_2 emissions from these systems. All gas and electrical supplies to each dwelling will be metered using smart meters to enable residents and tenant to be responsible for their own consumption and hence CO_2 emissions. There will be a central display area for tenants and utility companies to view the meter readings.

4.3 Estimated Annual Energy Consumption

Individual energy assessments have been carried out on a range of dwelling types to determine their estimated energy consumption and associated CO_2 emissions, using the SAP methodology.

The energy assessments have been carried out for a baseline case with no enhancements to the existing building and the proposed scheme with the aforementioned passive and energy efficient measures. Figure 4.3.1. outline the design parameters used in the base case and proposed models.

The analysis indicates that the proposed dwellings are all performing significantly better than base case and achieving an area weighted improvement for the development of 41% (see Figure 4.3.3).

All SAP calculations have been carried out using the approved software Elmhurst Energy and the Part L1B methodology.

4.3.1 Building Fabric Performance

Detail	Base case	Design
Ground floor average U-value	0.60W/m²K	0.22W/m²K
External wall average U-value	1.00W/m²K	0.28W/m²K
Roof average U-value	1.00W/m²K	0.18W/m²K
Window U-value (including frame)	5.60W/m²K	1.80W/m²K
Glazing total solar transmission	60%	60%
Y-value	0.15	0.15
Air permeability @ 50 Pascals	15.0m³/hr/m²	7.0m³/hr/m²

Figure 4.3.1 – Building Fabric Inputs

4.3.2 Fixed Building Services

Detail	Base case	Design
Heating type	Combi boilers	Combi boilers
Heating fuel	Natural gas	Natural gas
Gross boiler seasonal efficiency	90.00%	90.00%
Boiler compensator	Load	Load
Heat emitters	Radiators	Radiators
Heating system controls	Time, temp. & TRVs	Time, temp. & TRVs
DHW cylinder volume (per flat)	n/a	n/a
Low energy light fittings	none	100%
Hot water daily usage	> 125 l/p/day	< 125 l/p/day

Figure 4.3.2 – Building Services

4.3.3 Area Weighted Results

Area Weighted Results	Base case		Design	
	Absolute	per sqm	Absolute	per sqm
Heating (kWh)	42286	150	22471	79.5
Hot water (kWh)	11410	40	11071	39.2
Lights (kWh)	554	2	1584	5.6
Fans & Pumps(kWh)	808	3	808	2.9
Total Energy (kWh)	562	2	358	1.2
DER (kgCO_2)	46		27	
Improvement (%)			**41%**	

Figure 4.3.3 – Annual CO_2 Emission

4.4 Decentralised Energy Networks

The feasibility of connecting to an existing or proposed district network has been investigated for the site in accordance with Policy 5.6 of the London Plan.

The London Heat Map (www.londonheatmap.org.uk) indicates that there are no existing or proposed district heating networks in or around the site and site is not in an decentralised opportunity area, as shown in the image below (purple oval).

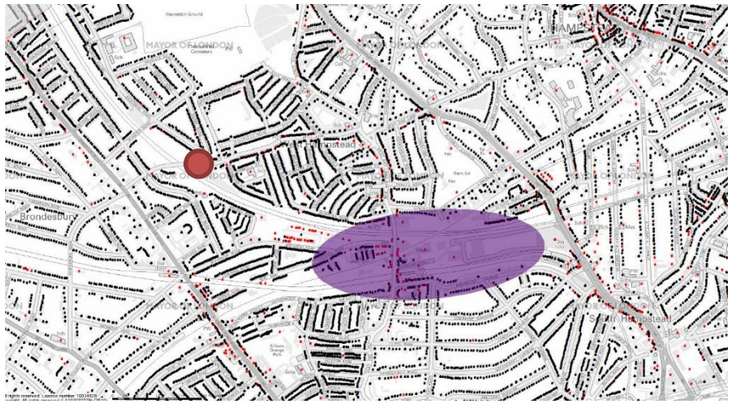


Figure 4.4.1 – London Heat Map of the Surround Areas

	Absolute kgs	Kg per sqm
Baseline CO2 Emissions (kg)	13035	45
Design CO2 Emissions (kg)	7734	27
35% renewables target (kg)	1547	5

4.5 Combined Heat & Power (CHP)

In accordance with the Decentralised Energy Hierarchy in Policy 5.6 the feasibility of a site wide CHP network has been investigated.

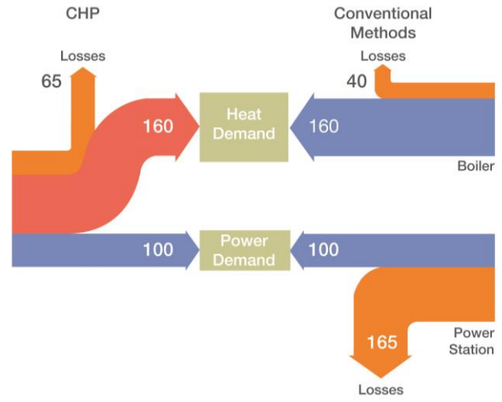


Figure 4.5.1 – CHP Efficiency Diagram

The development's heat load is predominately associated with its heating requirement, with peaks in the morning and evening. Even if substantial hot water cylinders were incorporated into the design to' level out' the peaks in order to increase the operational hours of the system, the base heat load for the 5 dwellings is not sufficient to support the efficient operational of a CHP system.

The building is also in an air quality management zone and the running a CHP will have higher NOx and PM10 particles compared to a gas boiler. Therefore CHP is not considered viable for the proposed development.

4.6 Low and Zero Carbon Energy Sources

Policy 5.7 of the London Plan requires that all major developments seek to reduce their CO_2 emissions by at least 20% through the use of onsite renewable energy generation wherever feasible.

This equates to a 2.5 tonnes target for the development, based on the estimated energy consumption rates and associated CO_2 emissions from the SAP result:

The following technologies have been considered for supplying a proportion of each dwelling's energy demand (a full summary table can be seen in Appendix B). The feasibility of each of the energy sources listed has been assessed with regard to the potential contribution each could make to supply a proportion of the dwelling's delivered energy requirement, whilst considering the technical, planning and financial issues.

4.6.1 Wind Turbines

The output from wind turbines are highly sensitive to wind speed. Hence it is essential that turbines should be sited away from obstructions, with a clear exposure or fetch for the prevailing wind.

In urban environments it is difficult to achieve high wind speeds that would make the operation of turbines viable, unless they are located at a site where there is locally high wind speed or located on the roof of tall buildings, where obstructions and surrounding buildings would not interfere with the wind flow.

The urban location of the site coupled with the adjacent buildings will result in a turbulent flow regime across the site. As such it is not proposed to include wind turbines as part of the development.

4.6.2 Photovoltaics

Photovoltaic solar cells convert solar energy directly into electricity. The cells consist of two layers of silicon with a chemical layer between. The incoming solar energy charges the electrons held within the chemical. The energised electrons move through the cell into a wire creating an electrical current.

The advance of photovoltaic cells is once they are installed they require minimal maintenance over their operational life and have no primary fuel requirements

However, the proposed roof structure has been design to be in keeping with the local styles, which will preclude the use of PV cells given the dorma style windows and other rooflights.

Additionally the building orientation on the site is pre-defined with the front roof facing South-West and is unsuitable for PV collectors as rooflights are currently being proposed. The rear roof faces North-East and as such is not suitable.

4.6.3 Solar Thermal

Solar thermal collectors utilises solar radiation to heat water for use in water heating of a building. The optimum orientation for a solar collector in the UK is a south facing surface, tilted at an angle of 30º from the horizontal.

Solar collectors are typically designed to meet a development's base heat load, associated with its domestic hot water requirements. For residential development these usually equates to 60-70% of the total DHW annual load, with the natural gas-fired boilers meeting the remainder of the load.

However, as previously stated the building orientation makes the inclusion of solar thermal collectors unviable.

4.6.4 Biomass Heating

Although the development's thermal load profile suggests that a biomass boiler could operate as a lead boiler in a modular arrangement with a number of conventional gas-fired boilers and provide a significant reduction in its CO_2 emissions, biomass boilers are not recommended for the proposed development.

Biolyt 50 – 160

The use of biomass would require a single plant room to serve all of the flats and they require significant space for storage and delivery of fuel which generally does not suit an existing building.

They have higher particulate emissions than gas boilers which typically raises concerns with the Environment Planning as central London suffers from poor air quality. Therefore biomass boilers have not be considered feasible for the proposed re-development.

4.6.5 Air Source Heat Pumps (ASHP)

Air source heat pumps exchange heat between the outside air and a building to provide space heating in winter and cooling in the summer months. The efficiency of these systems are inherently linked to the ambient air temperatures. In winter the system is less efficient when ambient air temperatures are lower.

Heat pumps supply more energy than they consume, by extracting heat from their surroundings. Heat pumps can supply as much as 3kW of heat output for just 1kW of electrical energy input. They can also be used to provide cooling, however the development has been design to be natural ventilated in summer negating the requirement for cooling on site.

They are most efficient when they work at lower temperatures, typically around 40ºC. As the output temperature increases above this the efficiency of the system drops off. Therefore, as DHW is required at 60-65ºC, two system would need to be installed if a heat pump system was considered; a conventional LTHW / CHP system for the DHW and either a under floor heating system for space heating or a heating coil on the MVHR which feeds off the heat pumps.

There is insufficient space available to incorporate four separate heating systems with separate hot water generators. Furthermore the system only offers a 3.4% CO_2 emission saving if it achieves a heating seasonal efficiency of 2.5. Recent studies have found that most installations in the UK are only achieving CSoP of 2-3. Hence a ASHP may actually result in an increase in CO_2 emissions and have therefore not been considered any further.

4.6.6 Ground Source Heat Pumps (GSHP)

Ground sourced heat pumps extract heat from the ground and pump it into a building to provide space heating and to pre-heat

domestic hot water. In the summer months this process can be reversed, rejecting heat to the ground, to meet the cooling requirements of a building.

GSHPs relies on the stable temperature of the ground of between 10-14ºC. In winter when the ambient air temperatures are below this ground source heat pumps have higher CoPs then air source heat pumps (as there is more energy in the ground).

GSHP systems can either extract energy through closed loops of pipework buried in the ground or from open loop system using natural aquifers in the ground. For closed loop systems the pipework or ground loop carrying the refrigerant/water can be laid horizontally or vertically.

GSHP systems only really work when there is a reasonably balanced heat and cooling requirement, so as not to heat up or cool down the ground around the piles. As the development has no cooling requirements and it not feasible to install boreholes under an existing building this technology is not considered viable.

4.7 Proposed Energy Strategy

In accordance with the London Borough of Camden's Planning requirements and the GLA's London Plan the following energy strategy has been developed:

Be Lean

The building envelope will be designed to perform significantly better than the Building Regulation standards, with low U-values, accredited construction details and low design air leakage rates the building's space heating load will be significantly reduced.

Be Clean

The London Heat map indicates there is no opportunity to connect to an existing or proposed district heating network, in accordance with Policy 5.6. Additionally the development's base heat load is not sufficient to support the efficient operation of a community CHP system, as there are only 5 dwellings being proposed.

Be Green

An extensive range of low and zero carbon technologies have been considered in terms of providing a proportion of the development's energy demand. The results indicated that for planning and operational reasons, none of the investigated technologies are viable for meet a proportion of the building's energy demands.

Summary

The combination of proposed energy efficient measures result in a reduction in CO_2 emissions of 41%.

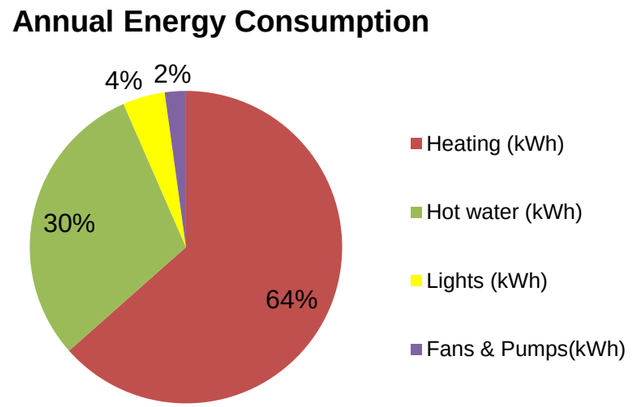
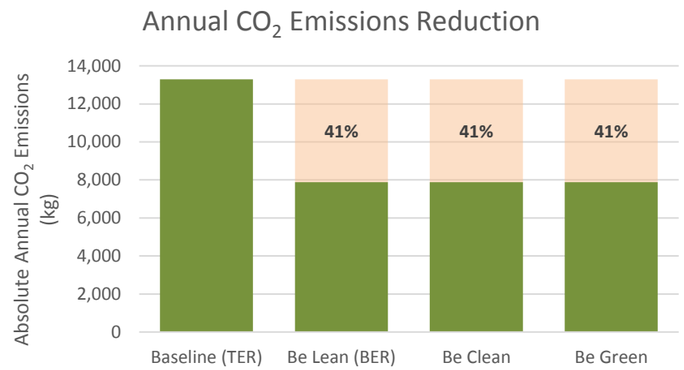


Figure 4.7.1. - Policy 5.2 Annual Energy Consumption



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Be Green	7877	27.4	5409	41%

Figure 4.7.2. - Policy 5.2 The Energy Hierarchy

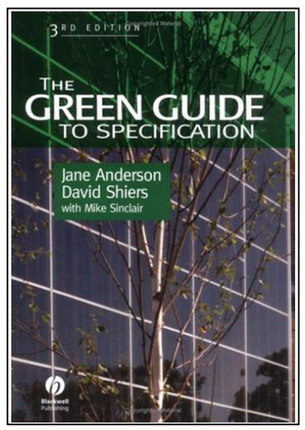
5. Materials

Building and construction activities worldwide consume 3 billion tons of raw material each year, which account for approximately 50% of total global consumption. Using green/sustainable building materials and products promotes conservation of dwindling non-renewable resources. In addition, integrating sustainable building materials into building projects can help reduce the environmental impacts associated with the extraction, transport, processing, fabrication, installation, reuse, recycling, and disposal of these source materials.

The aim for the proposed development will be for its overall environmental impact to be minimised through the specification of sustainable materials and components.

5.1 Environmental Impact of Materials

New materials with low overall environmental impact will be chosen and advice from the Green Guide to Specification will be taken into consideration for the selection.. The Green Guide rates the environmental impact of different materials and components, taking into account factors like toxicity, ozone depletion, ease of recycling, waste disposal etc. Where viable, at least 80% (by area) of the new main elements in the building, fabric & building services insulation should be specified to achieve the best performing “A” and “A+” ratings from the Green Guide.



5.2 Sustainable Timber

All timber used for basic or finishing building elements in the scheme will be sourced from responsibly managed and sustainable forests or plantations. Such timber products are the only truly renewable construction material in common use and growing trees also absorb and fix CO_2. Forests can also provide the habitat for a wide variety of plant and animal life, preserving important ecology and promoting biodiversity.

5.3 Locally Sustainable Materials

A building that is truly sustainable must be constructed using locally sourced, sustainable materials i.e. materials that can be supplied without any adverse effect on the environment. Therefore, where practicable, materials should be sourced from local suppliers, reducing the environment impacts and CO_2 emissions associated with transportation to the site.

5.4 Recycled Materials

The existing building’s structure and part of its façade will be retained and re-used.

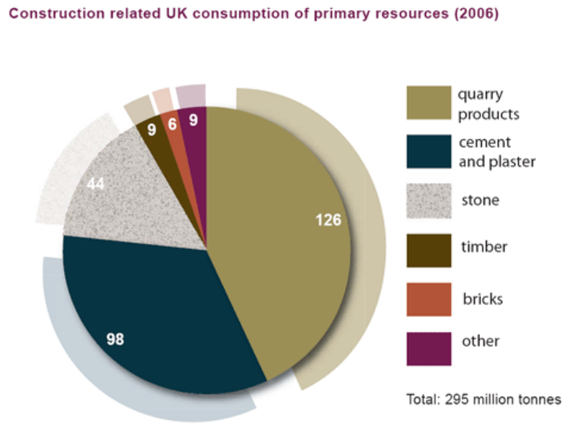
Scope for increased recycling will be incorporated by specifying recycled materials where possible and ensuring that even where new materials are used, as much as possible can be recycled at the end of the buildings’ life. Some typical building materials that can contain a high percentage of recycled material include reinforcing and framing steel, concrete masonry units, gypsum wallboard and facing paper, acoustic ceiling panels and their suspension system.

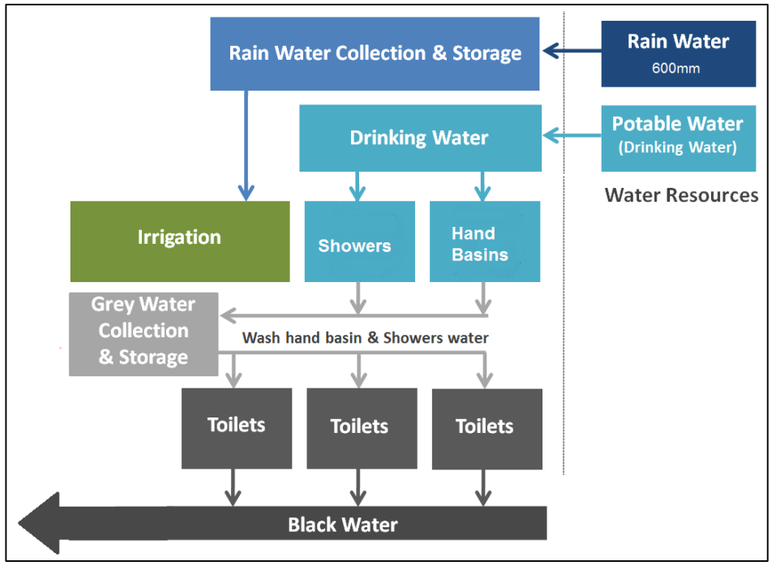
Specifying materials with a high-recycled content is also another method of saving processing or manufacturing energy. The recycled content of a material can be described as either post-consumer or post-industrial to indicate at what point in the life cycle a material is reclaimed.

5.5 Ozone Depletion and Global Warming

CFCs and HCFCs, compounds commonly used in insulation materials and refrigerants, can cause long-term damage to the Earth’s stratospheric ozone layer, exposing living organisms to harmful radiation from the sun. They also significantly increase global-warming if they leak into the atmosphere. Following the Montreal Protocol, production and use of CFCs is no longer permitted and EC regulations will require phasing out of HCFCs by 2015. However, products that replace these gases are often still potent global warming contributors.

All insulation materials specified for the proposed scheme will have zero Ozone Depleting Potential and low Global Warming Potential, (GWP<5) in either manufacture or composition in line with the BREEAM requirements. This will include insulation for building elements (roof, internal & external walls, floor – including foundations) as well as insulation for hot water vessels and pipework.





6 Water Conservation

Water consumption in the UK has risen by 70% over the last 30 years. Trying to meet the increasing demand by locating new sources of water supply is both expensive and damaging to the environment. Therefore, the design team have focused on reducing the demand for water and managing the existing resources.

6.1 Demand Reduction and Water Efficiency

The aim is to minimise internal and external potable water use within the development. Good water management can contribute to reducing the overall level of water consumption maintaining a vital resource and having environmental as well as cost benefits in the life-cycle of the building. The following water saving measures are being considered for a range of areas in line with the BREEAM requirements, which requires that water usage be limited to less than 105l/person/day.

Dual Flush Cisterns on WC's – will be provide for all dwellings and in the commercial unit toilets with a single flush of 4L and/or a full flush of 6L. It is proposed that these are used throughout the development in order to minimise water consumption.

Flow Restrictors to Taps - Flow restrictors reduce the volume of water discharging from the tap. Spray taps have a similar effect and are recommended to reduce both hot and cold-water consumption. Low flow taps in one of the above forms will be installed in all of areas so as to comply with the BREEAM mandatory requirements .

Water Meters - In 1995 approximately 33,200 million litres of water a day were extracted in England and Wales, this increased to 44,130 million litres/day in 2009, and much of this was for domestic water supply. To reduce this figure, accurate information on usage is required for management of a building's consumption. Water meters will be specified on the main supply and at the entry to all dwellings and commercial units in line with the BREEAM requirements.

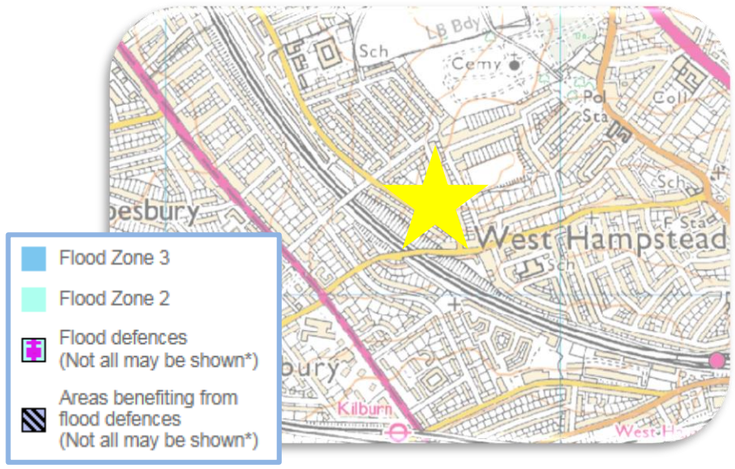
Grey Water Recycling – This involves recycling water from washbasins or other "low-grade" forms of water and re-using it to serve other purposes e.g. WC flushing, irrigation etc. Wastewater from washbasins is collected via dedicated waste stacks, separate from the soil discharge (WC's and Urinals). The water is passed through a simple filter and then discharged to a storage tank via gravity. Once within the storage tank the water is chemically dosed, ready to be used to feed WC cisterns and urinals for flushing.

The possibly of using grey water for WC flushing will be investigated during the detailed design phase.

7 Sustainable Urban Drainage

The garden is currently grassed with areas of hard landscaping where being extended. The main aim for the redevelopment will be to improve the water retention of the site and minimise the risk of flooding from all water sources.

As a minimum, the design will ensure that the peak rate of runoff into watercourses is reduced to 50% of the existing sites run off rate. This will comply with the Interim Code of Practice for Sustainable Drainage systems (SUDS) (CIRIA, 2004) or for at least the 1 year and 100 year return period events. The Envionment Agency map indicates that the site is in a flood risk area 1.



8 Waste Management

Buildings and building sites produce a significant amount of waste per year. Most of the waste produced in the UK is disposed of in landfill sites and only a small percentage of it is recycled or reused.

8.1 Waste Targets

Under EU legislation the UK will have to ensure that less than a third of its waste is sent for burial in landfill sites by 2020 and the figure at present is about 80%. To achieve this target a number of measures are implemented, including landfill tax, aiming to discourage disposal of waste to landfill. Good waste management is a key component of sustainable development. Reducing waste is an important means of:

- Reducing unnecessary expenditure
- Reducing the amount of natural resources used for production of new materials
- Reducing energy for waste disposal
- Reducing levels of contamination and pollution arising from waste disposal

The proposed development will minimise the impact of waste in the environment.

8.2 Demolition & Construction

During the construction phase a large amount of waste material will be generated through construction, demolition and land clearing procedures. In building construction, the primary waste products in descending percentages are: wood, asphalt/concrete/masonry, drywall, roofing, metals, and paper products.

Prior to commencement on a Site Waste Management Plan (SWMP) that complies with the requirements of current legislation and BREEAM will be prepared. This plan will identify the local waste haulers and recyclers, determine the local salvage material market, identify and clearly label site spaces for various waste material storage and require a reporting system that will quantify the results and set targets. As a minimum the SWMP will contain:

a. The target benchmark for resource efficiency e.g. m^3 of waste per $100m^2$ or tonnes of waste per $100m^2$;
b. Procedures and commitments for minimising non-hazardous waste in line with the benchmark;
c. Procedures for minimising hazardous waste;
d. Procedures for monitoring, measuring and reporting hazardous and non-hazardous site waste;
e. Procedures for sorting, reusing and recycling construction waste into defined waste groups either on site or through a licensed external contractor;
f. The name or job title of the individual responsible for implementing the above.

As the proposed development is on land that has previously been built upon, there is the potential for using waste materials from the demolition of existing buildings and hard paved areas. Bricks and concrete could possibly be reused as hard-core materials etc. Opportunities for introducing more reused or reusable materials/components will be explored during detailed design.

8.3 Waste Management & Reporting in Operation

The detailed design phases will identify the potential waste streams that the development will produce. At a minimum, plans will be formulated to handle the separation, collection, and storage of common recyclable materials such as paper, glass, plastics, and metals. The collection points will be easily accessible to all of the users.

The main aim will be to recycle as much waste as possible; this will be achieved by making sure that waste recycling facilities are strategically placed in convenient locations.

Dedicated storage space for recyclable materials generated by the site during occupation, will include the following:

- Be clearly labelled for recycling
- Be placed within accessible reach of the buildings
- Be in a location with good vehicular access to facilitate collections.

Storage of household waste

The space allocated for waste storage should be able to accommodate containers with at least the minimum volume recommended by British Standard 5906 (British Standards, 2005) based on a maximum collection frequency of once per week. This is 100 litres volume for a single bedroom dwelling, with a further 70 litres volume for each additional bedroom.

Large integrated recycling bin with at least 3 containers for recyclable waste and one general waste will be considered for each dwellings similar to the following image:

80 Litre Capacity (2 x 32L & 2 x 8L)
Cabinet size - 600mm

Waste collection points

Within the front garden refuse and recycling stores will be provided. These will be emptied on a regular basis.

9 Environmental Management

Construction sites are responsible for significant impacts, especially at a local level. These arise from noise, potential sources of pollution and waste and other disturbances. Impacts such as increased energy and water use are also significant. Therefore attention is being given to site-related parameters with the aim to protect and enhance the existing site & its ecology.

The aim is to have a construction site managed in an environmentally sound manner in terms of resource use, storage, waste management, pollution and good neighbourliness. To achieve this, there will be a commitment to comply with the Considerate Constructors Scheme and get a formal certification under the scheme in line with the BREEAM requirements. As a minimum a score of greater than 32 of out 40 will be achieved with an aspiration to exceed 36, with no individual section achieving a score of less than 3.

Areas that can be taken into consideration in order to minimise the impact of the construction site on its surroundings and the global environment as outlined in the BREEAM methodology:

- Monitor, report and set targets for CO_2 or energy usage arising from site activities
- Monitor, report and set targets for CO_2 or energy usage arising from transport to and from site
- Monitor, report and set targets for water consumption arising from site activities
- Monitor construction waste on site, sorting and recycling construction waste where applicable
- Adopt best practice policies in respect of air and water pollution arising from site activities
- Operates an Environmental Management System
- Additionally, all timber used on site should be responsibly sourced

10 Land Use and Ecology

The site currently comprises of a mix of existing buildings and hard landscaping, with no ecological value to the site.

New planted area will be included where possible, to increase the ecological value of the site and help protect local plant and animal species.

Recommended mitigation and enhancement measures include the implementation of protection measures during the construction phase with respect to retained trees (on the boundary of the site). Within the development, features are proposed to retain opportunities for any nesting birds or bats if present, and other flora and fauna.

The proposed development will result in no negative change to the ecology of the site.

11 Pollution

Global concern for environmental pollution has risen in recent years, as concentrations of harmful pollutants in the atmosphere are increasing. Buildings have the potential to create major pollution both from their construction and operation, largely through pollution to the air (dust emissions, NOx emissions, ozone depletion and global warming) but also through pollution to watercourses and ground water. The proposed development will aim to minimise the above impacts, both at the design stage and onsite.

11.1 Ozone Depletion

CFCs and HCFCs, compounds commonly used in insulation materials and refrigerants, can cause long-term damage to the Earth's stratospheric ozone layer, exposing living organisms to harmful radiation from the sun. They also significantly increase global-warming if they leak into the atmosphere. Following the Montreal Protocol, production and use of CFCs is no longer permitted and EC regulations will require phasing out of HCFCs by 2015. However, products that replace these gases are often still potent global warming contributors. Where refrigerants are used for air-conditioning and comfort cooling they will be CFC and HCFC-free.

11.2 Internal pollutants

Volatile organic compounds (VOCs) are emitted as gases (commonly referred to as offgassing) from certain solids or liquids. VOCs include a variety of chemicals, some of which are known to have short-term and long-term adverse health effects. Concentrations of many VOCs are consistently higher indoors (up to ten times higher) than outdoors.

VOCs are emitted by a wide array of products numbering in the thousands. Examples include: paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials, furnishings, adhesives, Urea-formaldehyde foam insulation (UFFI), pressed wood products (hardwood plywood wall panelling, particleboard, fibreboard) and furniture made with these pressed wood products.

'No' or 'low' VOC paints are available from most standard mainstream paint manufacturers. There 'eco-friendly' paints are made from organic plant sources and also powdered milk based products.

The design team will seek to select internal finishes and fittings with low or no emissions of VOCs and comply with European best practice levels as a minimum.

11.3 NOx emissions from boilers

Nitrous oxides (NOx) are emitted from the burning of fossil fuels and contribute to both acid rain and to global warming in the upper atmosphere. At ground level, they react to form ozone, a serious pollutant and irritant at low level. Burners in heating systems are a significant source of low-level NOx, while power stations (and therefore electric heating) are a significant source of NOx in the upper atmosphere.

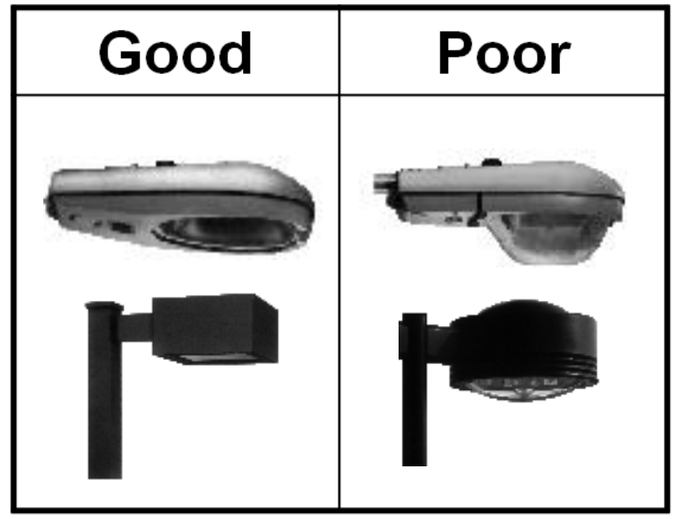
The amount of NOx emissions varies between products. New gas boilers vary from 40 NOx/kW to <70mg NOx/kWh (class 5).

11.4 Night Sky Pollution

External lighting encompasses vehicle and pedestrian access lighting, security lighting, facility illumination and general feature lighting. Where present it will be designed on a site wide basis to meet the mandatory requirements and aesthetic considerations. The strategy is to provide a balance between adequate external lighting for safe and secure operation of the site without unnecessary illumination or power consumption.

The intention is to be a good neighbour and not to introduce nuisance glare or light pollution of the night sky from miss directed or unnecessary lighting. Feature lighting, where required, will be focussed to the task/subject. Where necessary luminaires will be further screened in cases where there may be an issue of close proximity and light spill to the adjacent neighbouring residential areas, although the intention is to avoid this situation arising wherever possible from the outset. The external lighting design will take into consideration the relevant guidance from the British Standards and other recommended documents including the following Standards and Design Guides:

- CIBSE Lighting Guide for the Outdoor Environment
- CIBSE Lighting Design Guides
- BS5489 Code of Practice for the Design of Road Lighting
- BS EN 13201-1 Road Lighting, Selection of Lighting Classes
- BSEN 13201-2 Road Lighting, Performance requirements
- Institute of Lighting Engineers Guidance Notes for the Reduction of Obtrusive Light



12 Green Transport

The transport of people between buildings is the second largest source of CO_2 emissions in the UK after energy use in buildings and remains the main source of many local pollutants. Energy use and emissions from transport are growing at 4% per year, and at the same time, the effects of climate change are becoming more severe; there will be greater pressure to control CO_2 emissions from transport and sites without good access to public transport will be at much greater risk from these controls.

12.1 Site location

The site for the proposed development is located central London. Within close proximity to the shops and amenities of Kilburn Tube station which is within walking distance.

There are six local bus services off Westbere Road and Shoot-Up Hill and local national rail connections from Cricklewood station.

The site achieves a PTAL rating of 4.

12.2 Cycling Facilities

Secure cycling spaces will be provided for the residences in order to encourage the occupants to use this carbon-free mode of transport. Secure, convenient and weather-proof cycle storage areas for use by the residential units will be located within each development.

- Based on the current unit schedule 4 cycle spaces are required for one BREEAM credit.
- The development offers 6 cycle spaces.

12.3 Car Parking Spaces

Car parking will not be provided for the proposed development so as to encourage the occupants to use the local public transport facilities.

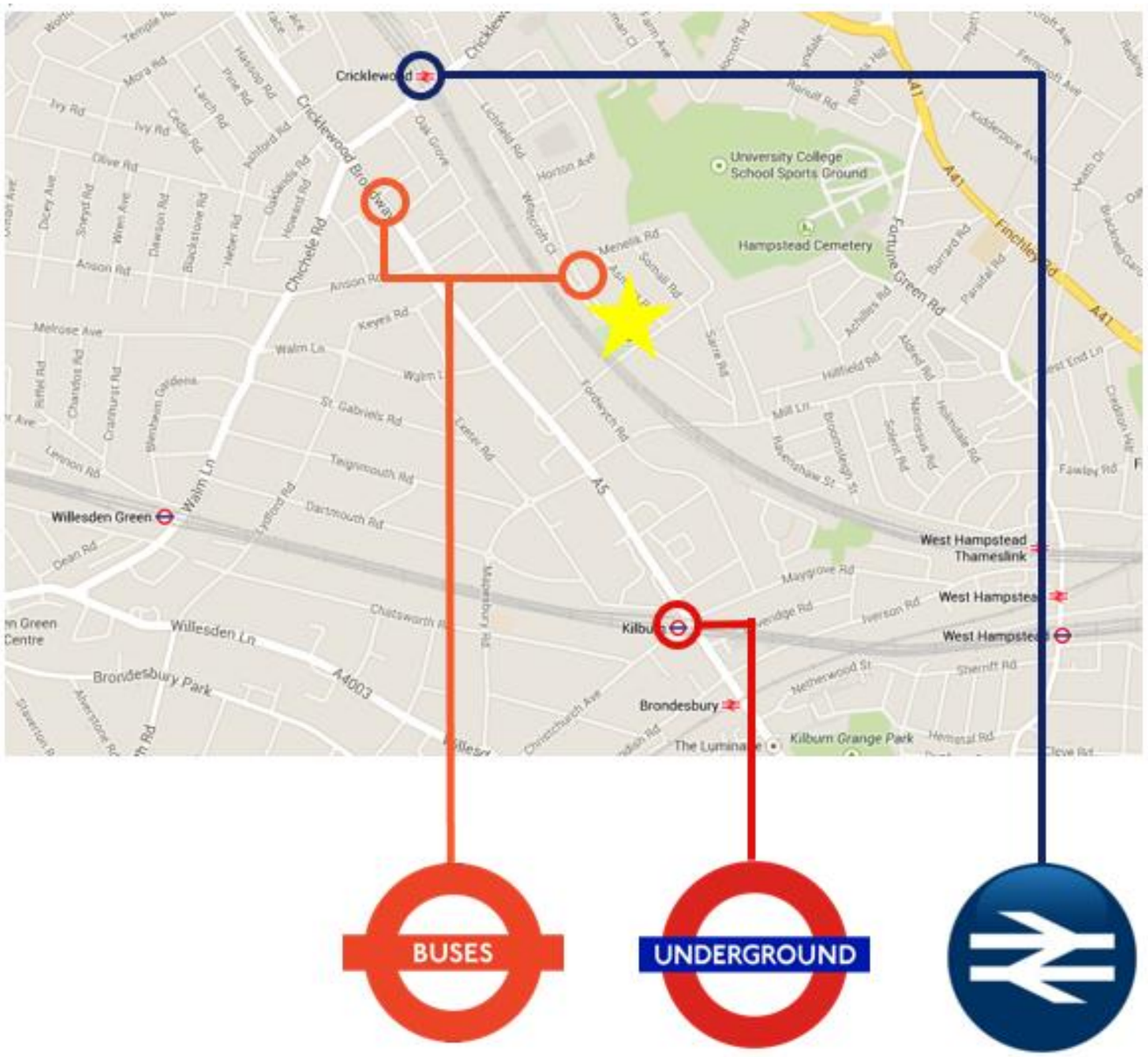


Image from google maps

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Appendix A – Preliminary LZC assessment

	Equipment	Energy Generation	Estimated Capital Cost (£)	Payback Period (yrs)	Annual CO_2 Emissions Savings	20 year life cycle cost	Feasibility (yes/no)	Physical,Spatial & land use Impact	Noise Impact	Additional Comments
VAWT	1No 3kW Ropatec WRE.030 wind turbine(s)	31% (Electrical)	£8,000	27	4.9%	£1,973	NO	Turbines must be sited away from obstructions. Above building roof heights and spaced at least 3 x their diameters apart horizontal	Wind turbines generate noise that can be heard, dependent on wind speed and direction, a few hundred metres away. However this level is normal only marginal greater than the actual wind noise itself (2-12 dB) and is hence not considered to be a problem	Built up area, estimated average windspeeds unlikely to be met for the majority of the year. Noise, safety and location all preclude wind turbines for this site.
HAWT	1No 1.5kW Bornay 1500 wind turbine(s)	84% (Electrical)	£5,000	5	13.5%	-£14,826	NO	Turbines must be sited away from obstructions. Above building roof heights and spaced at least 5 x their diameters apart horizontal	Wind turbines generate noise that can be heard, dependent on wind speed and direction, a few hundred metres away. However this level is normal only marginal greater than the actual wind noise itself (2-12 dB) and is hence not considered to be a problem	Built up area, estimated average windspeeds unlikely to be met for the majority of the year. Noise, safety and location all preclude wind turbines for this site.
Photovoltaics	13.5m² of Yingli Solar (235 W) Polycrystalline PV panels	65% (Electrical)	£6,804	15	10.5%	-£2,309	NO	Panels must be mounted on an area free from overshadowing	None	The existing orientation in combination with the proposed use of rooflights means that there will not be any useful roof area in the most suitable southernly facing roof space, making PV panels unviable in this instance.
Solar Thermal	13.5m² of Evacuated Tubes Collectors	79% (DHW)	£6,750	11	19.9%	-£6,099	NO	Collectors must be mounted on an area free from overshadowing	None	The existing orientation in combination with the proposed use of rooflights means that there will not be any useful roof area in the most suitable southernly facing roof space making SHW appear unviable in this instance.
Biomass Boiler	15kW boiler burning Wood Chips (25% MC)	77% (Heat)	£18,000	9	58.4%	-£20,441	NO	Potential issue of smoke & smell from boiler depending on moister content of fuel. ~ 30m³ fuel storage areas required with access for fuels deliveries.	Normal noises associated with boiler plant, noise convinced within the dedicated plant room. Potential additional noise generation associated with the fuel deliveries.	Could potentially provide a good level of CO2 emissions reduction, however they require significant space for storage and delivery of fuel which generally does not suit an existing building. They have higher particulate emissions than gas boilers which typically raises concerns with the Environment Planning.
Heat Pumps - ASHP	ASHP heat pump(s): 50kW heating / 22kW cooling	100% (Heat)	£32,500	n/a	3.1%	£37,326	NO	Minimal visual impact to site, will require additional plant space for heat pumps and external heat rejection units	Normal noises associated with HVAC plant, noise convinced within the dedicated plant areas	Recent studies have found that most installation in the UK are only achieving CSoP of 2-3. Hence a GSHP may actually result in an increase in CO2 emissions and have therefore not been considered any further.
Heat Pumps - GSHP	7No of 100m deep vertical boreholes	100% (Heat)	£46,667	48	20.9%	£27,099	NO	No visual impact to site, will require additional plant space for heat pumps and well heads.	Normal noises associated with HVAC plant, noise convinced within the dedicated plant areas	No scope for boring on existing site.
CHP	1No of 4kWe / 8kWth gas-fired CHP engine	54% / 26% (Heat / Electrical)	£8,000	n/a	-2.0%	£16,545	NO	No visual impact to site, will require additional plant space for CHP engine	Normal noises associated with HVAC plant, noise contained within the dedicated plant areas	Insufficiently diverse heating load due to the small size of the development makes anything except micro-CHP non-viable. Smallest commercial sized CHPs lead to a poor quality installation with insufficient running hours.

Appendix B – Preliminary BREEAM Assessment

BREEAM Domestic Refurbishment 2012 Pre-Assessment Estimator v0.7

BREEAM

This assessment and indicative BREEAM rating is not a formal certified BREEAM assessment or rating and must not be communicated as such. The score presented is indicative of a dwelling's potential performance and is based on a simplified pre-formal BREEAM assessment and unverified commitments given at an early stage in the design process.

Building name	44 Westbere Road
Indicative building score (%)	57.03%
Indicative BREEAM rating	BREEAM Very Good

Management | Health & Wellbeing | Energy | Water | Materials | Waste | Pollution

	Minimum Standards				
	Pass	Good	Very Good	Excellent	Outstanding
Ene 02	✓	✓	✓	✗	✗
Wat 01	✓	✓	✓	✓	✗
Hea 05	✓	✓	✓	✓	✓
Hea 06	✓	✓	✓	✓	✓
Pol 03	✓	✓	✓	✓	✓
Mat 02	✓	✓	✓	✓	✓

INNOVATION Section Weighting: 10% Indicative Section Score: 0.00%

Comments

MANAGEMENT Section Weighting: 12% Indicative Section Score: 5.45%

Man 01 Home Users Guide

No. of BREEAM credits available	3	Available contribution to overall score	3.27%
No. of BREEAM innovation credits	0	Minimum Standards applicable:	No

Assessment Criteria

Where a Home Users Guide be provided to all dwellings, covering all issues set out in the 'Users Guide Contents list', three credits may be awarded → Indicative Credits: 0

Comments

Man 02 Responsible Construction Practices

No. of BREEAM credits available	2	Available contribution to overall score:	2.18%
No. of BREEAM innovation credits	1	Minimum Standards	No

Assessment Criteria

Where a compliant considerate construction scheme will be used, credits are awarded depending the score achieved as outlined below: → Indicative Credits: 0

Large Scale - project with more than 5 units

	One Credit	Two Credits
Considerate Constructors Scheme	Score of 25-34 with a score of 5 in each section	Score of 35-39 with a score of 7 in each section
Alternative Compliant Scheme	Compliance	Beyond Compliance

Small Scale - project with 5 units or fewer

	One Credit	Two Credits
Considerate Constructors Scheme	Score of 25-34 with a score of 5 in each section	Score of 35-39 with a score of 7 in each section
Alternative Compliant Scheme	Compliance	Beyond Compliance
Checklist A-3	50% of the optional items	80% of the optional items

Exemplary Credit

Considerate Constructors Scheme	Score of 40 or more with a score of 7 in each section	→ Indicative Innovation Credits Achieved: 0
Alternative Compliant Scheme	Exemplary Level Compliance	
Checklist A-3*	All Items (Optional & Mandatory)	* Small Scale Project Only

Comments

Man 03 Construction Site Impacts

No. of BREEAM credits available	1	Available contribution to overall score	1.09%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where evidence demonstrate that site impacts will be monitored, as detailed below: → Indicative Credits: 0

	One Credit
Large Scale	Where there is evidence to demonstrate that **2 or more** of the sections in **Checklist A-4** are completed
Small Scale	Where there is evidence to demonstrate that **2 or more** of the sections in **Checklist A-5** are completed

Sections of Checklist	
Large Scale - Checklist A-4	Small Scale - Checklist A-5
Monitor, report and set targets for CO2 production of energy use arising from site activities	Set objectives for reducing CO2 production from energy use arising from site activities
Monitor, report and set targets for water consumption arising from site activities	Set objectives for reducing water use arising from site activities
A main contractor with an environmental materials policy	Main contractor environmental materials statement
A main contractor that operates an Environmental Management System	80% of site timber is reclaimed, re-used or responsibly sourced
80% of site timber is reclaimed, re-used or responsibly sourced	

Same definition of small and large scale as in Man 02

Comments

Man 04 Security

No. of BREEAM credits available	2	Available contribution to overall score:	2.18%
No. of BREEAM innovation credits	0	Minimum Standards applicable:	No

Assessment Criteria

Where the following requirements will be met: → Indicative Credits: 2

One Credit Secure windows and doors	External doors and accessible windows meet minimum standards and appropriately certified
Two Credits Secured by design	Principles and guidance of Secured by Design Section 2 are complied with
	A suitably qualified security consultant is consulted at the design stage and their recommendations are incorporated into the refurbishment

Comments

Man 05 Protection and Enhancement of Ecological Features

No. of BREEAM credits available	1	Available contribution to overall score:	1.09%
No. of BREEAM innovation credits	1	Minimum Standards applicable:	No

Assessment Criteria

Where the following requirements will be met: → Indicative Credits: 1

One Credit Protecting Ecological Features	Site survey carried out to determine presence of ecological features
	Statutory Nature Conservation Organisation notified of protected species
	Features of ecological value protected during refurbishment works

Exemplary Credit Ecological enhancement	A suitably qualified ecologist recommends features to enhance ecology of the site	→ Indicative Innovation Credits Achieved: 0
	adopts all general ecological recommendations	
	adopts 30% of additional recommendations	

Comments

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Man 06 Project Management

No. of BREEAM credits available	2	Available contribution to overall score	2.18%
No. of BREEAM innovation credits	2	Minimum Standards applicable	No

Assessment Criteria

Where the following requirements will be met:

Indicative Credits: 2

One Credit Project Roles and Responsibilities	Where all of the project team are involved in the project decision making
	Small Scale - the project manager assigns individual and shared responsibilities amongst the project team including all trades on site
	Large Scale - the project manager assigns individual and shared responsibilities across the following key design and refurbishment stages: i. Planning and Building control notification ii. Design iii. Refurbishment iv. Commissioning and handover v. Occupation

Small Scale projects: five units or fewer and less than £100k — **Large Scale projects: more than five units and more than £100k**

One Credit Handover and Aftercare	Handover meeting arranged
	2 or more of the following committed to: - A site inspection within 3 months of occupation - Conduct post occupancy interviews with building occupants or a survey via phone or posted information within 3 months of occupation - Longer term after care e.g. a helpline, nominated individual or other appropriate system to support building users for at least the first 12 months of occupation

Indicative Innovation Credits Achieved

Exemplary Credits: 0

One Exemplary Credit Early Design Input	Where A BREEAM Accredited Professional has been appointed to oversee key stages within the project. OR Where a BREEAM Domestic Refurbishment Assessor has been appointed at an early stage of the project, prior to the production of a refurbishment specification
One Exemplary Credit Thermographic Surveying and Airtightness Testing	Where Thermographic surveying and Airtightness testing have been carried out at both pre and post refurbishment stages Where an improved air tightness target has been set at design stage and testing demonstrates that this has been achieved post refurbishment

Comments

HEALTH & WELLBEING

Section Weighting: 17% — Indicative Section Score 9.92%

Hea 01 Daylighting

No. of BREEAM credits available	2	Available contribution to overall score	2.83%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where the refurbishment results in a neutral impact on daylighting or where minimum daylighting standards are met, up to two credits may be awarded as follows:

Indicative Credits: 0

For Existing Dwellings and Change of Use Projects

First Credit Maintaining Good Daylighting	The refurbishment results in a neutral impact on the dwellings daylighting levels in the kitchen, living room, dining room and study

Where the property is being extended

	New spaces achieve minimum daylighting levels
First Credit Maintaining Good Daylighting	The extension does not significantly reduce daylighting levels in the kitchen, living room, dining room or study of neighbouring properties

For All Properties

Second Credit Minimum Daylighting	The dwelling achieves minimum daylighting levels in the kitchen, living room, dining room and study

Comments

Hea 02 Sound Insulation

No. of BREEAM credits available	4	Available contribution to overall score	5.67%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

To ensure the provision of acceptable sound insulation standards and so minimise the likelihood of noise complaints.

Indicative Credits: 2

Properties where sound testing has been carried out:

Up to Four Credits	Four credits awarded according to the improvement over building regulations. See table in additional information in Technical Manual

Properties where sound testing is not feasible and not required by the appointed Building Control body

Two Credits	Where existing separating walls and floors are designed to meet the requirements of Building Regulations with compliant construction details
Up to Four Credits	Where a Suitably Qualified Acoustician (SQA) provides recommendations for the specification of all existing separating walls and floors
	SQA confirms in their professional opinion that they have the potential to meet or exceed the sound insulation credit requirements
	Where these recommendations are implemented
	See table in additional information in Technical Manual

Historic Buildings

Up to Four Credits	Where the dwelling is a Historic Building and sound testing results demonstrate existing separating walls and floor meet the Historic Building credit requirements
	See table in additional information in Technical Manual
	Where sound testing is not feasible and not required by the appointed Building Control body meeting criteria 2 and 3 using Table 12
	Properties where sound testing has been carried out, credits awarded according to the improvement over building regulations. See table in additional information in Technical Manual
	Where the dwelling is a detached property
	Where the dwelling is a propertywith separating walls or floors only between non habitable rooms OR Testing not required by building control body

Detached Properties

Four Credits	By Default

Properties with separating walls or floors only between non habitable rooms OR Testing not required by building control body

Four Credits	By Default

Comments

Hea 03 Volatile Organic Compounds

No. of BREEAM credits available	1	Available contribution to overall score	1.42%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where the refurbishment avoids the use of VOCs with new products meeting the following requirements:

Indicative Credits: 1

One Credit Avoiding the use of VOCs	Where all decorative paints and varnishes used in the refurbishment have met the requirement listed in table 5.4 in the Technical Manual
	Where at least five of the eight remaining product categories listed in table 5.4 have met the testing requirements and emission levels for Volatile Organic Compound (VOC) emissions against the relevant standards identified within table 5.4 in the Technical Manual
	Where five or less products are specified within the refurbishment, all must meet the requirements in order to achieve this credit.

Comments

Hea 04 Inclusive Design

No. of BREEAM credits available	2	Available contribution to overall score	2.83%
No. of BREEAM innovation credits	1	Minimum Standards applicable	No

Assessment Criteria

Where an access statement has been carried out using Checklist A-8 of the Technical Manual to optimise the accessibility of the home as follows:

Indicative Credits: 1

	Checklist A-8 of the Technical Manual	
	Section 1	Section 2
One Credit Minimum Accessibility	Completed with Evidence	
Two Credits Advanced Accessibility	Completed with Evidence	Completed with Evidence

Exemplary Performance

One Credit	Where an access expert suitably qualified member of the design team has completed sections 1, 2 and 3 of Checklist A-8, access statement template with evidence provided of the measures implemented in the refurbishment

Indicative Innovation Credits Achieved: Please Select

Comments

Hea 05 Ventilation

No. of BREEAM credits available	2	Available contribution to overall score	2.83%
No. of BREEAM innovation credits	0	Minimum Standards applicable	Yes

Assessment Criteria

Where the dwelling meets the following ventilation requirements:

Indicative Credits: 2

One Credit Minimum Ventilation Requirements	A minimum level of background ventilation is provided (with trickle ventilators or other means of ventilation) for all habitable rooms, kitchens, utility rooms and bathrooms compliant with section 7, Building Regulations Approved Document Part F, 2010
	A minimum level of extract ventilation is provided in all wet rooms (e.g. kitchen, utility and bath-rooms), compliant with section 5, Building Regulations Approved Document Part F 2010.
	A minimum level of purge ventilation is provided in all habitable rooms and wet rooms, compliant with section 7, Building Regulations Approved Document Part F, 2010.
	It is an historic building and meets historic building requirements in CN4 of the technical manual
Two Credits Advanced Requirements	Ventilation is provided for the dwelling that meets the requirements of Section 5 of Building Regulations Part F in full
	Where the building is a historic building and meets the requirements for Historic Buildings in compliance note 4 of the technical manual

Comments

Hea 06 Safety

No. of BREEAM credits available	1	Available contribution to overall score	1.42%
No. of BREEAM innovation credits	0	Minimum Standards applicable	Yes

Assessment Criteria

Where a fire and carbon monoxide (CO) detection and alarm system is specified as follows:

Indicative Credits: 1

One Credit Fire and Carbon Monoxide (CO) Detection and Alarm Systems	Where a compliant fire detection and fire alarm system is provided
	Carbon Monoxide detector installed if dwelling is supplied with mains gas or other fossil fuel
	Mains supplied fire detection and alarm system if project involves re-wiring*
	Battery operated fire detection and alarm system if no re-wiring* is to take place

*** see CN9 in Hea 06 for the definition of re-wiring**

Comments

ENERGY

Section Weighting: 43%

Indicative Section Score 23.72%

Ene 01 Improvement in Energy Efficiency Rating

No. of BREEAM credits available	6	Available contribution to overall score	8.90%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where the following targets are met for the improvement in Energy Efficiency Rating achieved as a result of refurbishment:

Indicative Credits: 2

Improvement in EER	Credits
≥ 5	0.5
≥ 9	1
≥ 13	1.5
≥ 17	2
≥ 21	2.5
≥ 26	3
≥ 31	3.5
≥ 36	4
≥ 42	4.5
≥ 48	5
≥ 54	5.5
≥ 60	6

Comments

Ene 02 Energy Efficiency Rating Post Refurbishment

No. of BREEAM credits available	4	Available contribution to overall score	5.93%
No. of BREEAM innovation credits	2	Minimum Standards applicable	Yes

Assessment Criteria

Where the following Energy Efficiency Rating benchmarks will be met as a result of refurbishment:

Indicative Credits: 2

EER post refurbishment	Credits	Minimum requirements
≥50	0.5	'Pass' level EER of 50
≥55	1	'Good' level EER of 58
≥60	1.5	
≥65	2	'Very Good level' EER of 65
≥70	2.5	'Excellent' level EER of 70
≥75	3	
≥80	3.5	'Outstanding' level EER of 81
≥85	4	

Exemplary	Credits
≥90	1
≥100	2

Indicative Innovation Credits Achieved: Please Select

Comments

Ene 03 Primary energy demand

No. of BREEAM credits available	7	Available contribution to overall score	10.38%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where the following Primary Energy Demand benchmarks will be met as a result of refurbishment:

Indicative Credits
5

Primary Energy Demand Post Refurbishment	Credits
≤ 400	0.5
≤ 370	1
≤ 340	1.5
≤ 320	2
≤ 300	2.5
≤ 280	3
≤ 260	3.5
≤ 240	4
≤ 220	4.5
≤ 200	5
≤ 180	5.5
≤ 160	6
≤ 140	6.5
≤ 120	7

Comments

Ene 04 Renewable Technologies

No. of BREEAM credits available	2	Available contribution to overall score	2.97%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where the dwelling will meet the following % contribution from renewables and primary energy demand targets as a result of refurbishment

Indicative Credits
0

Dwelling Type	Primary Energy Demand	Percentage from Renewables	
		1 Credit	2 Credits
Detached	≤ 250 kWh/m^2/year	≥10%	≥20%
Semi-Detached		≥10%	≥20%
Bungalow		≥10%	≥20%
End of Terrace		≥10%	≥20%
Mid Terrace	≤ 220 kWh/m^2/year	≥10%	≥20%
Low Rise Flat		≥10%	≥20%
Mid Rise Flat		≥10%	≥15%
High Rise Flat		≥10%	≥15%

Comments

Ene 05 Energy Labelled White Goods

No. of BREEAM credits available	2	Available contribution to overall score	2.97%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where Energy Efficiency White goods are to be provided as follows:

Indicative Credits
2

First Credit

Appliance	Appliance provided	Appliance not to be provided
Fridges, Freezers and Fridge-Freezers	Energy Saving Trust Recommended appliances specified	EU Energy Efficiency Labelling Scheme Information Leaflet provided to all dwellings

Second Credit

Appliance	Appliance provided	Appliance not to be provided
Washing Machines and Dishwashers	Energy Saving Trust Recommended appliances specified	Second credit not achieved
Washer-Dryers and Tumble Dryers	Appliances specified with B Rating under EU Energy Efficiency Labelling Scheme	EU Energy Efficiency Labelling Scheme Information Leaflet provided to all dwellings

Comments

Ene 06 Drying Space

No. of BREEAM credits available	1	Available contribution to overall score	1.48%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where adequate, secure internal or external space with posts and footings or fixings is provided with the following:

Indicative Credits
0

1 Credit

Number of bedrooms	Drying line required
1-2	4m+
3+	6m+

Comments

Ene 07 Lighting

No. of BREEAM credits available	2	Available contribution to overall score	2.97%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where energy efficient internal and external lighting is provided as follows:

Indicative Credits
1

External Lighting - 1 Credit

Energy Efficient Space Lighting of more than 45 lumens per circuit watt and Energy Efficient Security Lighting OR

Where Energy Efficient Space Lighting is provided ONLY

Internal Lighting - 1 Credit

Maximum average wattage across the total floor area of the dwelling of 9 watts/m2

Comments

Ene 08 Display Energy Devices

No. of BREEAM credits available	2	Available contribution to overall score	2.97%
No. of BREEAM innovation credits	1	Minimum Standards applicable	No

Assessment Criteria

Where consumption data is displayed to occupants by a compliant energy display device

Indicative Credits
2

Electricity usage data displayed	Primary Heating Fuel	
	Electricity	Other
Electricity usage data displayed	2 credits awarded	1 credit awarded
Primary Heating Fuel usage data displayed	N/A	1 credit awarded
Electricity & Primary Heating Fuel usage displayed	N/A	2 credits awarded

Exemplary Credits

One credit	
Recording consumption data	Where the first two credits are achieved
	Where any compliant Energy Display Device is capable of recording consumption data

Indicative Innovation Credits Achieved
0

Comments

Ene 09 Cycle Storage

No. of BREEAM credits available	2	Available contribution to overall score	2.97%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where individual or communal compliant cycle storage is provided as follows:

Indicative Credits
1

Dwelling Size	One Credit	Two Credits
Studios/ 1 bedroom	1 per two dwellings	1 per dwelling
2-3 bedrooms	1 per dwelling	2 per dwelling
4 bedrooms	2 per dwelling	4 per dwelling

Comments

Ene 10 Home Office

No. of BREEAM credits available	1	Available contribution to overall score	1.48%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where sufficient space and services will be provided to allow occupants to set up a home office in a suitable room with adequate ventilation

Indicative Credits
1

Comments

CUNDALL

WATER

Section Weighting: 11%

Indicative Section Score 7.70%

Wat 01 Internal Water Use

No. of BREEAM credits available	3		Available contribution to overall score	6.60%	
No. of BREEAM innovation credits	1		Minimum Standards applicable	Yes	

Assessment Criteria

Where the dwellings water consumption meets the following consumption benchmarks, or where terminal fittings meet the following water consumption standards:

Indicative Credits: 2.5

Calculated Water Consumption (litres/person/day)	Equivalent terminal fitting standards	Minimum Standard	Credits
>150	Typical baseline performance	N/A	0
from 140 to ≤ 150	All showers specified to 'Good' **OR** All taps and WC's to 'Good' **OR** Kitchen fittings specified to 'Excellent'	N/A	0.5
from 129 to < 140	All showers specified to 'Excellent' **OR** All showers and bathroom taps to 'Good'	BREEAM Very Good	1
from 118 to < 129	All bathroom and WC room fittings specified to 'Good' **OR** All bathroom fittings specified to 'Excellent'	N/A	1.5
from 107 to < 118	All Bathroom and WC room fittings specified to 'Excellent' **OR** All Bathroom fittings Specified to 'Excellent' and WC room fitting specified to 'Good' **OR** All Bathroom fittings, kitchen and utility sittings specified to 'Good'	BREEAM Excellent	2
from 96 to < 107	All kitchen, bathroom, utility room and WC room fittings specified to 'Good' **OR** All bathrooms, kitchens and utility rooms specified to 'Excellent'	N/A	2.5
< 96	All bathroom fittings specified to 'Excellent' and WC room, kitchen and utility room fittings specified to 'Good'	BREEAM Outstanding	3

NOTE: 'Good' fittings are equivalent to good practice fittings with "Excellent" fittings equivalent to best practice fittings (see the technical manual for full details.

Exemplary Credit	If the water consumption is less than 80l/person/day	

Indicative Innovation Credits Achieved: 0

Comments

Wat 02 External Water Use

No. of BREEAM credits available	1		Available contribution to overall score	2.20%	
No. of BREEAM innovation credits	0		Minimum Standards applicable	No	

Assessment Criteria

Where the following requirements will be met:

Indicative Credits: 0

Requirements:

One Credit	Where a compliant rainwater collection system for external/internal irrigation use has been provided to dwellings. **OR** Where dwellings have no individual or communal garden space.

Comments

Wat 03 Water Meter

No. of BREEAM credits available	1		Available contribution to overall score	2.20%	
No. of BREEAM innovation credits	0		Minimum Standards applicable	No	

Assessment Criteria

Where an appropriate water meter for measuring usage of mains potable water meter has been provided to dwelling(s), one credit may be awarded

Indicative Credits: 1

Comments

MATERIALS

Section Weighting: 8%

Indicative Section Score 4.09%

Mat 01 Environmental Impact of Materials

No. of BREEAM credits available	25		Available contribution to overall score	4.44%
No. of BREEAM innovation credits	0		Minimum Standards applicable	No

Assessment Criteria

Up to 25 credits can be awarded, with credits calculated using the Mat 01 calculator tool. The table below shows the maximum number of credits available for each element:

Indicative Credits
10

Elements	Green Guide Rating credits available	Thermal performance credits available*
Roof	5	3
External walls	5	3.8
Internal walls (including separating walls)	5	-
Upper and Ground Floor	5	1.2
Windows	5	2

The full 25 credits represents all of the elements containing refurbished or existing materials that meet the Green Guide Rating of A+(6)

GG Rating	Points for existing / refurbished elements	Points for new elements
A+ (6)	5	
A+ (5)	4.6	
A+ (4)	4.2	
A+ (3)	3.8	
A+ (2)	3.4	
A+	3	3
A	2	2
B	1	1
C	0.5	0.5
D	0.25	0.25
E	0	0

Where the full 25 credits cannot be achieved the score can be 'topped up' with thermal performance credits. The full number of thermal performance credits for each element can be achieved when achieving the minimum U-values shown below.

Elements	Minimum U-Value (W/m2K)
Roof	0.11
External walls	0.15
Internal walls (including separating walls)	-
Upper and Ground Floor	0.15
Windows	1.4

Comments

Mat 02 Responsible Sourcing of Materials

No. of BREEAM credits available	12		Available contribution to overall score	2.13%
No. of BREEAM innovation credits	0		Minimum Standards applicable	Yes

Assessment Criteria

Where new materials are responsibly sourced, up to 12 credits may be awarded where 80% of new materials for an element are responsibly sourced. The credits achieved are dependent on % of point achieved which is based upon the responsible sourcing tier level of each material sourced as detailed below:

Indicative Credits
9

Table 1

Tier level	Points
1	4
2	3.5
3	3
4	2.5
5	2
6	1.5
7	1
8	0

Will all new timber used in the project be sourced in accordance with the UK Government's Timber Procurement
Yes

Table 2

BREEAM credits	% of available points achieved
12	≥54%
10	≥45%
8	≥36%
6	≥ 27%
4	≥ 18%
2	≥ 9%

Comments

CUNDALL

Mat 03 Insulation

No. of BREEAM credits available	8		Available contribution to overall score	1.42%	
No. of BREEAM innovation credits	0		Minimum Standards applicable	No	

Assessment Criteria — **Indicative Credits**

Where any new insulation specified for use within external walls, ground floor, roof and buildings services meet the following requirements: ⇨ 4

Requirements

4 Credits	Where the Insulation Index for new insulation used in the buildings is ≥2
	Where Green Guide ratings are determined using the Green Guide to specification tool

Requirements

4 Credits	Where ≥ 80% of the new thermal insulation used in the building elements is responsibly sourced.

Comments

WASTE — Section Weighting: 3% — Indicative Section Score 2.40%

Was 01 Household Waste

No. of BREEAM credits available	2		Available contribution to overall score	1.20%	
No. of BREEAM innovation credits	0		Minimum Standards applicable	No	

Assessment Criteria — **Indicative Credits**

Where compliant recycling and composting facilities are provided, up to two credits may be awarded as follows ⇨ 2

First Credit - Recycling Facilities

Scenario	Internal recycling storage requirements
Compliant collection scheme in place	3 internal recycling containers provided where recycling is not sorted post
	1 internal recycling container provided where recycling is sorted post collection
	Minimum 30 litre total capacity, no single container less than 7 litre capacity
	Dedicated position in accordance with compliance note 1
No compliant collection scheme in place No adequate external storage	3 internal recycling containers provided
	Minimum 60 litre total capacity
	Dedicated position in accordance with compliance note 1
No compliant collection scheme in place Adequate external storage provided	3 internal recycling containers provided
	Minimum 30 litre total capacity, no single container smaller than 7 litre capacity
	Dedicated position in accordance with compliance note 1

Second credit - Composting facilities

With external space	Without external space
Where a composting service or facility is provided for green/garden waste	Where a composting service or facility is provided for kitchen waste
Where a composting service or facility is provided for kitchen waste	Where an interior container is provided for kitchen composting waste of at least 7 litres
Where an interior container is provided for kitchen composting waste of at least 7 litres	

Comments

Comments

Was 02 Refurbishment Site Waste Management

No. of BREEAM credits available	3		Available contribution to overall score	1.80%	
No. of BREEAM innovation credits	1		Minimum Standards applicable	No	

Assessment Criteria — **Indicative Credits**

Up to three credits are available depending on the site waste management plan to be implemented as follows ⇨ 2

Projects up to £100k

Three Credits	Where waste generated through the refurbishment process is managed in accordance with Checklist A-9
Exemplary Credit	Where a compliant Level 1; Site Waste Management Plan (SWMP) is in place

Indicative Innovation Credits Achieved ⇨ 0

Projects up to £300k

Three Credits	Where a compliant Level 1; Site Waste Management Plan (SWMP) is in place
Exemplary Credit	Where a compliant Level 2; Site Waste Management Plan (SWMP) is in place
	Non-hazardous construction waste generated by the dwellings refurbishment meets or exceeds the resource efficiency benchmark
	The percentage of non-hazardous construction waste and demolition waste generated by the project has been diverted from landfill and meets or exceeds the refurbishment & demolition waste diversion benchmarks

Projects over £300k

First Credit Management Plan	Where a compliant Level 2; Site Waste Management Plan (SWMP) is in place
Second Credit Good Practice Waste Benchmarks	First credit achieved
	Non-hazardous construction waste generated by the dwellings refurbishment meets or exceeds the resource efficiency benchmark
	Amount of waste generated against £100,000 of project value is recorded in the
	Pre-refurbishment audit of the existing building is completed
	If demolition is included as part of the refurbishment programme, then the audit should also cover demolition materials
Third Credit Best Practice Waste Benchmarks	Where the first two credits have been achieved achieved
	Where Non-hazardous demolition waste generated by the dwellings refurbishment meets or exceeds the refurbishment & demolition waste diversion
Exemplary Credit	Where non-hazardous construction waste generated by the dwellings refurbishment meets or exceeds the *exemplary level resource efficiency*
	Where Non-hazardous demolition waste generated by the dwellings refurbishment meets or exceeds the exemplary level diversion benchmarks

Comments

CUNDALL

POLLUTION

Section Weighting: 6%

Indicative Section Score 3.75%

Pol 01 NOx Emissions

No. of BREEAM credits available	3		Available contribution to overall score	2.25%	
No. of BREEAM innovation credits	0		Minimum Standards applicable	No	

Assessment Criteria

Credits are awarded on the basis of NOx emissions arising from the operation of space heating and hot water systems for each refurbished dwelling as follows:

Indicative Credits
2

	Dry NOx Emissions
One Credit	≤100 mg/kWh (NOx class 4 boiler)
Two Credits	≤70 mg/kWh (NOx class 5 boiler)
Three Credits	≤40 mg/kWh

Comments

Pol 02 Surface Water Runoff

No. of BREEAM credits available	3		Available contribution to overall score	2.25%	
No. of BREEAM innovation credits	1		Minimum Standards applicable	No	

Assessment Criteria

Where impacts of the refurbishment on surface water runoff are neutralised or where runoff is reduced as a result of refurbishment, up to three credits can be awarded as follows:

Indicative Credits
1

Requirements

One Credit Neutral Impact on Surface Water	New hard standing areas must be permeable
	If building on to previously permeable area additional run-off must be managed on site
	Calculations should be carried out by an appropriately qualified professional

Requirements

OR Second Credits Reducing Run-Off From Site: Basic	Where the criteria needed for One Credit has been achieved
	Where all run-off from the roof for rainfall depths up to 5 mm, have been managed on site using source control methods
	Include runoff from all existing and new parts of the roof.
	An appropriately qualified professional should be used to design an appropriate drainage strategy for the site

Requirements

OR Three Credits Reducing Run-Off From Site: Advanced	Where run-off as a result of the refurbishment is managed on site using source control
	An appropriately qualified professional should be used to design an appropriate drainage strategy for the site.
	The peak rate of run-off as a result of the refurbishment for the 1 in 100 year event has been reduced by 75% from the existing site.
	The total volume of run-off discharged into the watercourses and sewers as a result of the refurbishment, for a 1 in 100 year event of 6 hour duration has been reduced by 75%.
	An allowance for climate change must be included for all of the above calculations, in accordance with current best practice (PPS25, 2010).

Requirements

Exemplary Credit	Where all run-off from the developed site is managed on site using source control
	The peak rate of run-off as a result of the refurbishment for the 1 in 1 year event is reduced to zero.
	The peak rate of run-off as a result of the refurbishment for the 1 in 100 year event is reduced to zero.
	There is no volume of run-off discharged into the watercourses and sewers as a result of the refurbishment, for a 1 in 100 year event of 6 hour duration.
	An allowance for climate change must be included for all of the above calculations, in accordance with current best practice (PPS25, 2010).

Indicative Innovation Credits Achieved
Please Select

Comments

Pol 03 Flooding

No. of BREEAM credits available	2		Available contribution to overall score	1.50%	
No. of BREEAM innovation credits	0		Minimum Standards applicable	Yes	

Assessment Criteria

Where the dwelling is located in a low flood risk zone, or where in a medium to high flood risk zone and a flood resilience/resistance strategy has been implemented, up to two credits can be awarded as follows:

Indicative Credits
2

Minimum Standards	A minimum of two credits must be achieved for this issue at the Excellent and Outstanding levels

Option 1 - Low Flood Risk

Two Credits	Where a Flood Risk Assessment (FRA) has been carried out and the assessed dwellings are defined as having a low annual probability of flooding.

Option 2 - Medium / High Flood Risk

Two Credits	Where a Flood Risk Assessment (FRA) has been carried out and the assessed dwellings are defined as having a medium or high annual probability of flooding.
	Two credits are awarded where as a result of the dwellings floor level or measures to keep water away the dwelling is defined as achieving avoidance from flooding by following Checklist A-10; Decision Strategy Flow Chart.
	Where avoidance is not possible, two credits are achieved where a full flood resilience/resistance strategy is implemented for the dwellings in accordance with recommendations made by a Suitably Qualified Building Professional

Comments