13 RED LION SQUARE / LONDON / WC1 4SG / SUSTAINABILITY& ENERGY STATEMENT / DECEMBER 2015 / PLANNING APPLICATION ISSUE

/INTEGRATION

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DOCUMENT STATUS

Project: 13 Red Lion Square, London WC1 4SG

Project No.: 224

Client:

In Conjunction with: HWO Architects

Revision	Status	Checked	Date
-	Planning Application Issue	Bojan Cekic	04 December 2015
A	Planning Application Issue	Bojan Cekic	21 December 2015

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CONTENTS

EXECUTIVE SUMMARY

This Sustainability & Energy Statement has been prepared by Integration Consultancy Limited in support of the planning application for the extension and modifications to the existing property at 13 Red Lion Square in the London Borough of Camden. The property is situated within Bloomsbury Conservation Area.

This sustainability statement describes appropriate and viable measures that will be implemented through development design to maximise the energy efficiency of the development. As the development sits within Conservation Area the proposed environmental improvements will be limited as the historic character of the building and surroundings cannot be compromised. For that reason it is envisaged that achieving 'Excellent' status under BREEAM Domestic Refurbishment would be difficult and that the best that can be done is to improve the energy efficiency beyond its current status.

Currently development is in use as residential with number of flats spreading from basement to fourth floor. The proposed changes to the development includes refurbishment to number of existing flats and creation of one additional residential unit by adjusting some existing dwellings layouts including adding a small extension at the back of the property.

Due to extent and nature of the proposed modifications and minor extension to the existing property there is a limited opportunity to reduce the energy demand of the building through passive measures. All building envelop elements (walls and floors) will be retained apart from the roof which will be upgraded to improve the overall thermal performance of the development.

All existing building services systems within the property will be stripped out and replaced with the new, high efficiency plant and equipment to suit the remodelled and extended property. All new systems will be in accordance with, and where possible, exceed the energy efficiency requirements of the Domestic Building Service Compliance Guide.

It is proposed that the new systems will include a high efficiency, individual gas-fired condensing boiler for each apartment with new energy saving controls, variable speed circulating pumps, thermal insulation to all pipework, central mechanical extract ventilation (MEV) for each apartment, low energy LED fixed lighting throughout and A+ rated appliances. The development will also increase water efficiency by minimising water use.

In order to further reduce the CO2 emissions and make the development more energy efficient it is also envisaged that additional measures to protect the property from high rate of air infiltration will be implemented by draught-sealing doors and windows and achieving minimum air permeability requirement of 10 m3/h/m2.

It is demonstrated that with the introduction of upgraded roof and passive design measures in conjunction with low energy, efficient building services systems, a reduction in total regulated CO_2 emissions of 24.5% could be achieved compared with existing / current property.

Solar photovoltaic panels (PV) are considered to be the most practical and financially viable option to integrate renewable energy as part of the proposals. On the advice of HWO Architects installing PV's on the western roof will have a detrimental impact on the setting of Red Lion Square whilst PV installation on the eastern roof slope will have a detrimental impact on the setting of the Listed Buildings. For that reason and due to the need to protect the character and appearance of the property and surroundings it is envisaged that installing PV panels would not be viable solution for the development.

To reduce potable water demand and use the resource efficiently, dual and low flush toilets, flow restrictors on piped water supplies to sinks and basins and the use of water efficient appliances (A+ rated) will be adopted.

A BREEAM Domestic Refurbishment Pre-Assessment has been prepared for the planning application; the following summary demonstrates that the proposed development could achieve 'Good' rating, with a predicted score of 60,68. This is below the 'Excellent' rating required by London Borough of Camden but only due to the lower score in ENE2 energy section. The low score in ENE2 is due to retention of most of building envelope. The minimum standards can be achieved for the Water (60%) and Materials (40%) categories whilst standards for Energy (50%) once all the proposed measures are implemented are just below minimum requirements of 60%.

BREEAM Domestic Refurbishment 2012 Pre-Assessment Estimator v0.6: Results Summary

BREEAM

Building name	13 Red Lion Square
Indicative Building Score	60.68%
Indicative Building Rating	BREEAM Good

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.

Issue	Credits Available	Indicative Credits Achieved	Weighting	Section Score
Man 01	3	3	12%	8.33%
Man 02	2	1		
Man 03	1	1		
Man 04	2	0		
Man 05	1	1		
Man 06	2	2		
Hea 01	2	1	17%	9.92%
Hea 02	4	2		
Hea 03	1	1		
Hea 04	2	0		
Hea 05	2	2		
Hea 06	1	1		
Ene 01	6	0	43%	21.50%
Ene 02	4	1.5		
Ene 03	7	4		
Ene 04	2	0		
Ene 05	2	2		
Ene 06	1	1		
Ene 07	2	2		
Ene 08	2	2		
Ene 09	2	1		
Ene 10	1	1		
Wat 01	3	2	11%	8.80%
Wat 02	1	1		
Wat 03	1	1		
Mat 01	25	8	8%	2.84%
Mat 02	12	0		
Mat 03	8	8		
Was 01	2	2	3%	2.40%
Was 02	3	2		
Pol 01	3	3	6%	4.50%
Pol 02	3	1		
Pol 02	2	2		
Innovation	10	2	N/A	2.00%

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

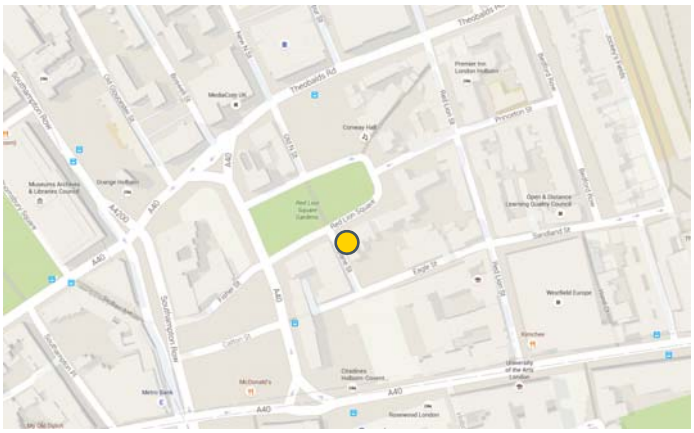
1 INTRODUCTION

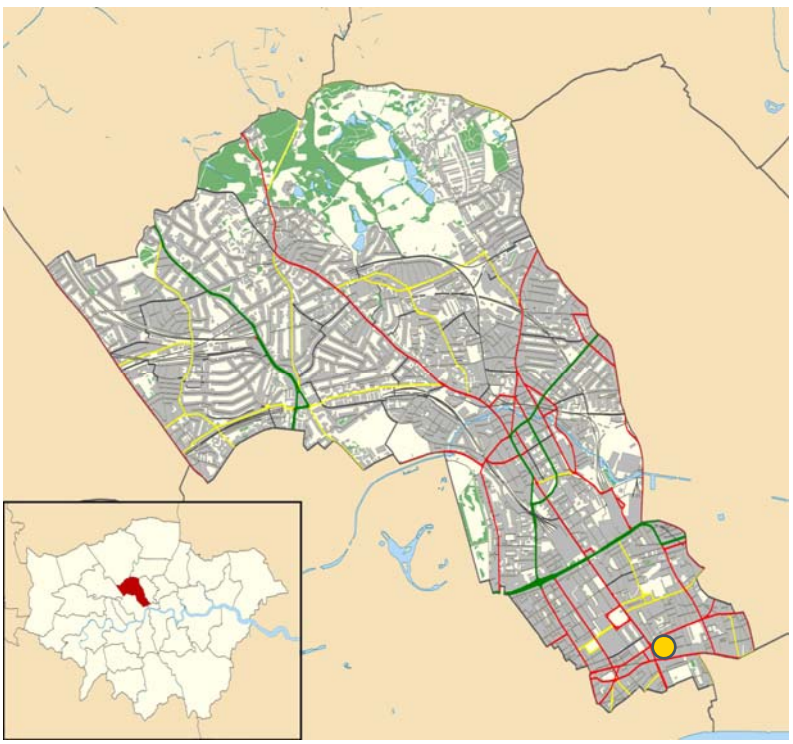
This Sustainability & Energy Statement has been prepared by Integration Consultancy Limited in support of the planning application for the refurbishment of the existing property at 13 Red Lion Square in the London Borough of Camden. The report is one of several documents that accompany the planning application and should be read in conjunction with these.

The purpose of this report is to set out how sustainability is integrated into the design and construction of the proposals, to demonstrate the design approach and the measures adopted to meet the sustainability targets set out in the London Borough of Camden Strategic Policies.

The Development Site

The site comprises an existing six storey (basement + ground + four) mixed use development of approximately 950m^2. Currently development is already in use as a residential development with number of flats spreading from basement to fourth floor. The proposed changes to the development includes refurbishment of all existing flats and creation of one additional residential unit by adjusting some existing dwellings layouts including adding a small extension at the back of the property. Once refurbished the proposed development will consist of 13 residential units (one, two, three and four bedroom apartments).





LONDON BOROUGH OF CAMDEN

2 PLANNING POLICY CONTEXT

The London Plan 2015 – Chapter 5: London's Response to Climate Change

Regional policy in London is controlled by The Greater London Authority, and is set out in The London Plan, adopted March 2015. The Plan sets out policy and guidance in the London context and identifies a number of main objectives related to improving London as a workplace and living place.

The concept of sustainable development runs through the London Plan and all its policies with reference to topics including Places, People, Economy, Response to climate change, Transport, and Living places and spaces. Chapter 5 of the London Plan sets out a range of policies in relation to climate change, including climate change mitigation and adaptation, waste, aggregates, contaminated land and hazardous substances.

Key policies within the London Plan which are applicable to the proposed development and addressed in this report are:

POLICY 5.2 -MINIMISING CARBON DIOXIDE EMISSIONS

Planning Decisions

A 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 efficiently

3 Be green: use renewable energy

B The Mayor will work with boroughs and developers to ensure that major developments meet the following targets for carbon dioxide emissions reduction in buildings. These targets are expressed as minimum improvements over the Target Emission Rate (TER) outlined in the national Building Regulations leading to zero carbon residential buildings from 2016 and zero carbon non-domestic buildings from 2019.

Residential Buildings:

Year	Improvement on 2010 Building Regulations
2010 – 2013	25 per cent
2013 – 2016	40 per cent
2016 – 2031	Zero carbon

Other key policies within the London Plan which are applicable to the proposed development and addressed in this report are:

- 5.3 - Sustainable Design & Construction
- 5.4 - Retrofitting
- 5.6 - Decentralised Energy In Development Proposals
- 5.7 - Renewable Energy
- 5.8 – Innovative Energy Technologies
- 5.9 - Overheating & Cooling
- 5.13 – Sustainable Drainage
- 5.15 - Water Use & Supplies

London Borough of Camden Relevant Policies

The sustainability and energy strategy for the property will be developed in accordance with London Borough of Camden's Local Development Framework, specifically the following policies:

- Core Strategy Policy CS13: Tackling climate change through promoting higher environmental standards
- Development Policy DP22: Promoting Sustainable Design and Construction
- Development Policy DP23: Water
- Camden Planning Guidance CPG3: Sustainability

Core Strategy Policy CS13: Tackling Climate Change through Promoting Higher Environmental Standards

Camden's Core Strategy sets out the key elements of the Council's planning vision and strategy for the borough and is the central part of the Local Development Framework.

Core Strategy Policy CS13 sets out the Council's commitment to reducing Camden's carbon dioxide emissions in line with the national target of 80% by 2050. Applicable policy for the proposed extension and modifications to the development at 13 Red Lion Square is:

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,

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 retention of the existing building and development of the existing land is considered an efficient use of land and buildings. The proposed development will minimise carbon emissions through enhancements to the thermal performance of the building fabric (roof), passive design measures and the use of energy efficient active building services systems.

Development Policy DP22: Promoting Sustainable Design and Construction

The London Borough of Camden Local Development Framework - Development Management Policies 2010-2025, sets out a long term planning vision and strategic objectives for future development in the area.

Development Policy DP22 sets out the Council's approach to improving energy conservation, efficiency and sustainability.

Applicable policy for the proposed extended property is:

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

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

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

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;

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.

Although area of the development that has a requirement for planning permission and falls under Development Policy DP22 is below 500m^2 and is affecting less than 5 properties overall the proposed new development once redeveloped will have a floor area greater than 500m^2. Therefore in order to strive for best achievable practice this report applied the BREEAM standards to the entire development. A sustainability assessment will be undertaken using BREEAM Domestic Refurbishment 2014 as the assessment tool. This has superseded EcoHomes which is referenced in DP22.

Appropriate climate change adaptation measures will be incorporated into the proposals, including recycling and where possible, renewable energy systems.

The basement area is not in a flood prone area.

Development Policy DP23: Water

Development Policy DP23 sets out the Council's approach to the efficient use and disposal of water and the minimisation of surface water run-off.

Applicable policy for the extended property is:

The Council will require developments to reduce their water consumption, the pressure on the combined sewer network and the risk of flooding by:

a) incorporating water efficient features and equipment and capturing, retaining and re-using surface water and grey water on-site;

b) limiting the amount and rate of run-off and waste water entering the combined storm water and sewer network through the methods outlined in part a) and other sustainable urban drainage methods to reduce the risk of flooding.

To reduce potable water demand and use the resource efficiently, dual and low flush toilets, flow restrictors on piped water supplies to sinks and basins and the use of water efficient appliances (A+ rated) will be adopted.

Camden Planning Guidance CPG3: Sustainability

Camden Planning guidance CPG3 is a Supplementary Planning Document including additional "material considerations" in planning decisions. The document provides information on ways to achieve carbon reductions and more sustainable developments. It also highlights the Council's requirements and guidelines which support the relevant Local Development Framework (LDF) policies.

The majority of the guidance within this document is relevant to the proposals for 13 Red Lion Square, however the key issues and requirements are:

2 The Energy Hierarchy

All developments are to be design to reduce carbon dioxide emissions

Energy strategies are to be designed following the steps set out by the energy hierarchy

1. Be lean: use less energy
2. Be clean: supply energy efficiently
3. Be green: use renewable energy

4 Energy Efficiency: Existing Buildings

All buildings, whether being updated or refurbished, are expected to reduce their carbon emissions by making improvements to the existing building. Work involving a change of use or an extension to an existing property is included. As a guide, at least 10% of the project cost should be spent on the improvements.

Development involving a change of use or a conversion of 5 or more dwellings or 500sq m of any floorspace, will be expected to achieve 60% of the un-weighted credits in the Energy category in their BREEAM assessment.

Special consideration will be given to buildings that are protected e.g. listed buildings to ensure that their historic and architectural features are preserved.

6 Renewable Energy

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.

7 Water Efficiency

The Council expects all developments to be designed to be water efficient by minimising water use and maximising the re-use of water. This includes new and existing buildings.

9 Sustainability Assessment Tools

A BREEAM Domestic Refurbishment Assessment will be required, a rating of 'Excellent' will be targeted with a minimum standard achieved for the following categories:

- Energy – 60%
- Water – 60%
- Materials – 40%

10 Brown Roofs, Green Roofs and Green Walls

The Council will expect all developments to incorporate brown roofs, green roofs and green walls unless it is demonstrated this is not possible or appropriate. This includes new and existing buildings. Special consideration will be given to historic buildings to ensure historic and architectural features are preserved.

Summary of Key Policy Requirements

1. A BREEAM Domestic Refurbishment Assessment will be required, a rating of 'Excellent' will be targeted with a minimum standard achieved for the following categories:
   - Energy – 60%
   - Water – 60%
   - Materials – 40%
2. The property should be designed to be water efficient by minimising water use and maximising the re-use of water, i.e. grey water and rainwater collection and re-distribution systems should be incorporated

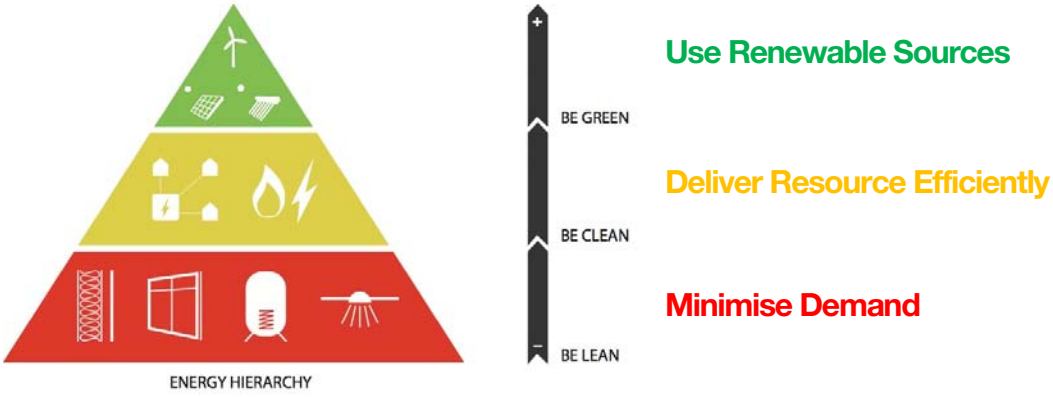
3 ENERGY STRATEGY

The Energy Strategy for 13 Red Lion Square will have the potential to generate carbon savings over the lifetime of the property. The objective is to develop an energy infrastructure that supplies low carbon energy, reduces energy bills for the home occupier, provides a high quality internal environment, is adaptable and able to accommodate future upgrades and retrofits.

The BREEAM Domestic Refurbishment Assessment will be used to demonstrate that sustainability is integral to the design, construction, operation and performance of the proposed property, outlining the design principles proposed across a wide range of criteria, i.e. Energy, Water, Materials, Surface Water run-off, Waste, Pollution, Health & Well-Being, Management, Ecology.

The Energy Hierarchy

The energy hierarchy referred to in the London Plan and Camden Planning Guidance CPG3 suggests a three-step approach to decision making and prioritizing strategies for the reduction of resource consumption and carbon emissions from energy. This approach is applicable to other resources such as water, waste and construction materials.



ENERGY HIERARCHY

Minimising Demand

The incorporation of appropriate passive measures in the building design is essential if the building services systems are to be efficient and economic. Passive design measures are integral to the building form and fabric and therefore have the greatest influence on carbon emissions throughout the life cycle of a building.

The development of passive design strategies starts by identifying site-specific challenges and opportunities, considering the microclimate, location and surroundings and applying them to the building form, façade and orientation.

Due to the extent and nature of the proposed modifications to existing development (refurbishment and small extension) there is a limited opportunity to significantly reduce the energy demand by enhancing the performance of existing fabric elements, and introducing new elements with low U values.

Building Fabric Performance & Insulation

Thermal insulation must be able to deliver significant carbon emissions reductions throughout the life of the development. High levels of insulation will significantly reduce energy consumption and ensure optimum occupant comfort all year round by retaining heat in the winter and reducing heat gain in the summer. For the existing retained elements of the roof of the development, this will be achieved by the introduction of additional insulation and membranes to reduce air leakage.

This is particularly relevant for glazed surfaces that may suffer from overheating in summer or overcooling and condensation formation in winter. It is envisaged that the existing windows will not be upgraded due to the development being situated within the Conservation Area.

The following proposed U values will be targeted, this data is used in the calculation of the annual energy demand for the proposed extended property.

External Fabric Element	Existing U-Values ($W/m^2 K$)	Building Regulations Part L1B Requirements for Upgraded Thermal Elements ($W/m^2 K$)		Proposed U Values ($W/m^2 K$)	
		Threshold U-Value	Improved U-Value	Retained Elements	New Elements
External Wall	2.00	0.70	0.30	2.00	0.18
Floor	2.00	0.70	0.25	2.00	0.15
Roof	2.30	0.35	0.18	0.18	0.18
Glazing	5.50	n/a	1.60	5.50	1.40

It can be seen from the table above that the proposed U values for the retained thermal elements will not change apart from U values for the roof which will be upgraded and will comply with the minimum requirements for compliance with Part L1B.

Air Tightness & Infiltration

The target air-permeability rate is 10 $m^3/m^2/h$, achieved though appropriate selection of materials and seals and design of airtight details. In order to protect the property from high rate of air infiltration draught-sealing doors and windows will be implemented.

Natural Ventilation & Thermal Mass

Daytime natural ventilation is essential to purge excess heat during the summer months and enables rapid dilution of pollutants. When used in combination with exposed thermal mass, natural ventilation will reduce high internal daily temperature variations which will minimise the overheating risk in the summer. Therefore occupant comfort can be maintained without sole reliance on the mechanical cooling or ventilation systems.

Solar Exposure and Daylight

Maximising exposure to solar energy and daylight is essential to reduce reliance on artificial lighting reducing winter daytime heating requirements and to contribute to the general wellbeing of occupants.

The site has average access to solar energy and natural daylight, as the property is set in extensive grounds, neighbouring buildings are a in a close proximity at the side of the property and therefore some overshadowing will limit access to natural daylight.

The primary living areas will have access to large glazed areas to maximise sunlight/daylight deep into the plan, reducing reliance on artificial lighting. All habitable spaces within the building will have manually openable windows to maximise natural cross ventilation to minimise overheating risk during the summer.

Active Systems

All existing building services systems within the property will be removed and replaced with new high efficiency systems and plant to suit the remodelled and extended property. All new systems will be in accordance with and where possible exceed the energy efficiency requirements of the Domestic Building Service Compliance Guide.

It is proposed that the primary heat source serving each property will be a high efficiency, individual gas-fired condensing boiler within each flat with new energy saving, variable speed circulating pumps and thermal insulation to all pipework. It is envisaged that due to space constraints individual boilers are preferred to central heating plant.

Within each flat individual MEV system will be installed. Dedicated centralised extract system (MEV) in each flat will serve all the wet rooms within each flat. As air leakage is still significant it is envisaged that this would negate any requirement for trickle vents in the façade thus allowing retention of existing windows. Systems will be designed and low energy fans selected to ensure a low specific fan power (SFP) and electrical consumption.

The heating systems will be controlled via a new central automatic control system, providing weather compensation, optimised start and time clock and temperature control to each individual room.

Low energy fixed lighting, generally comprising LED fittings, will be installed throughout the property.

It is proposed that domestic white goods are in line with BREEAM criteria 'Ene 5– Energy Labelled White Goods', all fridges, freezers, washing machines or tumble dryers will have an A or A+ rating under the EU Energy Labelling Scheme.

Delivering Resources Efficiently

Policy 5.6 of the London Plan and Camden Planning Guidance CPG3, requires developments to connect to a decentralised energy network and use the heat unless it can demonstrate it is not technically feasible or financially viable.

The property is located in the South of the borough of Camden, therefore connection to an existing district heating network is unlikely to be viable, the scheme is also not in an area which is deemed to be viable for a future district heating network.

Renewable & Low Energy Technology Systems

In accordance with Policy 5.7 of the London Plan and Camden Planning Guidance CPG3, the table below summarises the viability assessment for the most applicable renewable energy and low carbon technologies that could be installed to meet the target 20 % CO_2 emissions reduction. Capital and operational costs, local availability of renewable energy resource, local pollution, environmental impact, commercial availability, maintenance, control and operational issues, and carbon emissions are considered.

Technology			Assessment / Viability
	**Wind Power**	Wind turbine installed on the roof or within the grounds of the property.	Due to the suburban location, and the impacts in terms of visual appearance, noise and shadow flicker, wind turbines are not considered a viable technology for the property. **VISUALLY AND TECHNICALY INAPPROPRIATE**
	**Ground Source Heat Pump**	Open or closed loop GSHP system requiring extraction of ground water and / or deep boreholes.	High carbon reduction potential with no external visual impact. The available surface area of the existing garden would be insufficient for a horizontal geothermal collector, therefore a borehole system would be necessary requiring a significant investment, the construction of the boreholes would likely to be in excess of 5% of the total project budget. Considering the proposed fabric improvements and other measures to improve the energy efficiency of the property, this system will result in the total cost of energy efficiency measures to exceed 20% of the total project budget and would jeopardise the financial viability of the proposed extension. **NOT CONSIDERED FINANCIALLY VIABLE**
	**Air Source Heat Pump**	Electric powered external plant serving each residential unit providing heating and cooling	Simple and economic system utilises grid electricity - resultant CO_2 reductions cannot match other options available due to the relatively low COP, this efficiency is further reduced when generating domestic hot water. Siting of external units may have visual / planning and noise impact. **NOT CONSIDERED TECHNICALLY VIABLE**
	**Solar Thermal Collectors**	Roof mounted solar thermal panels providing heating energy to a centralised domestic hot water system	Roofs have good potential for solar thermal energy collection. Solar hot water collectors have a high efficiency and would provide a significant proportion of domestic hot water demand of the development. However PV systems have a greater carbon reduction potential and are more cost effective over the lifetime of the building for the same roof area coverage. **NOT CONSIDERED TECHNICALLY VIABLE**
	**Solar Photovoltaic Panels**	Roof mounted Photovoltaic panels (PV) provide electricity directly to the development, exporting any surplus production to the grid.	Roofs have good potential for solar power generation. PV electricity is clean and zero-carbon and will offset carbon intensive grid power. Unlike solar thermal systems, all electricity produced by PVs can be utilised with negligible losses regardless of the installation size/capacity. **POTENTIALLY VIABLE BUT CONSIDERATION SHOULD BE TAKEN TO PROTECT THE CHARACTER AND APPEARANCE**
	**Solar PV-Thermal Panes**	Emerging hybrid system, combination of the Solar Thermal Panels for heat supply and PV panels for electrical power supply.	Hybrid solar thermal + PV systems enhance efficiency by cooling exposed PV cells. Water is circulated on the rear of the panel and the heat is supplied to the building. There are few UK suppliers of PVT systems and installation will require significant investment. **NOT CONSIDERED FINANCIALLY VIABLE**
	**Biomass Heating**	Biomass fired community heating system.	Biomass heating is proven technology and is likely to provide a significant CO_2 reduction. The size of fuel storage, delivery management and local increase in pollution, notably particulates (PM10), SO_2 and NO_x emissions should be considered, The entire borough of Camden is an Air Quality Management Area (AQMA) which states that small biomass boilers are not suitable in AQMA's unless they have no adverse effects on local air quality compared to conventional gas fired boilers. **NOT CONSIDERED TECHNICALLY VIABLE**

Solar PV panels are considered to be the most practical and financially viable option to integrate renewable energy as part of the development. However due to the age and character of the property, it's location within the Conservation Area it is not considered feasible to install PV panels on the existing pitched roof of the property without causing harm to the character and appearance of the development and the surrounding area.

Energy Demand & CO_2 Emissions

The energy demand and carbon emissions calculations for Regulated Energy for both the existing and proposed dwelling have been prepared using SAP 2009 software. The calculations are based on the existing building construction details and heating systems and the proposed new and upgraded U values and building services systems detailed in this report.

Energy Demand

Energy Use	Energy Demand (kWh /year)		Energy Demand Rate (kWh/ m^2 / year)	
	Existing	Proposed (1)	Existing	Proposed (1)
Space Heating	195,659	146,801	206	154
Water Heating	32,314	31,353	34	33
Regulated Electricity	38,900	22,715	41	24
Total	**266,873**	**200,869**	**281**	**211**

(1) Calculated energy demand data for the proposed development following demand reduction measures, i.e. fabric improvements, passive design measure and energy efficient active building services systems.

The predicted total annual energy demand of the proposed property following the introduction of energy efficiency measures, passive design and low energy technologies is 200,869 kWh compared to the existing property demand of 266,873 kWh, which demonstrates a demand reduction of 24.7%.

The following table details the potential subsequent reduction in CO_2 emissions as a result of the improvements to the energy demand.

CO_2 Emissions

Energy Use	Emissions (kg CO_2 /year)		Emissions Rate (kg CO_2/ m^2 / year)	
	Existing	Proposed	Existing	Proposed
Space Heating	37,978	28,493	40,0	30,0
Water Heating	6,270	6,085	6,6	6,4
Regulated Electricity	6,892	4,030	7,3	4,2
Total	**51,140**	**38,608**	**53,1**	**40,6**

(1) Calculated carbon reduction data for the proposed dwelling following demand reduction measures, i.e. fabric improvements, passive design measure and energy efficient active building services systems.

The predicted total annual CO_2 emissions of the proposed property following the introduction of energy efficiency and passive design measures is 38,608 Kg compared to the existing property demand of 51,140 Kg, this demonstrates a CO_2 emissions reduction of 24.5%. This represents a significant improvement in carbon emissions, equating to a reduction of 12.5Kg per sq.m or 23.5%.

4 BREEAM Domestic Refurbishment

Camden Planning Guidance CPG3 requirement for the proposed extended property is to be designed and constructed in accordance with BREEAM Domestic Refurbishment. The assessment should target a 'Very Good' rating with a minimum standard achieved for the following categories:

- Energy – 60%
- Water – 60%
- Materials – 40%

A BREEAM Domestic Refurbishment Pre-Assessment has been undertaken for the property and a summary is included as an appendix to this report. In order to strive for best achievable practice this report applied the BREEAM standards to the entire development.

Scope of BREEAM Domestic Refurbishment 2014

The scheme is used to assess the environmental life cycle impacts of refurbishment projects including existing dwelling undergoing refurbishment, extensions, domestic conversions and change of use projects. The primary aim is to improve the environmental performance of existing dwellings in an appropriate and cost effective manner. This is achieved through integration and use of the scheme at key stages in the refurbishment process and enables the client to measure, evaluate and reflect the performance of their refurbishment project against best practice through an independent and robust process.

This performance is quantified by a number of individual measures and associated criteria across a holistic range of environmental issues, listed below, which is ultimately expressed as a single certified BREEAM rating.

- Energy
- Water
- Materials
- Pollution
- Health and Wellbeing
- Waste
- Management
- Innovation

'Domestic Refurbishment' is classified under two categories:

- Category 1: Alterations to existing dwellings and extensions
- Category 2: Domestic conversions and change of use projects

For the purposes of this development the scheme will be considered as a Category 1 project.

BREEAM Rating Benchmarks

The BREEAM rating benchmarks for domestic refurbishment projects assessed using the 2014 version of BREEAM Domestic Refurbishment are detailed below. The benchmark levels enable a client or other stakeholder to compare an individual building's performance with other BREEAM rated buildings and the typical sustainability performance of refurbished domestic buildings in the UK.

BREEAM Rating	Score	equivalent to:
OUTSTANDING	≥85	Less than top 1% of UK domestic refurbishments (innovator)
EXCELLENT	≥70	Top 10 of UK domestic refurbishments (best practice)
VERY GOOD	≥55	Top 25% of UK domestic refurbishments (advanced good practice)
GOOD	≥45	Top 50% of UK domestic refurbishments (intermediate good practice)
PASS	≥30	Top 75 of UK domestic refurbishments (standard good practice)
UNCLASSIFIED	<30	Performance that fails to meet either the BREEAM minimum standards of performance for key environmental issues or the overall threshold score required for formal BREEAM certification.

BREEAM Domestic Refurbishment 2014 Summary Compliance

Energy Reduction

The refurbished property will benefit from:

1. Upgraded pumps for heating and domestic water services.
2. 100% Low energy lighting throughout the dwelling.
3. Improved thermal envelope (Roof) to reduce energy consumption
4. Energy efficient white goods
    - Fridges, Freezers and Fridge-Freezers A+ Rating under EU Energy Efficiency Labelling Scheme
    - Washing Machine A++ under EU Energy Efficiency Labelling Scheme
    - Dishwasher A+ under EU Energy Efficiency Labelling Scheme
5. New high efficiency individual gas-fired boilers and low energy pumps significantly improving the efficiency of the heating to the property, this will be further enhanced by incorporating zonal heating to the dwelling, reducing the need for the whole property to be heated, considerably reducing energy consumption
6. Air tightness, the dwelling will benefit from a range of measures which will improve the air tightness of the dwelling.

Thermal Efficiency

Currently the dwelling has poor levels of insulation in the roof, walls and floor. The proposed design has sought to improve some of these elements retrospectively wherever possible. The following improvements have been made:

1. Roof to have mineral wool insulation between the rafters and an insulated plasterboard finish. This will improve the U Value from current 2.3 W/m^2 K to 0.18 W/m^2 K.

The improvements to the dwelling will adopt a fabric first approach to reducing the energy consumption; this is in accordance with the Building Regulations Approved Documents Part L1.

Energy Management

The dwelling will benefit from the following measures that will allow energy to be regulated:

1. Time, temperature and zone control of heating in the dwelling

Water Consumption

All water consuming appliances will be removed and modern systems will be supplied with the following flow rates:

- WCs - 4.5/2.5 litre dual flush
- Showers - 12 litres per minute
- Baths - 200-250 litres to overflow
- Kitchen taps - 6 litres per minute
- Basin taps - 4 litres per minute
- Washing Machines - 7 litres per kg dry load
- Dishwashers - 1 litre per place setting

Transport

The dwelling will incorporate a cycle store within the designated area at ground floor. This will give the residents a safe and convenient location to store bicycles and will also provide greater transport options.

The site benefits from gaining a London Public Transport Accessibility Level (PTAL) of 6. This demonstrates the site is well placed for public transport.

Materials

All new materials will be responsibly sourced according to the BRE`s Green Guide to Specification document. All existing elements will achieve an A rating. Any new building elements will be sourced from companies that supply materials with either tier 1 or tier 2 responsible sourcing schemes.

All timber will be sourced in line with the UK Governments Procurement policy for Timber.

A pre-demolition audit will be under taken with the following targets set for diversion from landfill:

- 70% non-hazardous construction waste
- 80% non-hazardous demolition waste

Where possible a minimum of 10% of materials will be sourced from recycled and re-used sources to ensure compliance with Camden Boroughs policy DP22 Promoting Sustainable Design and Construction

Ecology

The majority of construction works will be internal and there will be minimal impact on the external landscape once the works are completed.

User Comfort

The dwelling will be improved to ensure that the future dwelling users will live in a modern comfortable home, providing the following:

1. The property will benefit from having hard-wired fire detection systems. This will improve the safety of the future occupants.
2. All new building finishes (where relevant) will be sourced to have low VOC's
3. The property will have significantly improved ventilation. The ventilation measures will comply with or exceed the requirements of Building Regulations Approved Document F Section 7.

5 CONCLUSIONS

BE LEAN - Minimise Demand

Energy demand from the proposed property will be minimised via a series of passive and active system demand reduction measures.

The thermal performance of all new exposed elements will exceed the minimum requirements for Building Regulations compliance. Some retained elements (roof) will be significantly upgraded to improve the overall thermal performance of the development.

All existing building services systems within the property will be stripped out and replaced with new, high efficiency plant and equipment to suit the remodelled and extended property. All new systems will be in accordance with, and where possible, exceed the energy efficiency requirements of the Domestic Building Service Compliance Guide.

BE CLEAN - Deliver Resource Efficiently

Connection to an existing district heating network is unlikely to be viable due to the location of the development; the scheme is also not in an area which is deemed to be viable for a future district heating network.

BE GREEN - Use Renewable Sources

Solar PV panels are considered to be the most practical and financially viable option to integrate renewable energy, however due to the age and character of the property and its location within the Conservation Area it is not considered feasible to install PV panels on existing pitched roof of the property without causing harm to the character and appearance of the Conservation Area.

SUMMARY

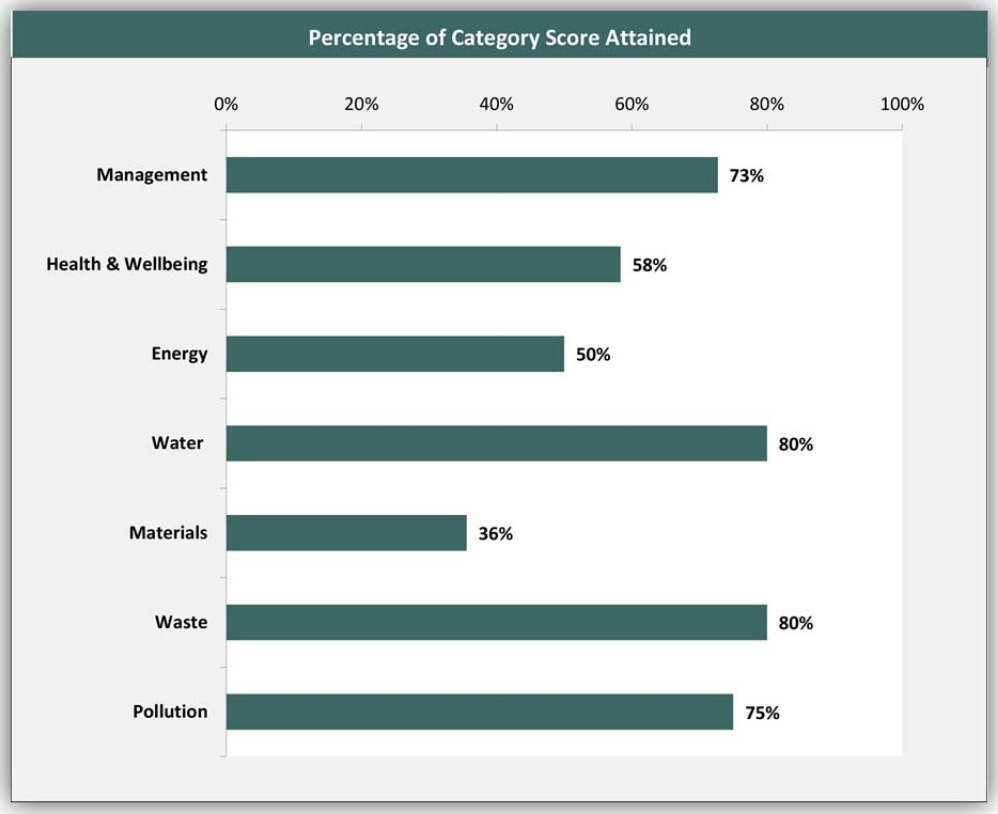
It is demonstrated that with the introduction of new and upgraded external fabric elements and passive design measures in conjunction with low energy, efficient building services systems, a reduction in total regulated CO_2 emissions of 24.5% could be achieved compared with existing / current property.

The installation of the solar PV panels at the available roof areas would not achieve the 20% reduction in CO_2 emissions set out under Policy CS13, and due to constraints and protection of the character and appearance of the property PV installation has not being considered.

To reduce potable water demand and use the resource efficiently, dual and low flush toilets, flow restrictors on piped water supplies to sinks and basins and the use of water efficient appliances (A+ rated) will be adopted.

The total consumption calculated equates to 115 litres per person per day using the BREEAM Refurbishment 2012 – Domestic Buildings Water Calculator Tool; this would satisfy the minimum standards requirements for an ‘Excellent’ rating.

A BREEAM Domestic Refurbishment Pre-Assessment has been prepared for the planning application, the assessment demonstrates that the proposed development could achieve a ‘Good’ rating, with a predicted score of 61, this would be below the ‘Excellent’ rating required by London Borough of Camden but the development would strive to achieve the minimum standards for the Water (60%) and Materials (40%) categories with Energy (50%) being close to 60% target.


Percentage of Category Score Attained
0%
20%
40%
60%
80%
100%
Management
73%
Health & Wellbeing
58%
Energy
50%
Water
80%
Materials
36%
Waste
80%
Pollution
75%

6 APPENDIX 1 - Checklist for Retro-Fitting Measures

The following checklist for retro-fitting measures details the measures included in the design proposals. The checklist is in accordance with Camden Planning Guidance CPG3, section 4, Energy Efficiency: Existing Buildings, as required for conversions and extensions over 30m^2.

Measures	Proposal / Details
Draught proofing	All existing doors and windows to be upgraded where possible with sealed units
Reflective radiator panels	Existing radiators removed and replaced with new radiators
Overhauling/upgrading windows	All windows to be retained.
New boiler	Existing boiler will be removed and replaced with new high efficiency gas fired condensing boiler.
LED lighting	All existing lighting will be removed and replaced with low energy LED lighting
Meters, timers, sensors, controls on heating or lighting	A new comprehensive automatic controls system will be installed throughout the development to provide weather compensation, optimised start and time clock and temperature control to each individual room of the property.
Mechanical Ventilation	All dwellings will be mechanically ventilated via centralised extract fans (MEV) installed within each dwelling. Systems will be designed and low energy fans selected to ensure a low specific fan power (SFP) and electrical consumption.
Insulation ▪ Hot water tank & pipes ▪ Roof ▪ Walls Internal ▪ Walls External ▪ Floor	Where dwellings have more than one bathroom hot water tanks will be installed to allow for more efficient use of domestic hot water heating. Hot water tanks and pipes will be insulated in accordance with the requirements of the Domestic Building Services Compliance Guide. All retained thermal elements will have the same U values apart from the roof which will be significantly upgraded to improve the overall thermal performance of the development.
Renewable energy technology ▪ Solar PV panels ▪ Solar thermal (hot water) panels ▪ Ground source heat pumps	Solar PV panels could be installed on the existing roof of the development, but this would be subject to the visual impact.
Combined heat and power unit	CHP not considered financially viable or appropriate.
Green or brown roof	A green roof is not proposed due to the impact on the character and appearance of the Conservation Area.
Rainwater harvesting	Rainwater from the roofs and hard landscaped areas is not being considered.

7 APPENDIX 2 – BREEAM Domestic Refurbishment Pre-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	13 Red Lion Square
Indicative building score (%)	60.68%
Indicative BREEAM rating	BREEAM 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: 2.00%

Comments

This assessment has been completed for the entire development. The development overall will achieve a score of 30% CO2 emission reductions.

MANAGEMENT

Section Weighting: 12% — Indicative Section Score: 8.73%

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: 3

Comments

A Home user guide will be provided to the dwelling

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: 1

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
Alternative Compliant Scheme	Exemplary Level Compliance
Checklist A-3*	All Items (Optional & Mandatory)

Indicative Innovation Credits Achieved: 0

* 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: 1

	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

Depending on the project value either <£300K or >£300K the route to compliance will change. Policy DP26 of Camdens policies require dust and other factors. This should be targeted to show compliance with the policy

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
		0
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

All existing single glazed doors and windows will be retained.

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:

		Achieved
		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	

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

Comments

An initial site survey shell be completed, the survey will follow the procedures set out in BREEAM guidance. If any features of ecological value are found then a fully qualified ecologist would be employed to achieve this credit.

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		1
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

BREEAM assessor to be appointed at an early stage.

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

Indicative Credits: 1

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:

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

First Credit Maintaining Good Daylighting	New spaces achieve minimum daylighting levels
	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

To gain a credit under this issue, the refurbishment works would need to have a neutral impact on the dwelling's daylighting levels in the kitchen, living room, dining room and study (see issue Ene 10: Home Office). A full daylight assessment of the existing and proposed units will have to be undertaken for this credit
Two credits would be targeted in this scenario.

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

Indicative Credits: 2

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

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

Historic Building, improvement of 3dB compared to prior to refurbishment.

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

Internal finishes and fittings that emit high levels of volatile organic compounds would be avoided in the development specification.
One available credit for this issue would be targeted in this scenario.

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: 0

	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: 0

Comments

Credits not targeted.

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

NB: MINIMUM STANDARD FOR BREEAM 'Excellent': 1 CREDIT
Two available credits would be targeted , all criterias for historic building to be achieved.

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

MINIMUM STANDARD FOR BREEAM 'Excellent': 1 CREDIT A mandatory credit for all BREEAM ratings, fire and carbon monoxide detection systems would be installed, meeting the following requirements: • The fire detection system would need to be a Grade D, Category LD3 system in accordance with BS 5839-6: 2004, positioned in accordance with Approved Document B.
• Carbon Monoxide detection systems would need to meet BS EN 50291-1:2001 (40), positioned in accordance with BS EN 50292:2002.

ENERGY

Section Weighting: 43%

Indicative Section Score 21.50%

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
0

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

To gain credits the energy efficiency of the dwelling would need to be improved, thus reducing its associated CO2 emissions. To evaluate the level of improvement, the BREEAM Domestic Refurbishment Energy Calculator would be used to calculate the Energy Efficiency Rating for before and after refurbishment, with information obtained from full SAP 2009 energy modelling.

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
1.5

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

A follow-on from the previous issue, the dwelling's post-refurbishment Energy Efficiency Rating (equivalent to its SAP rating) would equate to a BREEAM benchmark, and credits awarded according to its 'as built' rating. A SAP assessment has been carried out and the development avarage EER value estiamted just below 65

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
4

Primary Energy Demand Post Refurbishment (kWh/m^2/year)	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

To gain credits efforts would have to be made to reduce the absolute total regulated energy demand of the dwelling, as a result of refurbishment. A SAP assessment has been carried out for the development

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

A range of solar PV panels could be considered to gain atleast a 10% reduction. 20% would be favoured by the council

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

Fridge and freezers or fridge freezers have an A+ rating or better under the EU Energy Efficiency Labelling Scheme
Washing machines have an A++ rating or better under the EU Energy Efficiency Labelling Scheme, Dishwashers have an A+ rating or better under the EU Energy Efficiency Labelling Scheme AND Washer-dryers and tumble dryers have an A rating or better under the EU Energy Efficiency Labelling Scheme

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: 1

1 Credit

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

Comments

For the drying space credit, 6m+ of clothes-drying line would be provided to the dwelling, fixed within an external space or an adequate, secure internal space, ventilated in accordance with Part F of the building regulations.

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: 2

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

For lighting credits, energy efficient lighting would be specified throughout the dwelling. The internal lighting system would need to have an energy demand of no more than 9 watts/m2 of the total floor area, and external lighting would meet the BRE's requirements for Energy Efficient Space Lighting.

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	**Indicative Innovation Credits Achieved**
	Where any compliant Energy Display Device is capable of recording consumption data	1

Comments

To gain the energy display devices credit, a visual display device would be specified, fixed in a location within the dwelling that would be visible to occupants.
The device should also have the function of recording consumption data.

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

1 Cycle space per dweling will be provided to the development.

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	**Indicative Credits**
Where sufficient space and services will be provided to allow occupants to set up a home office in a suitable room with adequate ventilation	1

Comments

A home office is to be provided to each residential unit.

WATER

Section Weighting: 11%

Indicative Section Score 8.80%

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

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 detail

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

Indicative Innovation Credits Achieved: Please Select

Comments

The calculated water consumption would need to meet the target of <118 litres per person resident in the dwelling, per day. Two of the available three credits would be targeted in this scenario, which would meet the minimum requirements for a BREEAM 'Excellent' rating.

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: 1

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

No communal garden space.

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

to be provided to comply with local authority policies.

MATERIALS

Section Weighting: 8%

Indicative Section Score 2.84%

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

Indicative Credits: 8

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:

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

Provisional conservative amount of credits have been provided.

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

Indicative Credits: 0

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:

Table 1

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

sourced in accordance with the UK Government's Timber Procurement Policy?
Yes

Table 2

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

Comments

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: 8

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

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

To obtain the credits in this category, where thermal insulation is required, responsibly sourced materials with a low embodied environmental impact relative to its thermal properties would be specified in line with BRE requirements. Eight of the available eight credits would be targeted in this scenario.

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

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

Indicative Credits
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 collection
	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

To gain a creditrecycling facilities would be provided to the dwellings alongside those for non-recyclable waste, thus diverting household waste from landfill or incineration.

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

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

Indicative Credits
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
Please Select

Projects up to £300k

Three Credits	Where a compliant Level 1; Site Waste Management Plan (SWMP) is in place
	Where a compliant Level 2; Site Waste Management Plan (SWMP) is in place
Exemplary Credit	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 SWMP
	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 benchmarks
Exemplary Credit	Where non-hazardous construction waste generated by the dwellings refurbishment meets or exceeds the *exemplary level resource efficiency benchmark*
	Where Non-hazardous demolition waste generated by the dwellings refurbishment meets or exceeds the exemplary level diversion benchmarks

Comments

POLLUTION

Section Weighting: 6%

Indicative Section Score 4.50%

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
3

	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

A standard high efficieny gas boiler system is to be installed in each dwelling.

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 contro
	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

2 credits are targeted under this section, this is to comply with the local authorities policies on surface water and flooding.

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

A Flood Risk Assessment would be carried out to determine the development's annual probability of flooding in line with BRE requirements.
Two of the available two credits would be targeted in this scenario.