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## Energy and Sustainability Statement Panda House E14 7HS

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## About *MES Building Solutions*

***MES Building Solutions* is an established consultancy practice specialising in providing building solutions throughout the UK.**

We offer a full range of services for both residential and commercial buildings from small individual properties through to highly complex mixed use developments.

We are an industry leader in delivering a professional, accredited and certified service to a wide range of clients including architects, developers, builders, housing associations, the public sector and private householders.

Employing highly qualified staff, our team comes from a variety of backgrounds within the construction industry with combined knowledge of building design, engineering, assessment, construction, development, research and surveying.

We are renowned for our creative thinking and provide a high quality, honest and diligent service.

*MES Building Solutions* maintains its position at the forefront of changes in planning, building regulations and neighbourly matters, as well as technological advances. Our clients, large or small are therefore assured of a cost effective, cohesive and fully integrated professional service.

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## Section 1: Introduction

### 1.1 Executive Summary

The report is produced to accompany the detailed planning application to fulfil the current requirements of London Borough of Tower Hamlets.

We have calculated the total energy requirement for the development using NCM calculations and showed how the energy hierarchy will be used to reduce energy demand and CO<sub>2</sub> emissions from the development.

We have demonstrated how the development achieves a reduction in CO<sub>2</sub> emissions when compared to the Part L 2013 compliant baseline model, which includes a contribution from LZC technology. This is in line with the targets set out in London Plan Policy 5.2 and Tower Hamlets policy D.ES7. For each stage of the energy hierarchy we will demonstrate emission figures for both Part L and the updated SAP 10.

In order to achieve the required BER<TER an element of low and zero carbon technology in the form of air source heat pumps are specified to achieve an overall 64% reduction through Part L, which increases to 80% when utilising SAP10 emission factors, with more than 20% contribution from LZC technology which exceeds the reduction target from Tower Hamlets Council and the London Plan.

Table 1.a shows the reduction in kWh and tonnes of CO<sub>2</sub> per year through the recommended fabric improvements and energy efficiency system measures which ensure the development will meet and exceed current building regulations.

Table 1a: Total anticipated reduction in regulated emissions and energy use				
	Part L		SAP 10	
	kWh/year	Tonnes CO <sub>2</sub> /year	kWh/year	Tonnes CO <sub>2</sub> /year
Baseline	796,000	139.4	796,000	121
Unregulated	97,204	50.4	97,204	22.65
Be Lean & Be Clean	649,530	114.2	649,530	102
Be Green	292,142	50.0	292,142	23
Contribution from renewables	55.02%	56.22%	55.02%	77.45%
Total reduction over Part L	63.30%	64.13%	63.30%	80.99%

The Mayor's London Plan Viability Study assumes a carbon off-set price of £95 per tonne of carbon dioxide for a period of 30 years. This has been used to calculate the anticipated carbon offset payment for the proposed development based upon the estimated calculations detailed in Section 3 of this report. The results are shown in Table 1b below:

<i>1b: Zero Carbon offset payment calculation (anticipated)</i>		
<i>Tonnes of residual CO<sub>2</sub> (SAP 10)</i>	<i>Cost per Tonne (£95) x Period (30 years)</i>	<i>Offset payment (£)</i>
<b>23.00</b>		<b>£65,550</b>

The energy strategy proposed follows the requirements of the London Plan Chapter 5 (Climate Change) and London Borough of Tower Hamlets. The specification has been developed to comply with 2013 Part L Building Regulations through efficient building fabric and mechanical services alongside the provision of air source heat pumps.

This development is not in close proximity to an existing District Heating network or proposed future network and therefore connection to district heating is deemed not feasible.





## 1.2 Introduction

MES Building Solutions have been retained to provide an energy statement in order to address the requirements of London Borough of Tower Hamlets. The purpose of this energy and sustainability statement is to provide an overview of how sustainability will be promoted both during and after construction and to establish the predicted energy requirements for the proposed development. It will illustrate how energy efficiency measures in conjunction with renewable generation can be used to reduce the predicted energy consumption and associated carbon dioxide emissions.

We will demonstrate how the development will achieve at least a 45% reduction in energy demand when compared to the baseline model, which includes a minimum 20% contribution from LZC technology to satisfy the requirements of Tower Hamlets planning policy and the London Plan.

This report also includes details of how the design team will address wider aspects of sustainability in order to target delivery of a high standard BREEAM Excellent rated building.

A BREEAM Pre-Assessment is included which addresses a number of wider sustainability issues such as materials choice, health and wellbeing, water consumption and transport etc. with proposals intended to reduce the overall environmental impact and maximise the sustainability of the development throughout its lifecycle.

This is achieved by following the energy hierarchy which includes:

- Calculation of baseline energy consumption & CO<sub>2</sub> emissions using commercial NCM calculations
- Implementation of the energy hierarchy (be lean, be clean, be green)
- Calculation of energy consumption & CO<sub>2</sub> emissions at each stage of energy hierarchy
- Calculation of final energy consumption & CO<sub>2</sub> emissions
- Calculation of reduction in emissions achieved
- Calculation of contribution from renewable generation

### 1.3 SAP 10

The following guidance was issued by the GLA, in October 2018, for all new developments.

'Grid electricity has been significantly decarbonised since the last update of Part L in April 2014 and in July 2018 the Government published updated carbon emission factors (SAP 10) demonstrating this. These new emission factors will however not be incorporated into Part L of the Building Regulations until the Government has consulted on new Building Regulations.

The impact of these new emission factors is significant in that technologies generating on-site electricity (such as gas-engine CHP and solar PV) will not achieve the carbon savings they have to date. It is therefore anticipated that developments will need to utilise alternative or additional technologies to meet the 35% on-site carbon reduction target, including using zero emission or local secondary heat sources.

The GLA has decided that from January 2019 and until central Government updates Part L with the latest carbon emission factors, planning applicants are encouraged to use the SAP 10 emission factors for referable applications when estimating CO<sub>2</sub> emission performance against London Plan policies. This will ensure that the assessment of new developments better reflects the actual carbon emissions associated with their expected operation'.

As a result of the above guidance, MES have based the reduction targets on the current Part L emission factors, as these are the ones that the EPC certificates are currently assessed against, whilst still showing the impact that SAP 10 will have.

	Emissions kg CO <sub>2</sub> per kWh	
	SAP 2012	SAP 10
Mains Gas	0.216	0.210
Electricity	0.519	0.233

1c: SAP 2012 and SAP 10 emission factors



## 1.4 Planning Policy

### National Policy

In February 2019, the Government published the National Planning Policy Framework (NPPF) which superseded a number of planning policies including the Planning Policy Statement (PPS) suite.

The NPPF outlines the Government's planning policies for England. It provides a framework within which local people and accountable councils can produce their own distinctive local plan which reflect the needs and priorities of their neighbourhoods and communities. The purpose of the NPPF is to contribute to the achievement of sustainable development.

The NPPF aims to strengthen local decision making as a way to foster the delivery of sustainable developments. However, the NPPF also outlines that sustainable developments require careful attention to viability and costs in plan-making and decision-taking processes. Over everything else, plans should be deliverable. Therefore, the size and scale of development within the plan should not be subjected to large scale obligations and burdens, so that their ability to be developed viably is threatened.

The NPPF guidance promotes planning for climate change. Chapter 14 of the NPPF, Meeting the Challenge of Climate Change, Flooding and Coastal Change (paragraphs 149 to 154) state that:

Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.

- New development should be planned for in ways that:
  - Avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and





- Can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.
- To help increase the use and supply of renewable and low carbon energy and heat, plans should:
  - Provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);
  - Consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and
  - Identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.
- Local planning authorities should support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans or other strategic policies that are being taken forward through neighbourhood planning.
- In determining planning applications, local planning authorities should expect new development to:
  - Comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and
  - Take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.
- When determining planning applications for renewable and low carbon development, local planning authorities should:
  - Not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and
  - Approve the application if its impacts are (or can be made) acceptable. Once suitable areas for renewable



and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas.

## Tower Hamlets Local Plan 2031 - Adopted January 2020



### Policy D.ES6 - Sustainable water and wastewater management

1. Development is required to reduce water consumption: new residential developments must achieve a maximum water use of 105 litres per person per day and refurbishments and other non-domestic development should meet BREEAM water efficiency credits.
2. New development is required to minimise the pressure on the combined sewer network.
3. Major development is required to demonstrate that the local water supply and public sewerage networks have adequate capacity both on and off-site to serve the development, taking into consideration the cumulative impact of current and proposed development.

### Policy D.ES7 - A zero carbon borough

1. Development is required to meet the carbon dioxide emission reduction standards as set out below.

Residential development	
Year	Improvement on the 2013 building regulations
2016-2031	Zero carbon (to be achieved through a minimum 45% reduction in regulated carbon dioxide emissions on-site and the remaining regulated carbon dioxide emissions to 100% - to be offset through a cash in lieu contribution)

Non-residential development	
Year	Improvement on the 2013 building regulations
2016-2019	45% regulated carbon dioxide emissions reduction
2019-2031	Zero carbon (to be achieved through a minimum 45% reduction in regulated carbon dioxide emissions and the remaining regulated carbon dioxide emissions to 100% - to be off-set through a cash in lieu contribution)

2. Development is required to maximise energy efficiency based on the following standards:

- a. All new non-residential development over 500 square metres floorspace (gross) are expected to meet or exceed BREEAM 'excellent' rating
- b. All major non-residential refurbishment of existing buildings and conversions over 500 square metres floorspace (gross) must meet at least BREEAM non-domestic refurbishment 'excellent' rating
- c. As a minimum, all self-contained residential proposals will be strongly encouraged to meet the Home Quality Mark.

3. Major residential and major non-residential development will be required to submit an energy assessment. Minor non-residential development will be strongly encouraged to prepare an assessment.

4. The energy assessment should demonstrate how the development has been designed in accordance with the energy hierarchy and how it will:

- a. maximise energy efficiency as per the requirements set out in Part 2
- b. outline the feasibility of low nitrogen dioxide decentralised energy, and
- c. seek to provide up to 20% reduction of carbon dioxide emissions through on-site renewable energy generation.

5. The sustainable retrofitting of existing development with provisions for the reduction of carbon emissions will be supported.



## *London Plan (2016)*

### **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:**

<b>Year</b>	<b>Improvement on 2010 Building Regulations</b>
2010 – 2013	25 per cent (Code for Sustainable Homes level 4)
2013 - 2016	40 per cent
2016 - 2031	Zero Carbon

#### **Non-domestic buildings:**

<b>Year</b>	<b>Improvement on 2010 Building Regulations</b>
2010 – 2013	25 per cent
2013 - 2016	40 per cent
2016 - 2019	As per building regulations requirements
2019 - 2031	Zero Carbon

C Major development proposals should include a detailed energy assessment to demonstrate how the targets for carbon dioxide emissions reduction outlined above are to be met within the framework of the energy hierarchy.

D As a minimum, energy assessments should include the following details:

- a calculation of the energy demand and carbon dioxide emissions covered by Building Regulations and, separately, the energy



- demand and carbon dioxide emissions from any other part of the development, including plant or equipment, that are not covered by the Building Regulations (see paragraph 5.22) at each stage of the energy hierarchy
- b proposals to reduce carbon dioxide emissions through the energy efficient design of the site, buildings and services
  - c proposals to further reduce carbon dioxide emissions through the use of decentralised energy where feasible, such as district heating and cooling and combined heat and power (CHP)
  - d proposals to further reduce carbon dioxide emissions through the use of on-site renewable energy technologies.

E The carbon dioxide reduction targets should be met on-site. Where it is clearly demonstrated that the specific targets cannot be fully achieved on-site, any shortfall may be provided off-site or through a cash in lieu contribution to the relevant borough to be ring fenced to secure delivery of carbon dioxide savings elsewhere.

### **Policy 5.3 Sustainable Design and Construction**

#### **Strategic**

A The highest standards of sustainable design and construction should be achieved in London to improve the environmental performance of new developments and to adapt to the effects of climate change over their lifetime.

#### **Planning decisions**

B Development proposals should demonstrate that sustainable design standards are integral to the proposal, including its construction and operation, and ensure that they are considered at the beginning of the design process.

C Major development proposals should meet the minimum standards outlined in the Mayor's supplementary planning guidance and this should be clearly demonstrated within a design and access statement. The standards include measures to achieve other policies in this Plan and the following sustainable design principles:

- a minimising carbon dioxide emissions across the site, including the building and services (such as heating and cooling systems)
- b avoiding internal overheating and contributing to the urban heat island effect
- c efficient use of natural resources (including water), including making the most of natural systems both within and around buildings
- d minimising pollution (including noise, air and urban runoff)



- e minimising the generation of waste and maximising reuse or recycling
- f avoiding impacts from natural hazards (including flooding)
- g ensuring developments are comfortable and secure for users, including avoiding the creation of adverse local climatic conditions
- h securing sustainable procurement of materials, using local supplies where feasible, and
- i promoting and protecting biodiversity and green infrastructure.

### **LDF preparation**

D Within LDFs boroughs should consider the need to develop more detailed policies and proposals based on the sustainable design principles outlined above and those which are outlined in the Mayor's supplementary planning guidance that are specific to their local circumstances.

## **Policy 5.6 Decentralised Energy in Development Proposals**

### **Planning decisions**

A Development proposals should evaluate the feasibility of Combined Heat and Power (CHP) systems, and where a new CHP system is appropriate also examine opportunities to extend the system beyond the site boundary to adjacent sites.

B Major development proposals should select energy systems in accordance with the following hierarchy:

- 1 Connection to existing heating or cooling networks;
- 2 Site wide CHP network;
- 3 Communal heating and cooling;

C Potential opportunities to meet the first priority in this hierarchy are outlined in the London Heat Map tool. Where future network opportunities are identified, proposals should be designed to connect to these networks.

## **Policy 5.7 Renewable Energy**

### **Strategic**

A The Mayor seeks to increase the proportion of energy generated from renewable sources, and expects that the projections for installed renewable energy capacity outlined in the Climate Change Mitigation and Energy Strategy and in supplementary planning guidance will be achieved in London.





### **Planning decisions**

B Within the framework of the energy hierarchy (see Policy 5.2), major development proposals should provide a reduction in expected carbon dioxide emissions through the use of on-site renewable energy generation, where feasible.

### **LDF preparation**

C Within LDFs boroughs should, and other agencies may wish to, develop more detailed policies and proposals to support the development of renewable energy in London – in particular, to identify broad areas where specific renewable energy technologies, including large scale systems and the large scale deployment of small scale systems, are appropriate. The identification of areas should be consistent with any guidelines and criteria outlined by the Mayor.

D All renewable energy systems should be located and designed to minimise any potential adverse impacts on biodiversity, the natural environment and historical assets, and to avoid any adverse impacts on air quality.



## ***London Plan (December 2019) - Intend to publish version***

Following an Examination in Public (EiP) into the Draft London Plan held between January and May 2019 and consideration of the Panel of Inspectors' recommendations set out in their report of 8 October 2019, the Mayor issued his intention to publish the London Plan to the Secretary of State on 9 December 2019. This has been subject to scrutiny by the Secretary of State who provided his recent comments on 13 March 2020.

### **Policy SI 2 Minimising greenhouse gas emissions**

A Major development should be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy:

- 1) be lean: use less energy and manage demand during operation
- 2) be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly
- 3) be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site
- 4) be seen: monitor, verify and report on energy performance.

B Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy.

C A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:

- 1) through a cash in lieu contribution to the borough's carbon offset fund, or
- 2) off-site provided that an alternative proposal is identified and delivery is certain.

D Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported on annually.



E Major development proposals should calculate and minimise carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations, i.e. unregulated emissions.

F Development proposals referable to the Mayor should calculate whole life-cycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions.

### **Policy SI 3 Energy infrastructure**

A Boroughs and developers should engage at an early stage with relevant energy companies and bodies to establish the future energy and infrastructure requirements arising from large-scale development proposals such as Opportunity Areas, Town Centres, other growth areas or clusters of significant new development.

B Energy masterplans should be developed for large-scale development locations (such as those outlined in Part A and other opportunities) which establish the most effective energy supply options. Energy masterplans should identify:

- 1) major heat loads (including anchor heat loads, with particular reference to sites such as universities, hospitals and social housing)
- 2) heat loads from existing buildings that can be connected to future phases of a heat network
- 3) major heat supply plant including opportunities to utilise heat from energy from waste plants
- 4) secondary heat sources, including both environmental and waste heat
- 5) opportunities for low and ambient temperature heat networks
- 6) possible land for energy centres and/or energy storage
- 7) possible heating and cooling network routes
- 8) opportunities for futureproofing utility infrastructure networks to minimise the impact from road works
- 9) infrastructure and land requirements for electricity and gas supplies
- 10) implementation options for delivering feasible projects, considering issues of procurement, funding and risk, and the role of the public sector
- 11) opportunities to maximise renewable electricity generation and incorporate demand-side response measures.

C Development Plans should:

- 1) identify the need for, and suitable sites for, any necessary energy infrastructure requirements including energy centres, energy storage and upgrades to existing infrastructure



2) identify existing heating and cooling networks, identify proposed locations for future heating and cooling networks and identify opportunities for expanding and inter-connecting existing networks as well as establishing new networks.

D Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system:

1) the heat source for the communal heating system should be selected in accordance with the following heating hierarchy:

- a) connect to local existing or planned heat networks
- b) use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)
- c) use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network)
- d) use ultra-low NO<sub>x</sub> gas boilers

2) CHP and ultra-low NO<sub>x</sub> gas boiler communal or district heating systems should be designed to ensure that they meet the requirements in Part B of Policy SI 1 Improving air quality 3) where a heat network is planned but not yet in existence the development should be designed to allow for the cost-effective connection at a later date.

E) Heat networks should achieve good practice design and specification standards for primary, secondary and tertiary systems comparable to those set out in the CIBSE/ADE Code of Practice CP1 or equivalent.

#### **Policy SI 4 Managing heat risk**

A Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure.

B Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:

- 1) reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure
- 2) minimise internal heat generation through energy efficient design
- 3) manage the heat within the building through exposed internal thermal mass and high ceilings



- 4) provide passive ventilation
- 5) provide mechanical ventilation
- 6) provide active cooling systems.

## **Policy SI 12 Flood risk management**

A Current and expected flood risk from all sources (as defined in paragraph 9.12.2) across London should be managed in a sustainable and cost-effective way in collaboration with the Environment Agency, the Lead Local Flood Authorities, developers and infrastructure providers.

B Development Plans should use the Mayor's Regional Flood Risk Appraisal and their Strategic Flood Risk Assessment as well as Local Flood Risk Management Strategies, where necessary, to identify areas where particular and cumulative flood risk issues exist and develop actions and policy approaches aimed at reducing these risks. Boroughs should co-operate and jointly address cross-boundary flood risk issues including with authorities outside London.

C Development proposals should ensure that flood risk is minimised and mitigated, and that residual risk is addressed. This should include, where possible, making space for water and aiming for development to be set back from the banks of watercourses.

D Developments Plans and development proposals should contribute to the delivery of the measures set out in Thames Estuary 2100 Plan. The Mayor will work with the Environment Agency and relevant local planning authorities, including authorities outside London, to safeguard an appropriate location for a new Thames Barrier.

E Development proposals for utility services should be designed to remain operational under flood conditions and buildings should be designed for quick recovery following a flood.

F Development proposals adjacent to flood defences will be required to protect the integrity of flood defences and allow access for future maintenance and upgrading. Unless exceptional circumstances are demonstrated for not doing so, development proposals should be set back from flood defences to allow for any foreseeable future maintenance and upgrades in a sustainable and cost-effective way.

G Natural flood management methods should be employed in development proposals due to their multiple benefits including increasing flood storage and creating recreational areas and habitat.



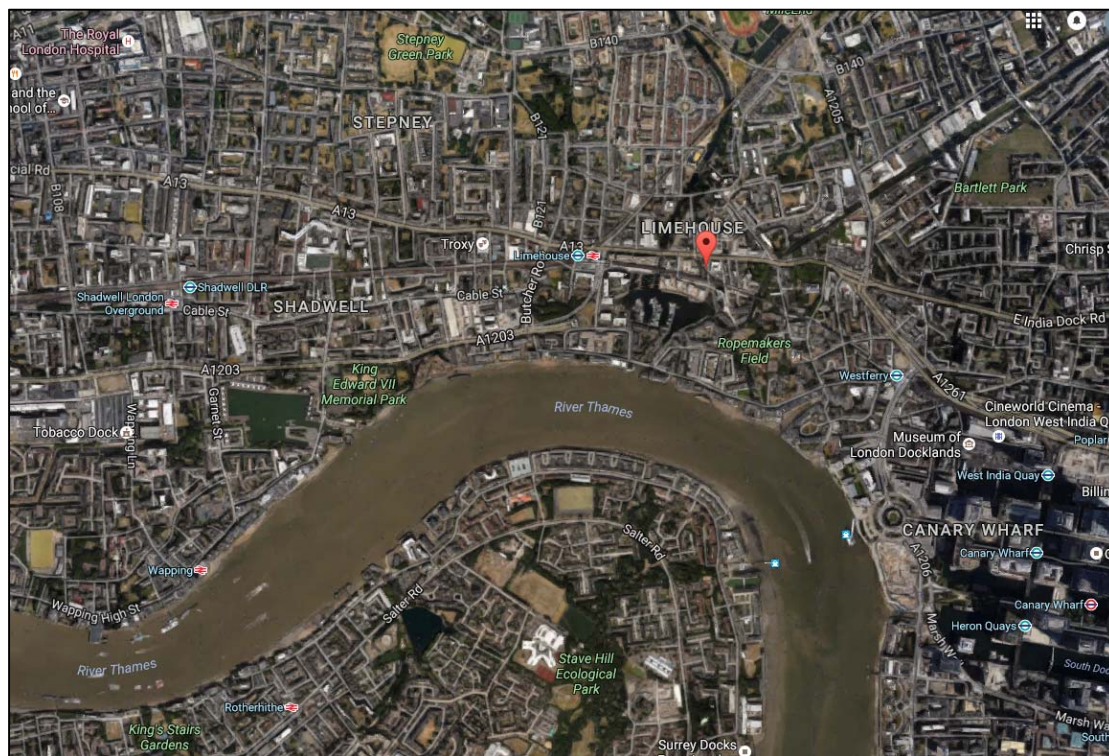


## Section 2: Description of development

### 2.1 Location

The application site is located in the East part of London, within the Tower Hamlets Local Authority area and is part of the Limehouse neighbourhood. The site is situated within the 'St. Anne's Church' conservation area between Commercial Road on the North and Limehouse Basin on the South. The area is not believed to be at risk of flooding.

The surrounding area is a mix of residential properties with some commercial use at ground floor level on Commercial Road. To the rear of the site is Lighthouse Basin, a residential led re-development around the existing dock. The railway line separates the site from the basin area.



Site Location Plan

### 2.2 Details of development

The development site currently holds an existing hostel which provides short term accommodation for young, single workers.

The proposal is for the demolition of existing building and erection of a building of up to five-storeys and two set back floors plus a lower ground floor to provide 109 rooms for short-term hostel.





## Section 3: Energy

### 3.1 The Energy Hierarchy

In order to address energy efficiency and in particular the 45% reduction in CO<sub>2</sub> emissions that is required by Tower Hamlets Policy D.ES7 the design team have adopted the energy hierarchy. The energy hierarchy is generally accepted as the most effective way of reducing a buildings' carbon emissions.

1. Be lean: use less energy
2. Be clean: supply energy efficiently
3. Be green: use renewable energy
4. Be seen: monitor, verify and report on energy performance

Development proposals should:

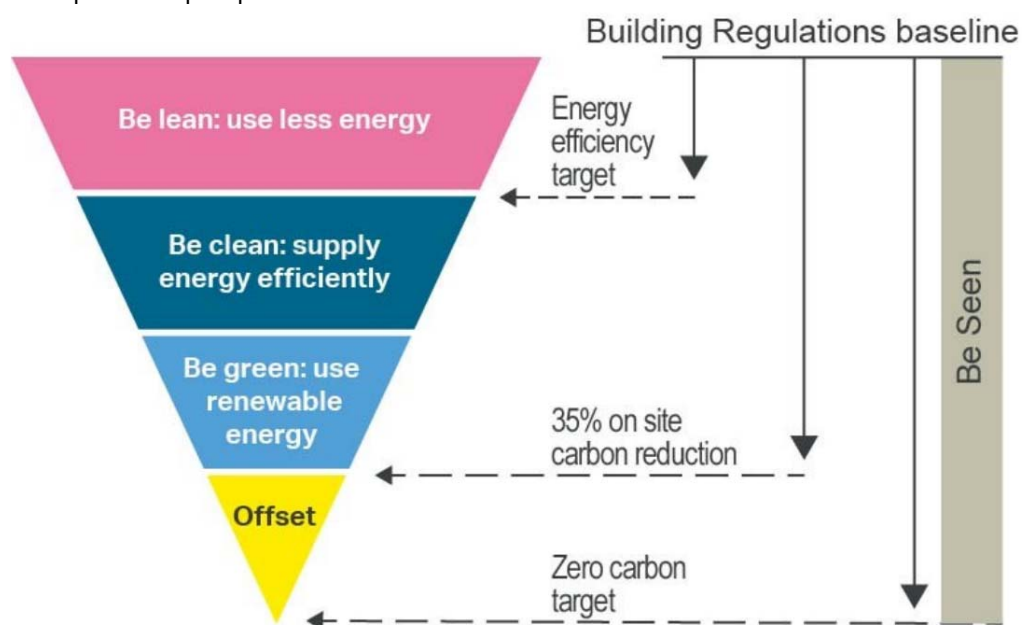


Figure 3.1: The Energy Hierarchy

- **Reducing energy demand**

The first step in the process of reducing the overall energy used and CO<sub>2</sub> produced by the building is to minimise the energy required to heat it. A well-insulated building envelope and passive design will reduce the energy requirement for heating and ventilating the building.

- **Energy efficient systems**

The second step is to specify services and controls, lighting and appliances that are energy efficient and which result in further reduction in energy requirements.

- ***Making use of Low or zero-carbon (LZC) technologies***

When the energy demand has been reduced by implementing the processes of improving the fabric and energy efficiency, then LZC technologies can be employed to reduce the environmental impact of the remaining energy consumption.

- ***Monitoring and reporting***

Ensure comprehensive monitoring and reporting of energy demand and carbon emissions. Major developments are required to undertake this process for at least five years.



### 3.2 Calculating Baseline Energy Demand

The first step is to calculate a Building Regulations Part L2A 2013 compliant specification in order to establish baseline emissions for the development. Calculated data using the government's approved methodology (SBEM 2013) has been used to establish baseline energy requirements which comply with the 2013 edition of Part L minimum elemental standards.

These have then been used to produce a BRUKL output document for the whole development with the correct number of zones assigned to each category.

The baseline emissions and energy consumption figures are produced by the Part L2A 'notional' building calculations taken from the IES software modelling. The combined results are shown in table 3b below:

3b: Total Annual Part L Baseline Regulated Emissions & Fabric Energy Efficiency	
Emissions Part L	139.4 kgCO <sub>2</sub> /yr
Emissions SAP 10	121 kgCO <sub>2</sub> /yr
Energy	796,000 kWh/yr

The strategic aim is to reduce carbon emissions overall, so that while planning decisions and monitoring requirements will be underpinned by the targets expressed above, the requirement for energy assessments to include separate details of unregulated emissions is to recognise explicitly the additional contribution that can be made through use of efficient equipment, building controls and good management practices. Unregulated emissions are therefore listed out separately as they are not taken into account when calculating percentage improvement.

### 3.3 Emission Reduction Targets (*Be Lean and Be Clean*)

The first two steps of the energy hierarchy look at reducing energy consumption in the hotel through improvements to its fabric and by increasing the efficiency of the building services. This reduces the energy required to run the building and thus the emissions associated with that energy use.

The current 2013 Part L2A is already very stringent in terms of fabric performance targets. The fabric specification used in the 'notional building' (used to calculate the target emission rate) can be difficult to achieve in reality and further opportunities for improvement to the building fabric and services beyond those which meet the current 2013 Building Regulations requirements can be very limited when compared with those which may be expected from buildings constructed to earlier versions of the Regulations, but further improvements are possible by considering the following steps:

- Reduce elemental U-Values
- Reducing heat loss through uncontrolled ventilation (air leakage)
- Increased control of necessary ventilation
- Improving mechanical & electrical system efficiency
- Increasing control over mechanical & electrical systems.

Element	Be Lean and Be Clean Specification
Walls	0.15W/m <sup>2</sup> K
Roof	0.12W/m <sup>2</sup> K
Heat loss Floors	0.10W/m <sup>2</sup> K
Windows/Doors	1.00W/m <sup>2</sup> K
Space Heating	Gas boiler 93% efficient
DHW	On demand 95% efficient
Ventilation	Natural ventilation with kitchen & bathroom extract
Lighting	70 Lm/W
Controls	On/Off
LZC Technology	None
Air tightness	3m <sup>3</sup> /hr/m <sup>2</sup>
Electrical Power Factor	<0.90

Table 3c: Be Lean and Be Clean specification



The improved Be Lean and Be Clean emissions and energy consumption figures produced by the Part L2A 'notional' building calculations taken from the IES software modelling are shown in table 3d below:

3d: Total Annual Part L Be Lean and Be Clean Regulated Emissions & Fabric Energy Efficiency	
Emissions Part L	114.2 kgCO <sub>2</sub> /yr
Emissions SAP 10	102 kgCO <sub>2</sub> /yr
Energy	649,530 kWh/yr



### 3.4 Communal Heating and CHP

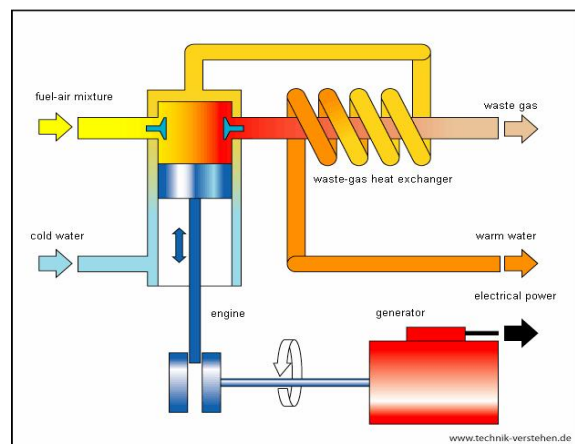
#### Communal heating scheme

The benefit of communal heating systems becomes questionable for small scale installation. Additional space is required for centralised plant rooms and ducting/pipework. The increased cost and complexity of such systems is not offset by the minimal performance improvement that may be achieved and given this; communal heating is not proposed for the development.

#### Combined heat & power (CHP)

Combined heat and power uses an electricity generator, generally a gas powered internal combustion engine, with heat recovery on the exhaust used to heat water for heating and domestic hot water supply.

The proportions of heat and electricity produced are normally in the region of 65:35. This requires a constant heat load throughout the year for the system to perform efficiently.



For CHP to be viable on commercial developments a high hot water demand is usually required in order to generate sufficient heating baseload. As this is the case on this occasion CHP is considered viable for consideration, yet comments from the Tower Hamlets public hearing state '*A CHP solution is not demonstrated to be appropriate for a development of this size and is not in accordance with policy in enabling the delivery of an area-wide network. Alternative low carbon heating methods (e.g. heat pumps) should be investigated and the current proposed strategy should be revised.*'



### 3.5 CO<sub>2</sub> reduction through the use of renewable or low carbon technology (Be green)

3e: Target contribution from low carbon & renewable technologies	Part L	SAP 10
Total 'baseline' Part L 2013 compliant CO <sub>2</sub> emissions (Tonnes CO <sub>2</sub> per year)	139.4	121
Total 'be lean, be clean' Part L 2013 compliant CO <sub>2</sub> emissions (Tonnes CO <sub>2</sub> per year)	114.2	102
Target contribution from renewables (Tonnes CO <sub>2</sub> per year)	37.53	35.45
Target reduction over Baseline (Tonnes CO <sub>2</sub> per year)	<b>76.67</b>	<b>66.55</b>

Energy resources accepted as renewable or low carbon technologies are defined by the Department of Energy and Climate Change Low Carbon Buildings Program as:

- Solar photovoltaics
- Wind turbines
- Solar thermal hot water
- Ground source heat pumps
- Air source heat pumps
- Bio-energy
- Renewable CHP
- Micro CHP (Combined heat and power)

The proposal is to install highly efficient air source heat pumps. This strategy will save approximately 355,484 kWh/yr of electricity whilst offsetting 79 tonnes of CO<sub>2</sub> across the development, under SAP 10, beyond the savings already made through the efficient fabric and mechanical services.

The final specification for the scheme is shown below in table 3f with the results shown in tables 3g.



Element	Be Lean, Be Clean and Be Green Specification
Walls	0.15W/m <sup>2</sup> K
Roof	0.12W/m <sup>2</sup> K
Heat loss Floors	0.10W/m <sup>2</sup> K
Glazing	1.00W/m <sup>2</sup> K
Space Heating	Air source heat pump SCoP 6.5 SEER 4.5 EER 3.5
DHW	ASHP 1,000litres of storage
Ventilation	Natural ventilation with kitchen & bathroom extract
Lighting	70 Lm/W
Controls	On/Off
LZC Technology	None
Air tightness	3m <sup>3</sup> /hr/m <sup>2</sup>
Electrical Power Factor	<0.90

Table 3f: Be Lean, Be Clean and Be Green specification

3g: Contribution from PV & total improvement over Part L	Part L	SAP 10
Total Baseline Emissions (Tonnes CO <sub>2</sub> /yr)	139.4	121
Total compliant Be Lean & Be Clean Emissions (Tonnes CO <sub>2</sub> /yr)	114.2	102
Contribution from renewables (Tonnes CO <sub>2</sub> /yr)	64.2	79
Total compliant Be Green Emissions (Tonnes CO <sub>2</sub> /yr)	50.0	23
Percentage reduction achieved from renewables	56.22%	77.45%
Total improvement over baseline (%)	<b>64.13%</b>	<b>80.99%</b>



## **Solar Photovoltaics**

Solar panel electricity systems, also known as solar photovoltaics (PV), capture the sun's energy using photovoltaic cells. These cells do not need direct sunlight to work – they can still generate some electricity on a cloudy day. The cells convert the sunlight into electricity, which can be used to run household appliances and lighting. When excess power is generated this can be sold back to the grid.



This technology has not been chosen for this site, but could be added as a supplementary technology if required.

## **Wind Turbines**

Wind turbines harness the power of the wind and use it to generate electricity. Forty percent of all the wind energy in Europe blows over the UK, making it an ideal country for domestic turbines. Urban sites such as the location of this development are generally unsuitable for wind turbine installations due to the interrupted turbulent wind flows caused by surrounding buildings and large obstacles. There are also possible issues with noise and 'flicker' for the neighbouring buildings.



The urban nature of the site and lack of space mean that a wind turbine cannot be recommended as a viable option for this development. There are also general issues surrounding the use of building mounted turbines with the potential for excessive noise and vibration within the building and the effect of flicker on surrounding buildings and amenity spaces.

**Table 3j: Average wind speeds for the site**

45m above ground level	6.0m/s
25m above ground level	5.5m/s
10m above ground level	4.7m/s

## *Solar Water heating*



Solar water heating systems use free heat from the sun to warm domestic hot water. Solar hot water heating can generate a large proportion of a buildings annual DHW requirement. IN this project the displaced fuel would be electricity meaning that the CO<sub>2</sub> savings of this type of system would be relatively low due to the low carbon intensity of the displaced fuel. The size of solar thermal systems is often also restricted by hot water requirements on site. This is not as great an issue with power generating technologies as excess power can be fed back into the grid.

## *Heat Pumps*

Heat pumps use similar technology as refrigerators but reversed. A refrigerant liquid is used as a medium to extract heat from a source and convert it into useful heat energy. The heat source used can be generally one of three types; the ground, the air or a body of water. Both



ground and water sourced heat pumps use a long circuitous pipe through which a refrigerant is pumped. In ground sourced heat pumps this can be either a coiled pipe or 'slinky' that is buried in a series of horizontal trenches or a loop inside a vertical bore hole to depths that can be up to 200m or deeper. Water sourced heat pumps generally use a similar system to the 'slinky' used for ground sourced systems but either floated on or submerged in a body of water (either a large pool or running water source). Air source heat pumps have a refrigerant coil mounted outside the building through which is passed air so that heat can be extracted. All three types of heat pump generally use the collected heat from the source to heat water. The heated water can then be used for space heating and DHW. Heat pumps require an input of energy to drive pumps, this is usually electricity and so the updated SAP10 emission factors further increase the suitability of this technology. Heat pumps also have very good efficiencies; energy

produced by heat pumps is typically in the region of 2.5 times of which is required to run them, giving efficiencies of 250%, but modern heat pumps can achieve efficiencies far exceeding this.

## **Bio Energy**

The Low Carbon Buildings Program (LCBP) defines biomass as follows:

*"Biomass is often called 'bioenergy' or 'biofuels'. These biofuels are produced from organic materials, either directly from plants or indirectly from industrial, commercial, domestic or agricultural products. Biofuels fall into two main categories:*



- *Woody biomass includes forest products, untreated wood products, energy crops, short rotation coppice (SRC), e.g. willow.*
- *Non-woody biomass includes animal waste, industrial and biodegradable municipal products from food processing and high energy crops, e.g. rape, sugar cane, maize."*

For small-scale domestic [and small scale commercial] applications of biomass the fuel usually takes the form of wood pellets, wood chips and logs. The LCBP goes on to state:

*"There are two main ways of using biomass to heat a domestic property:*

- *Stand-alone stoves providing space heating for a single room. These can be fuelled by logs or pellets but only pellets are suitable for automatic feed. Generally they are 5-11 kW in output, and some models can be fitted with a back boiler to provide water heating.*
- *Boilers connected to central heating and hot water systems. These are suitable for pellets, logs or chips, and are generally larger than 15 kW"*

*(<http://www.lowcarbonbuildings.org.uk/micro/biomass>)*

This technology is dismissed as the space requirements needed for the boiler and pellet store make this impractical along with complying with the clean air zone requirements.



## Section 4: Sustainability

### 4.1 BREEAM Assessment

A BREEAM Pre-Assessment has been completed for the proposed development to illustrate how an 'Excellent' rating can be achieved.

#### *What is BREEAM?*

BREEAM (Building Research Establishment's Environmental Assessment Method) is the world's leading and most widely used environmental assessment method for buildings, with over 115,000 buildings certified and nearly 700,000 registered. It sets the standard for best practice in sustainable design and has become the de facto measure used to describe a building's environmental performance. Credits are awarded in ten categories according to performance. These credits are then added together to produce a single overall score on a scale of Pass, Good, Very Good, Excellent and Outstanding. The operation of BREEAM is overseen by an independent Sustainability Board, representing a wide cross-section of construction industry stakeholders.

#### *Aims of BREEAM:*

- To mitigate the impacts of buildings on the environment
- To enable buildings to be recognised according to their environmental benefits
- To provide a credible, environmental label for buildings
- To stimulate demand for sustainable buildings

#### *Objectives of BREEAM:*

- To provide market recognition to low environmental impact buildings
- To ensure best environmental practice is incorporated in buildings
- To set criteria and standards surpassing those required by regulations and challenge the market to provide innovative solutions that minimise the environmental impact of buildings
- To raise the awareness of owners, occupants, designers and operators of the benefits of buildings with a reduced impact on the environment
- To allow organisations to demonstrate progress towards corporate environmental objectives





## Scope

Non-domestic BREEAM schemes can be used to assess the environmental impacts of a building in accordance with this scope document in England, Scotland, Wales and Northern Ireland. Assessments using UK BREEAM schemes can also be carried out in the Republic of Ireland, but it must be recognised that BREEAM is tailored to the UK's construction sector. No concessions are made in the schemes where the Republic of Ireland building standards and design and procurement practices differ from those in the UK.

The BREEAM New Construction scheme can be used to assess the environmental life cycle impacts of new non-domestic buildings at the design and construction stages. 'New Construction' is defined as development that results in a new standalone structure, or new extension to an existing structure, which will come into operation/use for the first time upon completion of the works. This BREEAM 2018 New Construction scheme is applicable to new non-domestic buildings in the United Kingdom only.

In terms of the application of the New Construction scheme, non-domestic buildings are defined in BREEAM as either standard or non-standard types. The standard type category includes buildings listed above against the commercial, public (non-housing) and multi-residential sectors. These are building types which BREEAM New Construction is specifically designed to assess and the assessment criteria tailored for. This standard category includes building types that in the past would have had their own stand-alone BREEAM scheme document, such as Offices, Retail, Industrial, Education, Healthcare, Multi-residential and so on.

Non-standard building types are those listed against the 'other buildings' sector and includes many types of building that, under previous version of BREEAM, would have been classified and assessed using the BREEAM Bespoke scheme. The non-standard building types listed against the 'other buildings' category now fall within the scope of the BREEAM 2018 New Construction scheme and therefore do not require separate tailored assessment criteria.

## Scoring & Rating

There are a number of elements that determine the BREEAM rating; these are as follows:

- BREEAM rating benchmarks
- BREEAM environmental weightings
- Minimum BREEAM standards
- BREEAM credits for Innovation

Each of these elements is described in the BREEAM 2018 New Construction Assessor manual; this includes guidance and examples describing how a BREEAM rating is calculated.

In addition, there are sections describing the conditions that must be met in order to award an assessed building a 'BREEAM Outstanding' rating, the highest achievable BREEAM rating.

## Rating Benchmarks

The rating benchmarks for the 2018 version of BREEAM are outlined in the table below:

BREEAM RATING	% SCORE
UNCLASSIFIED	<30
PASS	≥30
GOOD	≥45
V GOOD	≥55
EXCELLENT	≥70
OUTSTANDING*	≥85

Once each BREEAM issues has been assessed the category percentage scores are determined (based on the number of credits achieved over those available within a category), and an environmental weighting applied (as shown below).

The weighted category scores are then totalled to give an overall score, and any additional score for innovation is added to give the final BREEAM score which is used to determine the BREEAM rating.

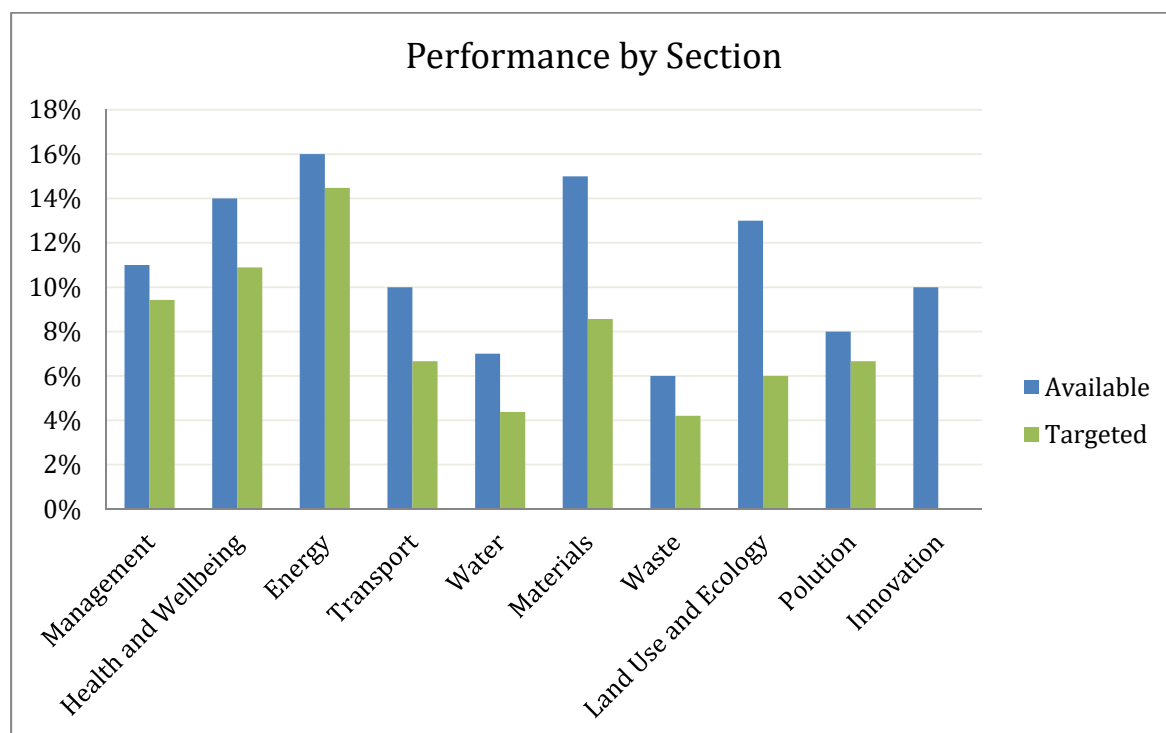


The weighting factors have been derived from consensus based research with various groups such as government, material suppliers and lobbyists. This research was carried out by BRE to establish the relative importance of each environmental issue.

### BREEAM Rating

Project:	190226 - Panda House
Report:	Pre-Assessment Stage
Design Target:	Excellent – 71.27%

Section	Available		Targeted	
	Credits	Percent	Credits	Percent
Management	21	11%	18	9.43%
Health and Wellbeing	18	14%	14	10.89%
Energy	21	16%	19	14.48%
Transport	12	10%	8	6.67%
Water	8	7%	5	4.38%
Materials	14	15%	8	8.57%
Waste	10	6%	7	4.2%
Land Use and Ecology	13	13%	6	6%
Pollution	12	8%	10	6.67%
Innovation	10	10%	0	0%
<b>Total</b>	<b>139</b>	<b>110.00%</b>	<b>95</b>	<b>71.27%</b>



## 4.2 Management

***Sustainability Objective:***

*To use sustainable construction methods and encourage best practice in building delivery.*

Consultation between the stakeholders, including the architect, client and Local Authority has ensured that all key design needs have been met.

Best practice will be used during construction so as to reduce the impact of works on the surrounding environment and a commitment will be made to register the site with the Considerate Contractors Scheme.

The construction site will be managed so as to reduce resource use, energy for site operations, water consumption, waste and pollution.

A system of monitoring, target setting and reporting will be put in place to ensure standards are met.

A system of commissioning will be instigated by the design team to ensure that all installed M&E plant is fully commissioned on installation and that this is followed up by further seasonal commissioning of heating and cooling systems for at least the first 12 months after completion.

Building user guides will be provided to building end users if requested to ensure they are provided with adequate information to enable effective use of the building and its systems. These will be tailored for both building managers and occupiers to ensure all building users fully understand the buildings operation so as to encourage efficient use. A programme of aftercare support will be implemented upon handover.

### 4.3 Health & Wellbeing

**Sustainability Objective:**

*To provide comfortable working and living spaces that promotes a healthy environment and which is adaptable to changing needs.*

Health and wellbeing considers the environment provided for building users and how this promotes healthy happy lives.

Habitable spaces are designed and orientated wherever possible in such a way as to provide natural daylight, sunlight and external views to occupied spaces thus adding to the internal environment.

Finishing elements will be chosen which do not contain harmful chemicals such as VOCs and formaldehyde.

Every practical effort will be made to minimise sound transmission both from the external environment and between individual units. The measures employed will go beyond current Building Regulation standards for minimising sound transmission wherever practical.

Residential units have been designed to be adaptable and accessible in order to accommodate occupiers changing needs over time.

### 4.4 Energy

**Sustainability Objective:**

*To ensure that the development is energy efficient in order to reduce running costs while maximising internal comfort for the building occupiers and ensure the emission of climate change gasses is minimised.*

Section 3 demonstrates how the development is designed to be energy efficient in terms of heating, cooling, lighting and ventilation.

In addition, all external lighting will be specified to be energy efficient and will be fitted with adequate controls to ensure optimum efficiency. Passenger lifts will be installed that incorporate energy efficient design features such as stand-by mode, regenerative drives and variable speed motors.

Where provided by the developers all equipment (white goods for example), will be energy efficient.

## 4.5 Transport

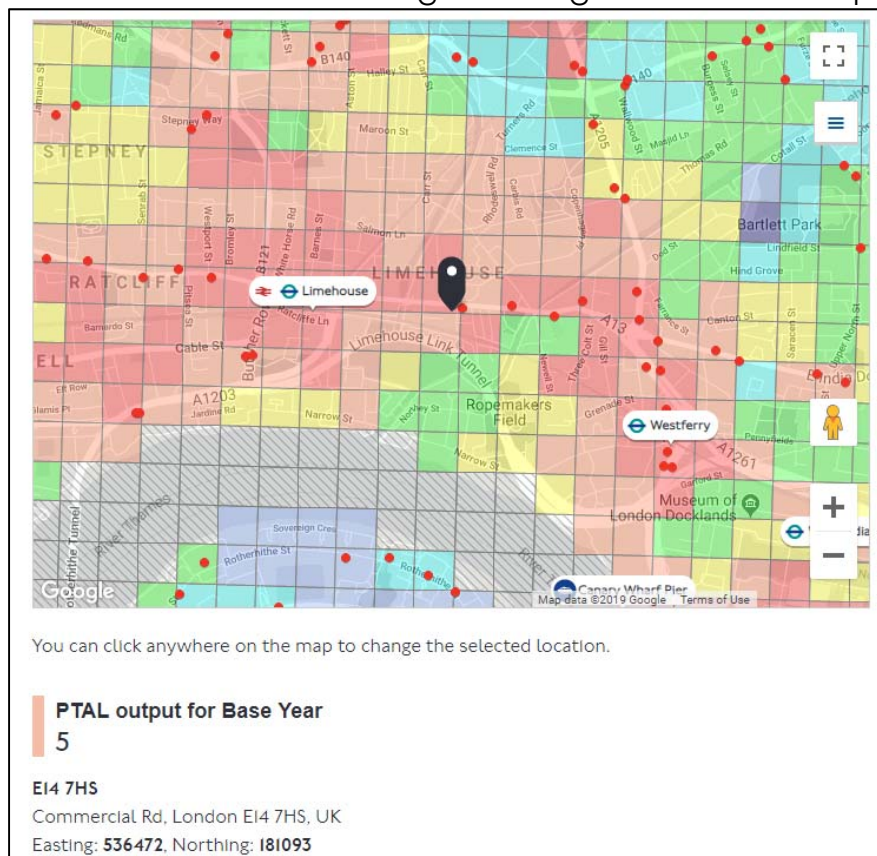
### **Sustainability Objective:**

*To reduce pollution and congestion levels. To encourage walking, cycling and the use of public transport.*

As around 30% of UK energy use is associated with transport. Developments of this nature that can encourage a reduction in car use have a positive impact on the environment both through a reduced reliance on precious fossil fuel resources and a reduction in harmful emissions.

The Transport for London PTAL database gives the site a PTAL score of 5. The central location of the development means that it is close to local amenities and has excellent public transport links, with regular bus services on Commercial Road and Limehouse Railway Station within 500m.

Secure cycle storage will be provided for residents while no parking will be provided, which will discourage car ownership and encourage car sharing along with more sustainable transport options. Safe pedestrian routes will further encourage walking and the use of public transport.





## 4.6 Water Use

**Sustainability Objective:**

*Conserve water through efficiency measures and recycling.  
Mitigating against increases in flood risk due to reduction in permeable areas and climate change.*

Water is a precious commodity even in the UK and with ever increasing demand for clean drinking water measures need to be taken to safeguard future supplies.

Approximately 50% of the water consumed in domestic dwellings is not used for consumption, (the percentage is even higher in many commercial buildings) it is for washing, and flushing of toilets etc. Measures to reduce the amount of potable water used for these activities reduce the demand for potable water and make better use of this limited resource.

A reduction in water use will be achieved through a combination of efficiency measures, including the specification of efficient fittings, lower capacity baths and dual flush toilets.

The efficiency of the following 'domestic scale' water consuming components will be considered

- WCs
- Urinals
- Taps (wash hand basins and where specified kitchen taps and waste disposal unit)
- Showers
- Baths
- Dishwashers (domestic and commercial sized)
- Washing machine (domestic and commercial or industrial sized)

## 4.7 Materials

***Sustainability Objective:***

*To reduce the impact of construction on natural resources by using sustainable, legally sourced product.*

Building materials have a significant impact when the embodied energy and resources used in their manufacture, transport and disposal are considered. Responsible sourcing of materials can have a real beneficial effect on the embodied impact of the final development.

All relevant materials in basic and finishing elements will be responsibly and legally sourced from certified suppliers using sustainable raw materials where possible.

Wherever possible reused and recycled materials will be sourced.

All materials will be sourced from local suppliers where possible to reduce transport miles and support the local supply chain.

Materials containing chemicals which are harmful to health or the environment will be avoided wherever possible.

## 4.8 Waste management

***Sustainability Objective:***

*To reduce waste going to landfill through material efficiency, recycling and sustainable construction methods.*

A key part of sustainability is to manage resources efficiently. Reducing the amount of waste created and maximising resource efficiency during demolition, construction and during the building's lifetime is fundamental to providing sustainable developments.

Efforts to reduce construction waste generally will concentrate on reducing site waste together with increasing reuse and recycling of waste that cannot be avoided in an effort to reduce volumes going to landfill. This will be implemented through a Site Waste Management Plan.

Adequate facilities will be provided for the storage and recycling of household and business waste and this in conjunction with the adoption of the Local Authority collection scheme for waste and recycling will encourage occupants to minimise waste going to landfill.

#### 4.9 Land Use & Ecology

**Sustainability Objective:**

*To protect, maintain and enhance existing biodiversity and habitats.  
To create new habitats to add value to the landscape in order to improve the urban environment.*

This is an urban location with an existing commercial use and as such it is assessed to have limited ecological value. The nature of the development means there is opportunity to improve the ecology of the site by incorporating areas of planting, especially in the open public spaces. Efforts will be made to protect any existing urban habitats while encouraging new ones.

As the current site has low ecological value any undertaking to improve upon this will have a positive ecological impact.

#### 4.10 Pollution

**Sustainability Objective:**

*To reduce the environmental impact of atmospheric, watercourse, noise and sound pollution.*

There are a variety of forms of environmental pollution that can potentially arise from the construction and use of buildings. A significant proportion is airborne in the form of dust, fumes and chemicals. Other forms of pollution include unwanted noise or light.

Best practice will be used during the construction phase to ensure that environmental pollution due to construction work will be minimised.

Efforts will be made to ensure the environmental impact of the materials used for the build will be reduced through responsible sourcing and reduced wastage.

The use of materials that's manufacture or installation requires the use of harmful global warming chemicals will be avoided.

Any cooling systems will be specified to either contain no potentially damaging chemicals, or where this is unavoidable to minimise the risk of environmental contamination due to accidental spillage.

Development of previously open land alongside climate change increases the chance of flash flooding and the management of



surface water run-off is to be considered seriously in order to mitigate these effects.

Initial investigations of the Environment Agency Flood Map suggest that the site is in Zone 1 with a low risk of flooding.

As the site is previously developed with all areas not within the building footprint surfaced with impermeable materials it is not anticipated that redevelopment would cause any increase in flood risk or run-off from the site.

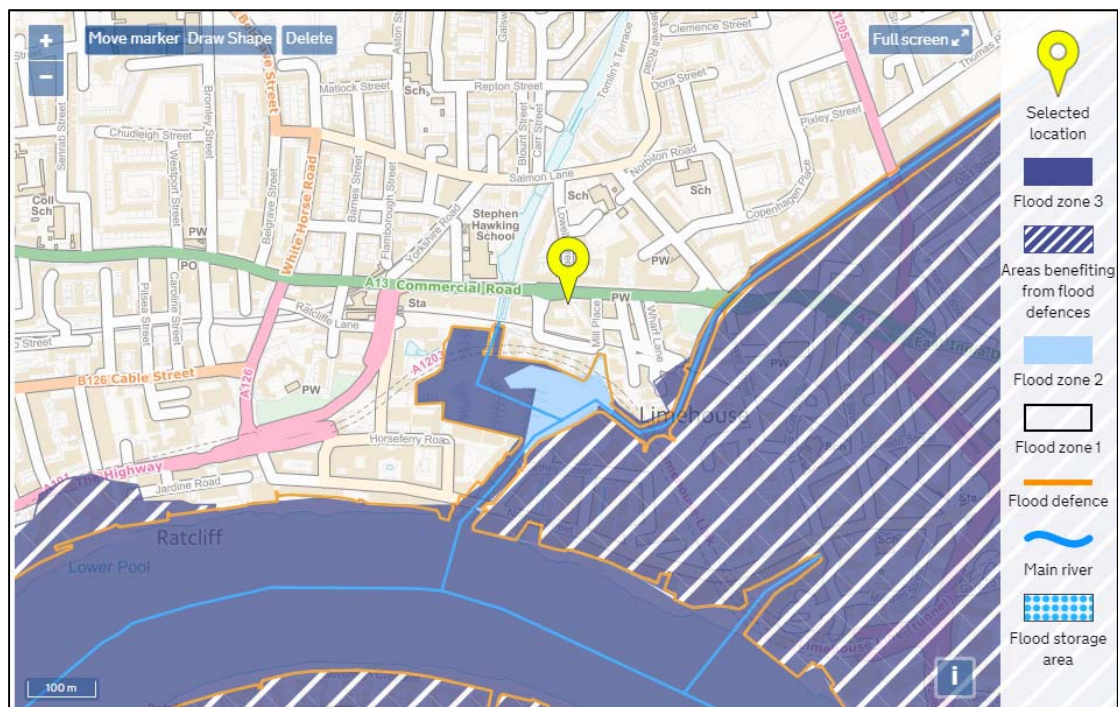


Figure 4.1: Environment Agency Flood Map for the Mill Lane area.



## Section 5: Anticipated Carbon Offset payment Calculation

### *Implementation of zero carbon homes (from 1 October 2016)*

The, intend to publish, London Plan policy S12 sets a 'zero carbon' target for both residential and non-residential development. This is in response to the Mayor of London declaring a climate emergency and has set an ambition for London to be net zero-carbon. This means all new buildings must be net zero carbon.

The 2019 Intend to publish London Plan states 'if the net zero-carbon target cannot be met on site and the GLA is satisfied that onsite savings have been maximised, then the annual remaining carbon emissions figure is multiplied by the assumed lifetime of the development's services (e.g. 30 years) to give the cumulative shortfall. The cumulative shortfall is multiplied by the carbon dioxide offset price to determine the required cash-in-lieu contribution.

Boroughs are expected to use the recommended carbon offset price of £95 per tonne of carbon dioxide, or to set their own based on local viability evidence'.

The above had been used to calculate the anticipated carbon offset payment for the proposed development based upon the calculations detailed in Section 3 of this report. The results are shown in Table 5a below:

<i>5a: Zero Carbon offset payment calculation (anticipated)</i>		
<i>Tonnes of residual CO<sub>2</sub> (SAP 10)</i>	<i>Cost per Tonne (£95) x Period (30 years)</i>	<i>Offset payment (£)</i>
<b>23.00</b>		<b>£65,550</b>



## Section 6: Summary

To ensure compliance with London Borough of Tower Hamlets and the London Plan a number of sustainable construction strategies will be incorporated in the design and construction of the development. These will include, amongst others, minimum standards relating to energy and water use which will reduce the developments environmental impact over its lifetime, which assists in ensuring a sustainable development for both current and future users. . A BREEAM Pre-Assessment has been completed that demonstrates how the proposal could achieve an 'Excellent' rating in BREEAM New Construction 2018.

The energy strategy proposed for the development, utilising efficient air source heat pumps, in conjunction with high standards of fabric and mechanical services, follows the energy hierarchy and promotes a sustainable development. In line with London Plan targets the development achieves a minimum 15% reduction through energy efficiency measures. This approach results in an overall reduction in emissions (when compared to a Building Regulations baseline) of 80.99% when using the recommended SAP 10 emission factors.

Table 6a shows the reduction in tonnes of CO<sub>2</sub> and kWh per year through the recommended fabric improvements, energy efficiency measures and LZC technologies.

Table 6a: Total anticipated reduction in regulated emissions and energy use				
	Part L		SAP 10	
	kWh/year	Tonnes CO <sub>2</sub> /year	kWh/year	Tonnes CO <sub>2</sub> /year
Baseline	796,000	139.4	796,000	121
Unregulated	97,204	50.4	97,204	22.65
Be Lean & Be Clean	649,530	114.2	649,530	102
Be Green	292,142	50.0	292,142	23
<b>Contribution from renewables</b>	<b>55.02%</b>	<b>56.22%</b>	<b>55.02%</b>	<b>77.45%</b>
<b>Total reduction over Part L</b>	<b>63.30%</b>	<b>64.13%</b>	<b>63.30%</b>	<b>80.99%</b>

The proposed strategy offsets a total of 99 tonnes CO<sub>2</sub> per year, a reduction of 80.99%. The proposal reduces the energy demand by 63.06% which ensures a sustainable development for now and the future.





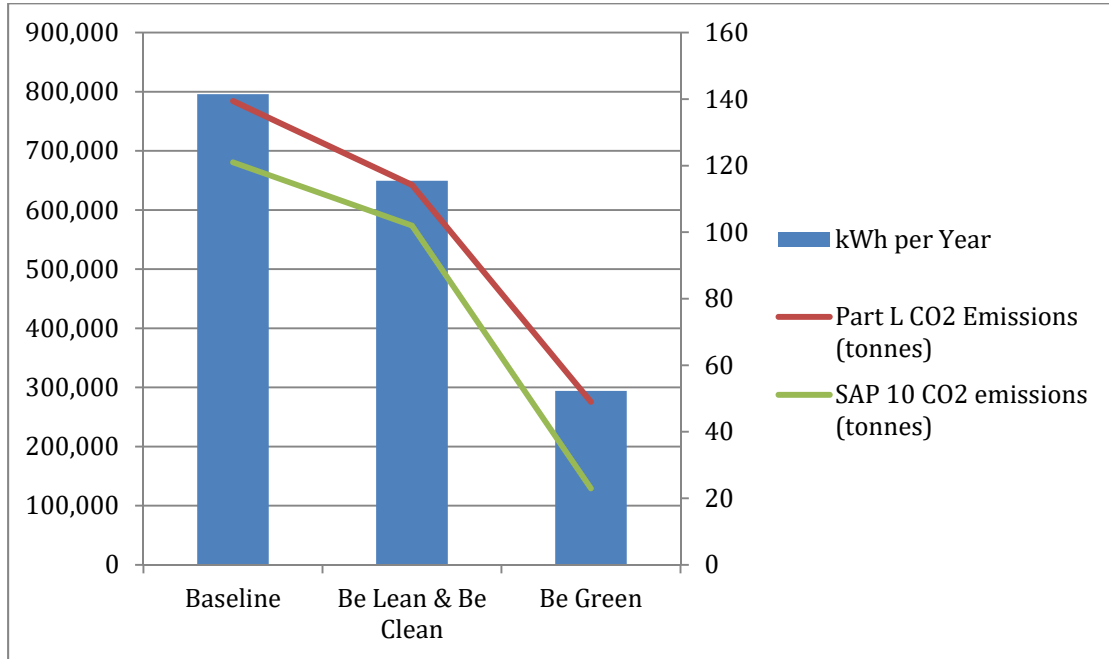


Figure 5.1: CO<sub>2</sub> emissions for each stage of the assessment



# Appendix



SAP 2012 PERFORMANCE

SAP10 PERFORMANCE

DOMESTIC

Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for domestic buildings

	Carbon Dioxide Emissions for domestic buildings (Tonnes CO <sub>2</sub> per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	0	
After energy demand reduction	0	
After heat network / CHP	0	
After renewable energy	0	

Table 2: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for domestic buildings

	Regulated domestic carbon dioxide savings	
	(Tonnes CO <sub>2</sub> per annum)	(%)
Savings from energy demand reduction	0	#DIV/0!
Savings from heat network / CHP	0	#DIV/0!
Savings from renewable energy	0	#DIV/0!
<b>Cumulative on site savings</b>	<b>0</b>	<b>#DIV/0!</b>
Annual savings from off-set payment	0	-
(Tonnes CO <sub>2</sub> )		
Cumulative savings for off-set payment	0	-
Cash in-lev contribution (£)	0	-

Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for domestic buildings

	Carbon Dioxide Emissions for domestic buildings (Tonnes CO <sub>2</sub> per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	0	
After energy demand reduction	0	
After heat network / CHP	0	
After renewable energy	0	

Table 2: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for domestic buildings

	Regulated domestic carbon dioxide savings	
	(Tonnes CO <sub>2</sub> per annum)	(%)
Savings from energy demand reduction	0	#DIV/0!
Savings from heat network / CHP	0	#DIV/0!
Savings from renewable energy	0	#DIV/0!
<b>Cumulative on site savings</b>	<b>0</b>	<b>#DIV/0!</b>
Annual savings from off-set payment	0	-
(Tonnes CO <sub>2</sub> )		
Cumulative savings for off-set payment	0	-
Cash in-lev contribution (£)	0	-

NON-DOMESTIC

Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for non-domestic buildings

	Carbon Dioxide Emissions for non-domestic buildings (Tonnes CO <sub>2</sub> per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	140	22
After energy demand reduction	119	22
After heat network / CHP	115	22
After renewable energy	51	22

Table 4: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for non-domestic buildings

	Regulated non-domestic carbon dioxide savings	
	(Tonnes CO <sub>2</sub> per annum)	(%)
Savings from energy demand reduction	21	15%
Savings from heat network / CHP	4	3%
Savings from renewable energy	64	46%
<b>Total Cumulative Savings</b>	<b>88</b>	<b>63%</b>

Table 5: Shortfall in regulated carbon dioxide savings

	Annual Shortfall (Tonnes CO <sub>2</sub> )	Cumulative Shortfall (Tonnes CO <sub>2</sub> )
Total Target Savings	49	-
Shortfall	-40	-1,188
Cash in-lev contribution (£)	-72,293	-

Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for non-domestic buildings

	Carbon Dioxide Emissions for non-domestic buildings (Tonnes CO <sub>2</sub> per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	121	22
After energy demand reduction	104	22
After heat network / CHP	102	22
After renewable energy	23	22

Table 4: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for non-domestic buildings

	Regulated non-domestic carbon dioxide savings	
	(Tonnes CO <sub>2</sub> per annum)	(%)
Savings from energy demand reduction	17	14%
Savings from heat network / CHP	1	1%
Savings from renewable energy	79	66%
<b>Total Cumulative Savings</b>	<b>98</b>	<b>81%</b>

Table 5: Shortfall in regulated carbon dioxide savings

	Annual Shortfall (Tonnes CO <sub>2</sub> )	Cumulative Shortfall (Tonnes CO <sub>2</sub> )
Total Target Savings	42	-
Shortfall	-56	-1,665
Cash in-lev contribution (£)	-99,907	-

SITE-WIDE

	Total regulated emissions (Tonnes CO <sub>2</sub> / year)	CO <sub>2</sub> savings (Tonnes CO <sub>2</sub> / year)	Percentage savings (%)
Part L 2013 baseline	140		
Be lean	119	21	15%
Be clean	115	4	3%
Be green	51	64	46%
		CO <sub>2</sub> savings off-set (Tonnes CO <sub>2</sub> )	-
Off-set	-	-1,188	-

	Total regulated emissions (Tonnes CO <sub>2</sub> / year)	CO <sub>2</sub> savings (Tonnes CO <sub>2</sub> / year)	Percentage savings (%)
Part L 2013 baseline	121		
Be lean	104	17	14%
Be clean	102	1	1%
Be green	23	79	66%
		CO <sub>2</sub> savings off-set (Tonnes CO <sub>2</sub> )	-
Off-set	-	-1,665	-

Building use	Energy demand following energy efficiency measures (MWh/year)						
	Space Heating	Hot Water	Lighting	Auxiliary	Cooling	Unregulated electricity	Unregulated gas
Domestic	0	0	0	0	0		
Non-domestic	0	0	0	0	0		

Development total	Target Fabric Energy Efficiency (kWh/m <sup>2</sup> )	Dwelling Fabric Energy Efficiency (kWh/m <sup>2</sup> )	Improvement (%)

	Area weighted average non-domestic cooling demand (MJ/m <sup>2</sup> )	Total area weighted non-domestic cooling demand (MJ/year)
Actual		
Notional		

# SBEM Summary

Panda House, London Nov 2020

		Lean	Clean	Green
<b>Base Model</b>		<b>Red. Energy Demand</b>	<b>Inc. Energy Efficiency</b>	<b>LZC Sources</b>
		<i>Changes over Base Model</i>	<i>Changes over Base Model</i>	<i>Changes over Base Model</i>
<b>Drawings</b>	<i>numbers</i>	<b>1</b>	<b>2</b>	<b>3</b>
<b>U Values</b>				
Ext. Walls	<b>0.26</b>	<b>0.15</b>		
Gnd Floor	<b>0.22</b>	<b>0.10</b>		
Windows	<b>1.60</b>	<b>1.00</b>		
Access Doors	<b>2.20</b>	<b>1.00</b>		
Roof	<b>0.18</b>	<b>0.12</b>		
<b>Mech Services</b>				
Space Heating	<b>Gas Fired LPHW</b>			<b>ASHP</b>
Seasonal Efficiency	<b>93%</b>			<b>SCoP 6.5</b>
DHW	<b>Demand</b>			<b>Same ASHP 1,000lts Storage</b>
Delivery Efficiency	<b>95%</b>			
Ventilation				
General	<b>Nat Vent</b>			
WCs/Bathrooms	<b>Local Zone Extract</b>			
Lighting Control	<b>70.0 Lm/W</b>		<b>95.0 Lm/W, D/L Dimming Occup Sensors</b>	
Renewables	<b>None</b>			
<b>Air Tightness</b>	<b>10 m<sup>3</sup>/hr/m<sup>2</sup></b>	<b>3.0</b>		
<b>Electrical Power Factor</b>	<b>&lt;0.9</b>		<b>&gt;0.95</b>	
<b>Lighting Metering Prov?</b>	<b>No</b>		<b>Yes</b>	
<b>Lighting Out-of range Warning?</b>	<b>No</b>		<b>Yes</b>	
<b>BER</b>	<b>31.5</b>	<b>26.9</b>	<b>25.8</b>	<b>11.3</b>
<b>TER: 31.5</b>		<b>Impmnt. 15%</b>	<b>Impmnt. 18%</b>	<b>Impmnt. 64%</b>

## Project name

**Panda House 3. Green**

As designed

Date: Mon Nov 30 16:59:47 2020

## Administrative information

## Building Details

Address: LONDON, E14 7HS

## Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

BRUKL compliance check version: v5.6.b.0

## Certifier details

Name: MES Building Solutions

Telephone number: 01636 653 055

Address: Newark Beacon, Cafferata Way, NEWARK, NG24 2TN

Criterion 1: The calculated CO<sub>2</sub> emission rate for the building must not exceed the target

CO <sub>2</sub> emission rate from the notional building, kgCO <sub>2</sub> /m <sup>2</sup> .annum	24.8
Target CO <sub>2</sub> emission rate (TER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	24.8
Building CO <sub>2</sub> emission rate (BER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	11.3
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

## Building fabric

Element	U <sub>a</sub> -Limit	U <sub>a</sub> -Calc	U <sub>i</sub> -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.15	0.15	R00000A0:Surf[0]
Floor	0.25	0.1	0.1	RM000020:Surf[0]
Roof	0.25	0.12	0.12	V_00000B:Surf[0]
Windows***, roof windows, and rooflights	2.2	1	2	R00000A4:Surf[2]
Personnel doors	2.2	1	1	RM000034:Surf[0]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

U<sub>a</sub>-Limit = Limiting area-weighted average U-values [W/(m<sup>2</sup>K)]U<sub>a</sub>-Calc = Calculated area-weighted average U-values [W/(m<sup>2</sup>K)]U<sub>i</sub>-Calc = Calculated maximum individual element U-values [W/(m<sup>2</sup>K)]

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

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

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

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

Air Permeability	Worst acceptable standard	This building
m <sup>3</sup> /(h.m <sup>2</sup> ) at 50 Pa	10	3

## Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

### 1- Panda ASHP System NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
<b>This system</b>	6.5	-	0.2	0	0.75
<b>Standard value</b>	2.5*	N/A	N/A	N/A	0.5
<b>Automatic monitoring &amp; targeting with alarms for out-of-range values for this HVAC system</b>					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

### 2- Panda ASHP System M Ext

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
<b>This system</b>	6.5	-	0.2	0	-
<b>Standard value</b>	2.5*	N/A	N/A	N/A	N/A
<b>Automatic monitoring &amp; targeting with alarms for out-of-range values for this HVAC system</b>					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

"No HWS in project, or hot water is provided by HVAC system"

### Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]										HR efficiency	
	ID of system type	A	B	C	D	E	F	G	H	I	Zone	Standard
	<b>Standard value</b>	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1		
R.00.07 Laundry		0.4	-	-	-	-	-	-	-	-	-	N/A
R.00.07 Laundry		0.4	-	-	-	-	-	-	-	-	-	N/A
R.00.07 Laundry		0.4	-	-	-	-	-	-	-	-	-	N/A
R.00.08 ACC WC		0.4	-	-	-	-	-	-	-	-	-	N/A
R.00.08 ACC WC		0.4	-	-	-	-	-	-	-	-	-	N/A
R.00.08 ACC. WC.		0.4	-	-	-	-	-	-	-	-	-	N/A
R.00.09 Laundry		0.4	-	-	-	-	-	-	-	-	-	N/A
R.00.09 Laundry		0.4	-	-	-	-	-	-	-	-	-	N/A
R.00.09 Laundry		0.4	-	-	-	-	-	-	-	-	-	N/A
R.00.09 Laundry		0.4	-	-	-	-	-	-	-	-	-	N/A
R.00.10 ACC WC		0.4	-	-	-	-	-	-	-	-	-	N/A







Zone name	SFP [W/(l/s)]										HR efficiency	
	ID of system type	A	B	C	D	E	F	G	H	I		
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
R.12 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.12 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.12 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.12 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.13 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.13 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.13 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.13 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.13 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.13 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.14 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.14 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.14 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.14 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.14 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.15 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.15 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.15 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.15 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.15 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.16 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.16 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.16 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.16 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.16 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.17 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.18 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.19 Bathroom	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.00.09 Kitchen	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.00.09 Kitchen	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.00.09 Kitchen	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.00.11 Kitchen	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.00.11 Kitchen	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.00.11 Kitchen	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.00.11 Kitchen	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.00.15 Kitchen	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.00.13 Kitchen	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.00.13 Kitchen	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.00.13 Kitchen	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.00.13 Kitchen	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.00.13 Kitchen	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.00.13 Kitchen	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.00.13 Kitchen	0.4	-	-	-	-	-	-	-	-	-	-	N/A
R.00.13 Kitchen	0.4	-	-	-	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency		
	ID of system type	A	B	C	D	E	F	G	H	I	Zone	Standard
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1		
R.00.13 Kitchen		0.4	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
R.00.01 Common Hall		-	95	-	82
R.00.01 Common Hall		-	95	-	82
R.00.01 Common Hall		-	95	-	59
R.00.01 Common Hall		-	95	-	82
R.00.01 Common Hall		-	95	-	82
R.00.01 Common Hall		-	95	-	74
R.00.01 Common Hall		-	95	-	134
R.00.01 Common Hall		-	95	-	82
R.00.02 Lift Lobby		-	95	-	21
R.00.02 Lift Lobby		-	95	-	21
R.00.02 Lift Lobby		-	95	-	21
R.00.02 Lift Lobby		-	95	-	21
R.00.02 Lift Lobby		-	95	-	19
R.00.02 Lift Lobby		-	95	-	21
R.00.02 Lift Lobby		-	95	-	24
R.00.03 Common Hall		-	95	-	77
R.00.03 Common Hall		-	95	-	68
R.00.03 Common Hall		-	95	-	124
R.00.03 Lobby		-	95	-	34
R.00.04 Common Hall		-	95	-	98
R.00.04 Common Hall		-	95	-	98
R.00.04 Common Hall		-	95	-	36
R.00.04 Common Hall		-	95	-	98
R.00.04 Common Hall		-	95	-	98
R.00.04 Lobby		-	95	-	25
R.00.04 Lobby		-	95	-	25
R.00.04 Lobby		-	95	-	25
R.00.04 Lobby		-	95	-	25
R.00.04 Stair 1		-	95	-	31
R.00.04 Stair 1		-	95	-	29
R.00.04 Stair 1		-	95	-	34
R.00.05 Common Hall		-	95	-	24
R.00.05 Lobby		-	95	-	25
R.00.05 Lobby		-	95	-	25
R.00.05 Lobby		-	95	-	25
R.00.05 Lobby		-	95	-	25
R.00.05 Stair 2		-	95	-	41
R.00.05 Stair 2		-	95	-	37

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name	Standard value	Luminaire	Lamp	Display lamp	
		60	60	22	
R.00.05 Stair 2		-	95	-	35
R.00.06 Cleaner		95	-	-	5
R.00.06 Cleaner		95	-	-	7
R.00.06 Cleaner		95	-	-	8
R.00.06 Cleaner		95	-	-	7
R.00.06 Cleaner		95	-	-	7
R.00.06 Cleaner		95	-	-	7
R.00.06 Cleaner		95	-	-	7
R.00.06 Common Hall		-	95	-	87
R.00.06 Stair 1		-	95	-	31
R.00.06 Stair 1		-	95	-	31
R.00.06 Stair 1		-	95	-	31
R.00.06 Stair 1		-	95	-	31
R.00.07 Common Hall		-	95	-	42
R.00.07 Laundry		-	95	-	58
R.00.07 Laundry		-	95	-	66
R.00.07 Laundry		-	95	-	52
R.00.07 Stair 2		-	95	-	37
R.00.07 Stair 2		-	95	-	37
R.00.07 Stair 2		-	95	-	37
R.00.07 Stair 2		-	95	-	37
R.00.08 ACC WC		-	95	-	31
R.00.08 ACC WC		-	95	-	27
R.00.08 ACC. WC.		-	95	-	37
R.00.08 Lobby		-	95	-	34
R.00.09 Laundry		-	95	-	58
R.00.09 Laundry		-	95	-	58
R.00.09 Laundry		-	95	-	58
R.00.09 Laundry		-	95	-	58
R.00.09 Plant Room		95	-	-	99
R.00.09 Stair 1		-	95	-	31
R.00.10 ACC WC		-	95	-	31
R.00.10 ACC WC		-	95	-	31
R.00.10 ACC WC		-	95	-	31
R.00.10 ACC WC		-	95	-	31
R.00.10 Gym		-	95	-	187
R.00.10 Living		-	95	-	39
R.00.10 Lounge		-	95	-	42
R.00.10 Stair 2		-	95	-	31
R.00.11 Cleaner		95	-	-	7
R.00.12 Laundry		-	95	-	58
R.00.12 Living		-	95	-	84
R.00.12 Living		-	95	-	84



General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name	Standard value	Luminaire	Lamp	Display lamp	
		60	60	22	
R.00.12 Living		-	95	-	84
R.00.12 Living		-	95	-	84
R.00.13 ACC WC		-	95	-	31
R.00.13 Luggage Room		95	-	-	19
R.00.14 Cinema Room		-	95	-	116
R.00.14 Living		-	95	-	54
R.00.14 Living		-	95	-	54
R.00.14 Living		-	95	-	54
R.00.14 Living		-	95	-	54
R.00.14 Office		95	-	-	146
R.00.15 Reception		-	95	70	116
R.01 Bathroom		-	95	-	17
R.01 Bathroom		-	95	-	20
R.01 Bathroom		-	95	-	24
R.01 Bathroom		-	95	-	20
R.01 Bathroom		-	95	-	20
R.01 Bathroom		-	95	-	17
R.01 Bathroom		-	95	-	20
R.01 Bathroom		-	95	-	17
R.01 Bedroom		-	95	-	39
R.01 Bedroom		-	95	-	46
R.01 Bedroom		-	95	-	40
R.01 Bedroom		-	95	-	38
R.01 Bedroom		-	95	-	46
R.01 Bedroom		-	95	-	46
R.01 Bedroom		-	95	-	51
R.01 Bedroom		-	95	-	46
R.02 Bathroom		-	95	-	17
R.02 Bathroom		-	95	-	21
R.02 Bathroom		-	95	-	21
R.02 Bathroom		-	95	-	18
R.02 Bathroom		-	95	-	18
R.02 Bathroom		-	95	-	18
R.02 Bathroom		-	95	-	18
R.02 Bathroom		-	95	-	18
R.02 Bedroom		-	95	-	44
R.02 Bedroom		-	95	-	48
R.02 Bedroom		-	95	-	44
R.02 Bedroom		-	95	-	31
R.02 Bedroom		-	95	-	26
R.02 Bedroom		-	95	-	44
R.02 Bedroom		-	95	-	44
R.02 Bedroom		-	95	-	44



General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name	Standard value	Luminaire	Lamp	Display lamp	
		60	60	22	
R.03 Bathroom		-	95	-	20
R.03 Bathroom		-	95	-	21
R.03 Bathroom		-	95	-	16
R.03 Bathroom		-	95	-	16
R.03 Bathroom		-	95	-	16
R.03 Bathroom		-	95	-	18
R.03 Bathroom		-	95	-	16
R.03 Bathroom		-	95	-	16
R.03 Bedroom		-	95	-	30
R.03 Bedroom		-	95	-	41
R.03 Bedroom		-	95	-	41
R.03 Bedroom		-	95	-	41
R.03 Bedroom		-	95	-	41
R.03 Bedroom		-	95	-	51
R.03 Bedroom		-	95	-	41
R.03 Bedroom		-	95	-	46
R.04 Bathroom		-	95	-	22
R.04 Bathroom		-	95	-	16
R.04 Bathroom		-	95	-	20
R.04 Bathroom		-	95	-	18
R.04 Bathroom		-	95	-	16
R.04 Bathroom		-	95	-	16
R.04 Bathroom		-	95	-	16
R.04 Bedroom		-	95	-	41
R.04 Bedroom		-	95	-	33
R.04 Bedroom		-	95	-	41
R.04 Bedroom		-	95	-	41
R.04 Bedroom		-	95	-	51
R.04 Bedroom		-	95	-	41
R.04 Bedroom		-	95	-	46
R.05 Bathroom		-	95	-	22
R.05 Bathroom		-	95	-	18
R.05 Bathroom		-	95	-	18
R.05 Bathroom		-	95	-	18
R.05 Bathroom		-	95	-	18
R.05 Bathroom		-	95	-	18
R.05 Bathroom		-	95	-	17
R.05 Bathroom		-	95	-	21
R.05 Bedroom		-	95	-	44
R.05 Bedroom		-	95	-	44
R.05 Bedroom		-	95	-	49
R.05 Bedroom		-	95	-	26
R.05 Bedroom		-	95	-	44

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name	Standard value	Luminaire	Lamp	Display lamp	
		60	60	22	
R.05 Bedroom		-	95	-	44
R.05 Bedroom		-	95	-	55
R.05 Bedroom		-	95	-	44
R.06 Bathroom		-	95	-	20
R.06 Bathroom		-	95	-	20
R.06 Bathroom		-	95	-	21
R.06 Bathroom		-	95	-	17
R.06 Bathroom		-	95	-	17
R.06 Bathroom		-	95	-	25
R.06 Bathroom		-	95	-	20
R.06 Bathroom		-	95	-	20
R.06 Bedroom		-	95	-	52
R.06 Bedroom		-	95	-	51
R.06 Bedroom		-	95	-	38
R.06 Bedroom		-	95	-	45
R.06 Bedroom		-	95	-	45
R.06 Bedroom		-	95	-	40
R.06 Bedroom		-	95	-	45
R.06 Bedroom		-	95	-	45
R.07 Bathroom		-	95	-	18
R.07 Bathroom		-	95	-	18
R.07 Bathroom		-	95	-	18
R.07 Bathroom		-	95	-	18
R.07 Bathroom		-	95	-	20
R.07 Bathroom		-	95	-	23
R.07 Bathroom		-	95	-	21
R.07 Bedroom		-	95	-	55
R.07 Bedroom		-	95	-	45
R.07 Bedroom		-	95	-	40
R.07 Bedroom		-	95	-	45
R.07 Bedroom		-	95	-	45
R.07 Bedroom		-	95	-	45
R.07 Bedroom		-	95	-	45
R.07 Bedroom		-	95	-	31
R.08 Bathroom		-	95	-	18
R.08 Bathroom		-	95	-	26
R.08 Bathroom		-	95	-	18
R.08 Bathroom		-	95	-	18
R.08 Bathroom		-	95	-	19
R.08 Bathroom		-	95	-	17
R.08 Bedroom		-	95	-	44
R.08 Bedroom		-	95	-	44
R.08 Bedroom		-	95	-	44
R.08 Bedroom		-	95	-	18

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name	Standard value	Luminaire	Lamp	Display lamp	
		60	60	22	
R.08 Bedroom		-	95	-	40
R.08 Bedroom		-	95	-	44
R.08 Bedroom		-	95	-	58
R.09 Bathroom		-	95	-	18
R.09 Bathroom		-	95	-	18
R.09 Bathroom		-	95	-	18
R.09 Bathroom		-	95	-	19
R.09 Bathroom		-	95	-	18
R.09 Bathroom		-	95	-	21
R.09 Bedroom		-	95	-	43
R.09 Bedroom		-	95	-	43
R.09 Bedroom		-	95	-	43
R.09 Bedroom		-	95	-	48
R.09 Bedroom		-	95	-	43
R.09 Bedroom		-	95	-	40
R.10 Bathroom		-	95	-	21
R.10 Bathroom		-	95	-	21
R.10 Bathroom		-	95	-	21
R.10 Bathroom		-	95	-	21
R.10 Bathroom		-	95	-	21
R.10 Bathroom		-	95	-	21
R.10 Bedroom		-	95	-	48
R.10 Bedroom		-	95	-	60
R.10 Bedroom		-	95	-	60
R.10 Bedroom		-	95	-	60
R.10 Bedroom		-	95	-	60
R.10 Bedroom		-	95	-	60
R.11 Bathroom		-	95	-	21
R.11 Bathroom		-	95	-	22
R.11 Bathroom		-	95	-	22
R.11 Bathroom		-	95	-	22
R.11 Bathroom		-	95	-	22
R.11 Bathroom		-	95	-	22
R.11 Bedroom		-	95	-	53
R.11 Bedroom		-	95	-	48
R.11 Bedroom		-	95	-	53
R.11 Bedroom		-	95	-	53
R.11 Bedroom		-	95	-	53
R.11 Bedroom		-	95	-	53
R.12 Bathroom		-	95	-	22
R.12 Bathroom		-	95	-	22
R.12 Bathroom		-	95	-	22
R.12 Bathroom		-	95	-	22

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name	Standard value	Luminaire	Lamp	Display lamp	
		60	60	22	
R.12 Bathroom		-	95	-	26
R.12 Bathroom		-	95	-	18
R.12 Bedroom		-	95	-	43
R.12 Bedroom		-	95	-	53
R.12 Bedroom		-	95	-	53
R.12 Bedroom		-	95	-	53
R.12 Bedroom		-	95	-	53
R.12 Bedroom		-	95	-	57
R.13 Bathroom		-	95	-	21
R.13 Bathroom		-	95	-	21
R.13 Bathroom		-	95	-	18
R.13 Bathroom		-	95	-	21
R.13 Bathroom		-	95	-	21
R.13 Bathroom		-	95	-	24
R.13 Bedroom		-	95	-	60
R.13 Bedroom		-	95	-	43
R.13 Bedroom		-	95	-	65
R.13 Bedroom		-	95	-	60
R.13 Bedroom		-	95	-	60
R.13 Bedroom		-	95	-	60
R.14 Bathroom		-	95	-	18
R.14 Bathroom		-	95	-	18
R.14 Bathroom		-	95	-	18
R.14 Bathroom		-	95	-	18
R.14 Bathroom		-	95	-	18
R.14 Bedroom		-	95	-	43
R.14 Bedroom		-	95	-	43
R.14 Bedroom		-	95	-	43
R.14 Bedroom		-	95	-	43
R.14 Bedroom		-	95	-	43
R.15 Bathroom		-	95	-	18
R.15 Bathroom		-	95	-	18
R.15 Bathroom		-	95	-	18
R.15 Bathroom		-	95	-	22
R.15 Bedroom		-	95	-	44
R.15 Bedroom		-	95	-	44
R.15 Bedroom		-	95	-	44
R.15 Bedroom		-	95	-	44
R.15 Bedroom		-	95	-	53
R.16 Bathroom		-	95	-	18
R.16 Bathroom		-	95	-	18
R.16 Bathroom		-	95	-	18

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name	Standard value	Luminaire	Lamp	Display lamp	
		60	60	22	
R.16 Bathroom		-	95	-	21
R.16 Bathroom		-	95	-	18
R.16 Bedroom		-	95	-	45
R.16 Bedroom		-	95	-	60
R.16 Bedroom		-	95	-	45
R.16 Bedroom		-	95	-	45
R.16 Bedroom		-	95	-	45
R.17 Bathroom		-	95	-	19
R.17 Bedroom		-	95	-	40
R.18 Bathroom		-	95	-	19
R.18 Bedroom		-	95	-	40
R.19 Bathroom		-	95	-	20
R.19 Bedroom		-	95	-	40
R.08 Bedroom		-	95	-	38
R.00.09 Dining		-	95	-	43
R.00.09 Kitchen		-	95	-	126
R.00.09 Dining		-	95	-	44
R.00.09 Kitchen		-	95	-	135
R.00.09 Kitchen		-	95	-	114
R.00.09 Living		-	95	-	99
R.00.09 Dining		-	95	-	31
R.00.11 Dining		-	95	-	38
R.00.11 Kitchen		-	95	-	128
R.00.11 Dining		-	95	-	38
R.00.11 Kitchen		-	95	-	128
R.00.11 Dining		-	95	-	38
R.00.11 Kitchen		-	95	-	128
R.00.11 Dining		-	95	-	38
R.00.11 Kitchen		-	95	-	128
R.00.15 Dining		-	95	-	43
R.00.15 Kitchen		-	95	-	83
R.00.13 Kitchen		-	95	-	79
R.00.13 Dining		-	95	-	74
R.00.13 Kitchen		-	95	-	61
R.00.13 Kitchen		-	95	-	61
R.00.13 Kitchen		-	95	-	79
R.00.13 Dining		-	95	-	74
R.00.13 Kitchen		-	95	-	61
R.00.13 Dining		-	95	-	74
R.00.13 Kitchen		-	95	-	79
R.00.13 Kitchen		-	95	-	61
R.00.13 Dining		-	95	-	74
R.00.13 Kitchen		-	95	-	79

**Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains**

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
R.00.10 Gym	N/A	N/A
R.00.14 Office	NO (-58%)	NO
R.00.15 Reception	NO (-44.8%)	NO
R.01 Bedroom	NO (-77.4%)	NO
R.01 Bedroom	NO (-79.6%)	NO
R.01 Bedroom	NO (-10.6%)	NO
R.01 Bedroom	NO (-18.2%)	NO
R.01 Bedroom	NO (-79.6%)	NO
R.01 Bedroom	NO (-79.6%)	NO
R.01 Bedroom	NO (-79.4%)	NO
R.01 Bedroom	NO (-79.6%)	NO
R.02 Bedroom	NO (-56%)	NO
R.02 Bedroom	NO (-56%)	NO
R.02 Bedroom	NO (-56%)	NO
R.02 Bedroom	NO (-57.1%)	NO
R.02 Bedroom	NO (-78.6%)	NO
R.02 Bedroom	NO (-56%)	NO
R.02 Bedroom	NO (-56%)	NO
R.02 Bedroom	NO (-56%)	NO
R.02 Bedroom	NO (-56%)	NO
R.03 Bedroom	YES (+15.4%)	NO
R.03 Bedroom	NO (-58%)	NO
R.03 Bedroom	NO (-58%)	NO
R.03 Bedroom	NO (-58%)	NO
R.03 Bedroom	NO (-58%)	NO
R.03 Bedroom	NO (-42%)	NO
R.03 Bedroom	NO (-58%)	NO
R.03 Bedroom	NO (-58%)	NO
R.04 Bedroom	NO (-58%)	NO
R.04 Bedroom	YES (+16%)	NO
R.04 Bedroom	NO (-58%)	NO
R.04 Bedroom	NO (-58%)	NO
R.04 Bedroom	NO (-12.7%)	NO
R.04 Bedroom	NO (-58%)	NO
R.04 Bedroom	NO (-58%)	NO
R.05 Bedroom	NO (-56.7%)	NO
R.05 Bedroom	NO (-56.7%)	NO
R.05 Bedroom	NO (-56.7%)	NO
R.05 Bedroom	NO (-80.9%)	NO
R.05 Bedroom	NO (-56.7%)	NO
R.05 Bedroom	NO (-56.7%)	NO
R.05 Bedroom	NO (-26.4%)	NO
R.05 Bedroom	NO (-56.7%)	NO
R.06 Bedroom	NO (-79.7%)	NO
R.06 Bedroom	NO (-48.3%)	NO



Zone	Solar gain limit exceeded? (%)	Internal blinds used?
R.06 Bedroom	NO (-77.2%)	NO
R.06 Bedroom	NO (-79.4%)	NO
R.06 Bedroom	NO (-79.4%)	NO
R.06 Bedroom	NO (-17.1%)	NO
R.06 Bedroom	NO (-79.4%)	NO
R.06 Bedroom	NO (-79.4%)	NO
R.07 Bedroom	NO (-15.7%)	NO
R.07 Bedroom	NO (-29.7%)	NO
R.07 Bedroom	NO (-38.5%)	NO
R.07 Bedroom	NO (-29.7%)	NO
R.07 Bedroom	NO (-29.7%)	NO
R.07 Bedroom	NO (-29.7%)	NO
R.07 Bedroom	NO (-61.8%)	NO
R.08 Bedroom	NO (-27.5%)	NO
R.08 Bedroom	NO (-27.5%)	NO
R.08 Bedroom	NO (-27.5%)	NO
R.08 Bedroom	N/A	N/A
R.08 Bedroom	NO (-36.1%)	NO
R.08 Bedroom	NO (-27.5%)	NO
R.08 Bedroom	NO (-34.1%)	NO
R.09 Bedroom	NO (-26.3%)	NO
R.09 Bedroom	NO (-26.3%)	NO
R.09 Bedroom	NO (-26.3%)	NO
R.09 Bedroom	NO (-37.5%)	NO
R.09 Bedroom	NO (-26.3%)	NO
R.09 Bedroom	NO (-37.3%)	NO
R.10 Bedroom	NO (-37.5%)	NO
R.10 Bedroom	NO (-59.2%)	NO
R.10 Bedroom	NO (-59.2%)	NO
R.10 Bedroom	NO (-59.2%)	NO
R.10 Bedroom	NO (-59.2%)	NO
R.10 Bedroom	NO (-65.8%)	NO
R.11 Bedroom	NO (-34.2%)	NO
R.11 Bedroom	NO (-38.4%)	NO
R.11 Bedroom	NO (-34.2%)	NO
R.11 Bedroom	NO (-34.2%)	NO
R.11 Bedroom	NO (-34.2%)	NO
R.11 Bedroom	NO (-34.2%)	NO
R.12 Bedroom	NO (-37.6%)	NO
R.12 Bedroom	NO (-32.8%)	NO
R.12 Bedroom	NO (-32.8%)	NO
R.12 Bedroom	NO (-32.8%)	NO
R.12 Bedroom	NO (-32.8%)	NO
R.12 Bedroom	NO (-32.7%)	NO
R.13 Bedroom	NO (-59.9%)	NO
R.13 Bedroom	NO (-37.6%)	NO
R.13 Bedroom	NO (-65.8%)	NO
R.13 Bedroom	NO (-59.9%)	NO
R.13 Bedroom	NO (-59.9%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
R.13 Bedroom	NO (-59.9%)	NO
R.14 Bedroom	NO (-34.3%)	NO
R.14 Bedroom	NO (-34.3%)	NO
R.14 Bedroom	NO (-38.5%)	NO
R.14 Bedroom	NO (-34.3%)	NO
R.14 Bedroom	NO (-34.3%)	NO
R.15 Bedroom	NO (-35.3%)	NO
R.15 Bedroom	NO (-35.3%)	NO
R.15 Bedroom	NO (-35.3%)	NO
R.15 Bedroom	NO (-35.3%)	NO
R.15 Bedroom	NO (-32.8%)	NO
R.16 Bedroom	NO (-37.3%)	NO
R.16 Bedroom	NO (-65.8%)	NO
R.16 Bedroom	NO (-37.3%)	NO
R.16 Bedroom	NO (-37.3%)	NO
R.16 Bedroom	NO (-37.3%)	NO
R.16 Bedroom	NO (-37.3%)	NO
R.17 Bedroom	NO (-43.1%)	NO
R.18 Bedroom	NO (-54.3%)	NO
R.19 Bedroom	NO (-55%)	NO
R.08 Bedroom	NO (-28.4%)	NO
R.00.09 Dining	NO (-54.8%)	NO
R.00.09 Dining	NO (-60.3%)	NO
R.00.09 Dining	NO (-51.8%)	NO
R.00.11 Dining	NO (-65.4%)	NO
R.00.11 Dining	NO (-65.4%)	NO
R.00.11 Dining	NO (-65.4%)	NO
R.00.11 Dining	NO (-65.4%)	NO
R.00.15 Dining	NO (-51.1%)	NO
R.00.13 Dining	NO (-25.9%)	NO
R.00.13 Dining	NO (-25.9%)	NO
R.00.13 Dining	NO (-25.9%)	NO
R.00.13 Dining	NO (-25.9%)	NO

**Criterion 4: The performance of the building, as built, should be consistent with the calculated BER**

Separate submission

**Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place**

Separate submission

**EPBD (Recast): Consideration of alternative energy systems**

<b>Were alternative energy systems considered and analysed as part of the design process?</b>	<b>NO</b>
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

# Technical Data Sheet (Actual vs. Notional Building)

## Building Global Parameters

	Actual	Notional
Area [m <sup>2</sup> ]	4426.4	4426.4
External area [m <sup>2</sup> ]	3854.5	3854.5
Weather	LON	LON
Infiltration [m <sup>3</sup> /hm <sup>2</sup> @ 50Pa]	3	3
Average conductance [W/K]	1151.99	2153.19
Average U-value [W/m <sup>2</sup> K]	0.3	0.56
Alpha value* [%]	10.4	10

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

## Building Use

### % Area Building Type

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

## Energy Consumption by End Use [kWh/m<sup>2</sup>]

	Actual	Notional
Heating	3.5	10.86
Cooling	0	0
Auxiliary	3.88	2.61
Lighting	3.7	10.25
Hot water	11.17	25.27
Equipment*	21.96	21.96
<b>TOTAL**</b>	<b>22.25</b>	<b>49</b>

\* Energy used by equipment does not count towards the total for consumption or calculating emissions.

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

## Energy Production by Technology [kWh/m<sup>2</sup>]

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

## Energy & CO<sub>2</sub> Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m <sup>2</sup> ]	72.98	100.03
Primary energy* [kWh/m <sup>2</sup> ]	66.6	146.66
Total emissions [kg/m <sup>2</sup> ]	11.3	24.8

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

## HVAC Systems Performance

System Type	Heat dem MJ/m <sup>2</sup>	Cool dem MJ/m <sup>2</sup>	Heat con kWh/m <sup>2</sup>	Cool con kWh/m <sup>2</sup>	Aux con kWh/m <sup>2</sup>	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
Actual	49.7	0	2.4	0	2.2	5.8	0	6.5	0
Notional	74.3	0	8.1	0	1.1	2.56	0	----	----
[ST] Central heating using water: radiators, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
Actual	180.2	0	8.6	0	11.4	5.8	0	6.5	0
Notional	220.4	0	23.9	0	9.6	2.56	0	----	----
[ST] No Heating or Cooling									
Actual	0	0	0	0	0	0	0	0	0
Notional	0	0	0	0	0	0	0	----	----

### Key to terms

Heat dem [MJ/m <sup>2</sup> ]	= Heating energy demand
Cool dem [MJ/m <sup>2</sup> ]	= Cooling energy demand
Heat con [kWh/m <sup>2</sup> ]	= Heating energy consumption
Cool con [kWh/m <sup>2</sup> ]	= Cooling energy consumption
Aux con [kWh/m <sup>2</sup> ]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type



# Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

## Building fabric

Element	U <sub>i-Typ</sub>	U <sub>i-Min</sub>	Surface where the minimum value occurs*
Wall	0.23	0.15	R00000A0:Surf[0]
Floor	0.2	0.1	RM000020:Surf[0]
Roof	0.15	0.12	V_00000B:Surf[0]
Windows, roof windows, and rooflights	1.5	1	R00000A8:Surf[0]
Personnel doors	1.5	1	RM000034:Surf[0]
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building
U <sub>i-Typ</sub> = Typical individual element U-values [W/(m <sup>2</sup> K)]		U <sub>i-Min</sub> = Minimum individual element U-values [W/(m <sup>2</sup> K)]	
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m <sup>3</sup> /(h.m <sup>2</sup> ) at 50 Pa	5	3

## Criteria Summary

<b>Project:</b>	190226 - Panda House
<b>Report:</b>	Pre-Assessment Stage
<b>Design Target:</b>	Excellent - 71.27%

Management	Compliance Requirements	Available		Targeted	
		Credits	Percent	Credits	Percent
Man 01: Project brief and design > 1. Project delivery planning	<p><b>One credit - Project delivery planning</b></p> <p><b>1.</b> Prior to completion of the Concept Design, the project delivery stakeholders (see Definitions) meet to identify and define for each key phase of project delivery:</p> <ul style="list-style-type: none"> <li>a. Roles</li> <li>b. Responsibilities</li> <li>c. Contributions.</li> </ul> <p><b>2.</b> Consider each one of the following items when defining roles, responsibilities and contributions for each key phase of the project:</p> <ul style="list-style-type: none"> <li>a. End user requirements</li> <li>b. Aims of the design and design strategy</li> <li>c. Particular installation and construction requirements or limitations</li> <li>d. Occupiers' budget and technical expertise in maintaining any proposed systems</li> <li>e. Maintainability and adaptability of the proposals</li> <li>f. Operational energy (see Assessment scope)</li> <li>g. Requirements for the production of project and end user documentation</li> <li>h. Requirements for commissioning, training and aftercare support.</li> </ul> <p>Where the building occupants are not known, the list of considerations above still applies. The appropriate project delivery stakeholder considers each item, based on likely scenarios of building occupancy.</p> <p><b>3.</b> The project team demonstrates how the project delivery stakeholders' contributions and the consultation process outcomes influence the following:</p> <ul style="list-style-type: none"> <li>a. Initial Project Brief</li> <li>b. Project Execution Plan (see Definitions)</li> <li>c. Communication Strategy (see Definitions)</li> <li>d. Concept Design.</li> </ul>	1	0.52%	1	0.52%



<p>Man 01: Project brief and design &gt; 2. Stakeholder consultation</p>	<p><b>One credit - Stakeholder consultation (interested parties)</b>  <b>4.</b> Prior to completion of the Concept Design, the design team consult with all interested parties (see Definitions) on matters that cover the minimum consultation content (see Methodology).  <b>5.</b> Demonstrate how the stakeholder contributions and consultation exercise outcomes influence the Initial Project Brief and Concept Design.  <b>6.</b> Prior to completion of the detailed design (RIBA Stage 4, Technical Design or equivalent), all interested parties (see Definitions) give and receive consultation feedback.  <b>Additionally for Education, Healthcare, Law courts and Major transportation hub building types only:</b>  <b>7.</b> An independent party (see Definitions) carries out the consultation exercise. The Design Quality Indicator (DQI) and the Achieving Excellence Design Evaluation Toolkit (AEDET) could be used as methods to assess the design quality of buildings.  <b>Prerequisite for BREEAM Advisory Professional credits (Concept and Developed Design)</b>  <b>8.</b> The project team, including the client, formally agree strategic performance targets (see Definitions) early in the design process, see Definitions, (with the support of the BREEAM AP where appointed).</p>	<p>1</p>	<p>0.52%</p>	<p>1</p>	<p>0.52%</p>
<p>Man 01: Project brief and design &gt; 3. BREEAM Advisory Professional : BREEAM AP (Concept Design)</p>	<p><b>One credit (or one exemplary credit for Simple Buildings) - BREEAM AP (Concept Design)</b>  <b>9.</b> Involve a BREEAM AP in the project at an appropriate time and level to:  <b>a.</b> Work with the project team, including the client, to consider the links between BREEAM issues and assist them in maximising the project's overall performance against BREEAM, from their appointment and throughout Concept Design.  <b>b.</b> Monitor progress against the performance targets (see Definitions on the next page) agreed under criterion 8 throughout all stages after their appointment where</p>	<p>1</p>	<p>0.52%</p>	<p>0</p>	<p>0%</p>

	<p>decisions critically impact BREEAM performance.</p> <p>c. Proactively identify risks and opportunities related to the achievement of the targets agreed under criterion 8.</p> <p>d. Provide feedback to the project team as appropriate, to support them in taking corrective actions and achieving their agreed performance targets.</p> <p>e. Monitor and, where relevant, coordinate the generation of appropriate evidence by the project team.</p>				
<p>Man 01: Project brief and design &gt; 3. BREEAM Advisory Professional : BREEAM AP (Developed Design)</p>	<p><b>One credit (or one exemplary credit for Simple Buildings) - BREEAM AP (Developed Design)</b></p> <p><b>10.</b> Criteria 8 and 9 are achieved.</p> <p><b>11.</b> Involve the BREEAM AP in the project at an appropriate time and level to:</p> <p>a. Work with the project team, including the client, to consider the links between BREEAM issues and to assist them in maximising the project's overall performance against BREEAM throughout Developed Design.</p> <p>b. Monitor progress against the performance targets agreed under criterion 8 throughout all stages where decisions critically impact the specification and tendering process and the BREEAM performance.</p> <p>c. Proactively identify risks and opportunities related to the achievement of the targets agreed under criterion 8.</p> <p>d. Provide feedback to the project team as appropriate, to support them in taking corrective actions and achieving their agreed performance targets.</p> <p>e. Monitor and, where relevant, coordinate the generation of appropriate evidence by the project team.</p>	1	0.52%	0	0%
<p>Man 02: Life cycle cost and service life planning &gt; 1. Elemental life cycle cost (LCC)</p>	<p><b>Two credits - Elemental LCC</b></p> <p><b>1.</b> A competent person (see Definitions) carries out an outline, entire asset LCC plan at Process Stage 2 (equivalent to Concept Design - RIBA Stage 2)</p>	2	1.05%	2	1.05%

	<p>together with any design options appraisals in line with 'Standardised method of life cycle costing for construction procurement' PD 156865: 2008.</p> <p><b>2. The elemental LCC plan:</b></p> <ul style="list-style-type: none"> <li><b>a.</b> Provides an indication of future replacement costs over a period of analysis as required by the client (e.g. 20, 30, 50 or 60 years);</li> <li><b>b.</b> Includes service life, maintenance and operation cost estimates.</li> </ul> <p>The study period should ideally be agreed by the client, in line with the design life expectancy of the building. However, where the life expectancy of the building is not yet formally agreed (due to being at very early design stages), the default design life of 60 years should be used for modelling purposes (in line with the UK default).</p> <p><b>3.</b> Demonstrate, using appropriate examples provided by the design team, how the elemental LCC plan has been used to influence building and systems design and specification to minimise life cycle costs and maximise critical value.</p>				
<p>Man 02: Life cycle cost and service life planning &gt; 2. Component level life options appraisal</p>	<p><b>One credit - Component level LCC options appraisal</b></p> <p><b>4.</b> A competent person develops a component level LCC options appraisal by the end of Process Stage 4 (equivalent to Technical Design – RIBA Stage 4) in line with PD 156865: 2008. The component level LCC includes (where present):</p> <ul style="list-style-type: none"> <li><b>a.</b> Envelope, e.g. cladding, windows, or roofing</li> <li><b>b.</b> Services, e.g. heat source cooling source, or controls</li> <li><b>c.</b> Finishes, e.g. walls, floors or ceilings</li> <li><b>d.</b> External spaces, e.g. alternative hard landscaping, boundary protection.</li> </ul> <p>The Component level LCC option appraisal should review all of the above component types (where present). However, you do not need to consider every single example cited under each component; only a selection of those most likely to draw valued comparisons. This is to ensure that a wide range of options are considered and help focus the analysis on components which would benefit the most from appraisal.</p>	<p>1</p>	<p>0.52%</p>	<p>1</p>	<p>0.52%</p>

	5. Demonstrate, using appropriate examples provided by the design team, how the component level LCC options appraisal has been used to influence building and systems design and specification to minimise life cycle costs and maximise critical value.				
Man 02: Life cycle cost and service life planning > 3. Capital cost reporting	<b>One credit - Capital cost reporting</b> 6. Report the capital cost for the building in pounds per square metre of gross internal floor area (£k/m <sup>2</sup> ) as part of the submission to BRE. See also Methodology below and Additional information.	1	0.52%	1	0.52%
Man 03: Responsible construction practices > 1. Pre-requisite - Legally harvested and traded timber	1. All timber and timber-based products used during the construction process of the project are 'legally harvested and traded timber' (see Definitions). For other materials there are no prerequisite requirements at this stage.	0	0%	0	0%
Man 03: Responsible construction practices > 3. Environmental management	<b>One credit – Environmental management</b> 3. All parties who at any stage manage the construction site (e.g. the principal contractor, the demolition contractor) operate an EMS covering their main operations. The EMS must: a. Be third party certified, to ISO 14001: 2015, EMAS (EU Eco-Management and Audit Scheme) or equivalent standard; OR b. In compliance with BS 8555: 2016 have: i. Appropriate structure ii. Reached implementation stage phase four 'implementation and operation of the environmental management system' iii. Completed defined phase audits one to four. 4. All parties who at any point manage the construction site (e.g. the principal contractor, the demolition contractor) implement best practice pollution prevention policies and procedures on-site in accordance with Working at construction and demolition sites: PPG6, Pollution Prevention Guidelines.	1	0.52%	1	0.52%
Man 03: Responsible construction practices > 4. BREEAM Advisory Professional	<b>Pre-requisite for the BREEAM AP credit</b> 5. The client and the contractor	1	0.52%	0	0%

(Site)	<p>formally agree performance targets.</p> <p><b>One credit – BREEAM AP (site)</b></p> <p>6. Involve a BREEAM AP in the project at an appropriate time and level to:</p> <ul style="list-style-type: none"> <li>a. Work with the project team, including the client, to consider the links between BREEAM issues and assist them in achieving and if possible going beyond the design intent, to maximise the project's performance against the agreed performance targets throughout the Construction, Handover and Close Out stages.</li> <li>b. Monitor construction progress against the performance targets agreed under criterion 5 throughout all stages where decisions critically impact BREEAM performance.</li> <li>c. Proactively identify risks and opportunities related to the procurement and construction process and the achievement of the targets agreed under criterion 5.</li> <li>d. Provide feedback to the constructors and the project team as appropriate, to support them in taking corrective actions and achieving their agreed performance targets.</li> <li>e. Monitor and, where relevant, coordinate the generation of appropriate evidence by the project team and the provision to the assessor.</li> </ul>				
Man 03: Responsible construction practices > 5. Responsible construction management	<p><b>One credit</b></p> <p>7. Achieve items listed as required for one credit in Table 4.1 Responsible construction management items</p> <p><b>Two credits</b></p> <p>8. Achieve criterion 7.</p> <p>9. Achieve six additional items in table 4.1</p> <p><b>Exemplary level criteria: one credit</b></p> <p>To achieve an exemplary performance credit:</p> <p>23. Achieve all items in Table 4.1.</p>	2	1.05%	2	1.05%
Man 03: Responsible construction practices > 6. Monitoring of construction site impacts : Pre-requisite	<p><b>10.</b> Assign responsibility to an individual for monitoring, recording and reporting energy use, water consumption and transportation data (where</p>	0	0%	0	0%

	measured) resulting from all on-site construction processes (and dedicated off-site manufacturing) throughout the build programme. To ensure the robust collection of information, this individual must have the appropriate authority and responsibility to request and access the data required. Where appointed, the BREEAM AP could perform this role.				
Man 03: Responsible construction practices > 6. Monitoring of construction site impacts : Utility consumption	<p><b>One credit - Utility consumption</b>  <b>Energy Consumption</b>  <b>11.</b> Achieve criterion 10.  <b>12.</b> Set targets for the site energy consumption in kWh (and where relevant, litres of fuel used) as a result of the use of construction plant, equipment (mobile and fixed) and site accommodation.  <b>13.</b> Monitor and record data for the energy consumption described in criterion 12.  <b>14.</b> Report the total carbon dioxide emissions (total kgCO<sub>2</sub>/project value) from the construction process via BREEAM Projects (for the purposes of potential future BREEAM performance benchmarking).  <b>Water consumption</b>  <b>15.</b> Achieve criterion 10.  <b>16.</b> Set targets for the potable water consumption (m<sup>3</sup>) arising from the use of construction plant, equipment (mobile and fixed) and site accommodation.  <b>17.</b> Monitor and record data for the potable water consumption described in criterion 16.  <b>18.</b> Use the collated data to report the total net water consumption (m<sup>3</sup>), i.e. consumption minus any recycled water use from the construction process via BREEAM Projects (for the purposes of potential future BREEAM performance benchmarking).</p>	1	0.52%	1	0.52%
Man 03: Responsible construction practices > 6. Monitoring of construction site impacts : Transportation of construction materials and waste	<p><b>One credit (or one exemplary credit for Simple Buildings) - Transportation of construction materials and waste</b>  <b>19.</b> Achieve criterion 10.  <b>20.</b> Set targets for transportation movements and impacts resulting from delivery of the majority of construction materials to site and construction waste from site. As a minimum cover:  <b>a.</b> transportation of materials from the point of supply to the building site, including any transport,</p>	1	0.52%	1	0.52%



	<p>intermediate storage and point of supply (see Definitions). Monitor as a minimum:</p> <ul style="list-style-type: none"> <li>i. Materials used in major building elements (i.e. those defined in BREEAM issue Mat 01 Environmental impacts from construction products - Building life cycle assessment (LCA)).</li> <li>ii. Ground works and landscaping materials.</li> </ul> <p>b. transportation of construction waste from the construction gate to waste disposal processing or recovery centre gate. This monitoring must cover the construction waste groups outlined in the project's resource management plan.</p> <p>21. Monitor and record data for the transportation movements as described in criterion 20 above.</p> <p>22. Using the collated data, report separately for materials and waste, the total transport-related carbon dioxide emissions (kgCO<sub>2</sub>eq), plus total distance travelled (km) via BREEAM Projects (for the purposes of potential future BREEAM performance benchmarking).</p>				
<p>Man 04: Commissioning and handover &gt; 1. Commissioning - testing schedule and responsibilities</p>	<p><b>One credit - Commissioning - testing schedule and responsibilities</b></p> <p>1. Prepare a schedule of commissioning and testing. The schedule identifies and includes a suitable timescale for commissioning and re-commissioning of all complex and non-complex building services and control systems and for testing and inspecting building fabric.</p> <p>2. The schedule identifies the appropriate standards for all commissioning activities to be conducted, where applicable, in accordance with:</p> <ul style="list-style-type: none"> <li>a. Current Building Regulations</li> <li>b. BSRIA guidelines</li> <li>c. CIBSE guidelines</li> <li>d. Other appropriate standards (see Methodology)</li> </ul> <p>Exclude from the assessment any process or manufacture-related equipment specified as part of the project. However, include such</p>	<p>1</p>	<p>0.52%</p>	<p>1</p>	<p>0.52%</p>

	<p>equipment in cases where they form an integral part of the building HVAC services, such as some heat recovery systems.</p> <p><b>3.</b> Where a building management system (BMS) is specified:</p> <ul style="list-style-type: none"> <li><b>a.</b> Carry out commissioning of air and water systems when all control devices are installed, wired and functional</li> <li><b>b.</b> Include physical measurements of room temperatures, off-coil temperatures and other key parameters, as appropriate, in commissioning results</li> <li><b>c.</b> The BMS or controls installation should be running in auto with satisfactory internal conditions prior to handover</li> <li><b>d.</b> All BMS schematics and graphics (if BMS is present) are fully installed and functional to user interface prior to handover</li> <li><b>e.</b> Fully train the occupier or facilities team in the operation of the system.</li> </ul> <p><b>4.</b> Appoint an appropriate project team member to monitor and programme pre-commissioning, commissioning and testing. Where necessary include re-commissioning activities on behalf of the client.</p> <p><b>5.</b> The principal contractor accounts for the commissioning and testing programme, responsibilities and criteria within their budget and the main programme of works. Allow the required time to complete all commissioning and testing activities prior to handover.</p>				
<p>Man 04: Commissioning and handover &gt; 2. Commissioning - design and preparation</p>	<p><b>One credit - Commissioning - design and preparation</b></p> <p><b>6.</b> Achieve criteria 1 to 5.</p> <p><b>7.</b> During the design stage, the client or the principal contractor appoints an appropriate project team member (see criterion 4), provided they are not involved in the general installation works for the building services systems, with responsibility for:</p> <ul style="list-style-type: none"> <li><b>a.</b> Undertaking design reviews and giving advice on suitability for ease of commissioning.</li> <li><b>b.</b> Providing commissioning management input to construction programming</li> </ul>	<p>1</p>	<p>0.52%</p>	<p>1</p>	<p>0.52%</p>

	<p>and during installation stages.</p> <p>c. Management of commissioning, performance testing and handover or post-handover stages.</p> <p>For buildings with complex building services and systems, this role needs to be carried out by a specialist commissioning manager (see Definitions).</p>				
Man 04: Commissioning and handover > 3. Testing and inspecting building fabric	<p><b>One credit - Testing and inspecting building fabric</b></p> <p><b>8.</b> Achieve criteria 1 to 5.</p> <p><b>9.</b> Complete post-construction testing and inspection to quality-assure the integrity of the building fabric, including continuity of insulation, avoidance of thermal bridging and air leakage paths (this is through air tightness testing and a thermographic survey). A suitably qualified professional (see Definitions) undertakes the survey and testing in accordance with the appropriate standard.</p> <p><b>10.</b> Rectify any defects identified during post-construction testing and inspection prior to building handover and close out. Any remedial work must meet the required performance characteristics for the building or element as defined at the design stage (see Methodology).</p>	1	0.52%	1	0.52%
Man 04: Commissioning and handover > 4. Handover	<p><b>One credit - Handover</b></p> <p><b>11.</b> Prior to handover, develop two building user guides (see Methodology) for the following users:</p> <ul style="list-style-type: none"> <li>a. A non-technical user guide for distribution to the building occupiers.</li> <li>b. A technical user guide for the premises facilities managers.</li> </ul> <p>A draft copy is developed and discussed with users first (where the building occupants are known) to ensure the guide is most appropriate and useful to potential users.</p> <p><b>12.</b> Prepare two training schedules timed appropriately around handover and proposed occupation plans for the following users:</p> <ul style="list-style-type: none"> <li>a. A non-technical training schedule for the building occupiers.</li> <li>b. A technical training schedule for the premises facilities managers.</li> </ul>	1	0.52%	1	0.52%
Man 05: Aftercare > 1. Aftercare support	<p><b>One credit - Aftercare support</b></p> <p><b>1.</b> Provide aftercare support to</p>	1	0.52%	1	0.52%

	<p>the building occupiers through having in place operational infrastructure and resources. This includes as a minimum:</p> <ul style="list-style-type: none"> <li><b>a.</b> A meeting between the aftercare support team or individual, and the building occupier or management team (prior to initial occupation, or as soon as possible thereafter) to: <ul style="list-style-type: none"> <li><b>i.</b> Introduce the aftercare support available, including the content of the building user guide (where it exists) and training schedule and their content.</li> <li><b>ii.</b> Present key information about feature of the building including the design intent and how to use the building to ensure it operates as efficiently and effectively as possible.</li> </ul> </li> <li><b>b.</b> On-site facilities management training including: <ul style="list-style-type: none"> <li><b>i.</b> a walkabout of the building</li> </ul> </li> </ul> <p>AND</p> <ul style="list-style-type: none"> <li><b>ii.</b> introduction to and familiarisation with the building systems, their controls and how to operate them in accordance with the design intent and operational demands.</li> </ul> <ul style="list-style-type: none"> <li><b>c.</b> Provide initial aftercare support for at least the first month of building occupation, e.g. weekly attendance on-site, to support building users and management (the level of frequency will depend on the complexity of the building and building operations).</li> <li><b>d.</b> Provide longer term aftercare support for occupiers for at least the first 12 months from occupation, e.g. a helpline, nominated individual or other appropriate system to support building users and management.</li> </ul> <p><b>2.</b> Establish operational infrastructure and resources to coordinate the collection and</p>				
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	<p>monitoring of energy and water consumption data for a minimum of 12 months, once the building is substantially occupied. This facilitates analysis of discrepancies between actual and predicted performance, with a view to adjusting systems and user behaviours accordingly.</p>				
<p>Man 05: Aftercare &gt; 2. Commissioning - implementation</p>	<p><b>One credit - Commissioning - implementation</b>  <b>3.</b> Complete the following commissioning activities over a minimum 12-month period, once the building becomes substantially occupied:  <b>a.</b> Complex systems: The specialist commissioning manager will:  <b>i.</b> Identify changes made by the owner or operator that might have caused impaired or improved performance.  <b>ii.</b> Test all building services under full load conditions, i.e. heating equipment in mid-winter, cooling and ventilation equipment in mid-summer and under part load conditions (spring and autumn).  <b>iii.</b> Where applicable, carry out testing during periods of extreme (high or low) occupancy.  <b>iv.</b> Interview building occupants (where they are affected by the complex services) to identify problems or concerns regarding the effectiveness of the systems.  <b>v.</b> Produce monthly reports comparing sub-metered energy performance to the predicted one (see Ene 01 Reduction of energy use and carbon emissions).  <b>vi.</b> Identify inefficiencies and areas in need of improvement.  <b>vii.</b> Re-commission systems (following any work needed to serve revised loads), and incorporate any revisions in operating procedures into the operations and</p>	1	0.52%	1	0.52%

	<p>maintenance (O&amp;M) manuals.</p> <p><b>b.</b> Simple systems (naturally ventilated): The external consultant, aftercare team or facilities manager will:</p> <p><b>i.</b> Review thermal comfort, ventilation, and lighting, at three, six and nine month intervals after initial occupation, either by measurement or occupant feedback.</p> <p><b>ii.</b> Identify deficiencies and areas in need of improvement.</p> <p><b>iii.</b> Re-commission systems and incorporate any relevant revisions in operating procedures into the O&amp;M manuals.</p>				
Man 05: Aftercare > 3. Post Occupancy Evaluation (POE)	<p><b>One credit - Post-occupancy evaluation (POE)</b></p> <p><b>4.</b> The client or building occupier commits to carry out a POE exercise (see Definitions) one year after the building is substantially occupied. This gains comprehensive in-use performance feedback (see criterion 5.b.v below) and identifies gaps between design intent and in-use performance. The aim is to highlight any improvements or interventions that need to be made and to inform operational processes.</p> <p><b>5.</b> An independent party (see Definitions) carries out the POE covering:</p> <p><b>a.</b> A review of the design intent and construction process (review of design, procurement, construction and handover processes).</p> <p><b>b.</b> Feedback from a wide range of building users including facilities management on the design and environmental conditions of the building covering:</p> <p><b>i.</b> Internal environmental conditions (light, noise, temperature, air quality)</p> <p><b>ii.</b> Control, operation and maintenance</p> <p><b>iii.</b> Facilities and amenities</p> <p><b>iv.</b> Access and layout</p> <p><b>v.</b> Energy and water consumption (see</p>	1	0.52%	1	0.52%



	<p>critterion 2 and Methodology)  <b>vi.</b> Other relevant issues, where appropriate (see Definitions)  <b>6.</b> The independent party provides a report with lessons learned to the client and building occupiers.  <b>7.</b> The client or building occupier commits funds to pay for the POE in advance. This requires an independent party to be appointed to carry out the POE as described in criterion 5. Evidence of the appointment of the independent party and schedule of responsibilities which fulfils the BREEAM criteria are acceptable to demonstrate compliance.</p>				
Management Totals		21	11.00%	18	9.43%

Health and Wellbeing	Compliance Requirements	Available		Targeted	
		Credits	Percent	Credits	Percent
Hea 01: Visual comfort > 1. Control of glare from sunlight control	<p><b>One credit - Control of glare from sunlight</b>  <b>1.</b> Identify areas at risk of glare using a glare control assessment. The glare control assessment also justifies any areas deemed not at risk of glare.  <b>2.</b> Where risk has been identified within a relevant building area (Definitions on page 85), a glare control strategy is used to design out the potential for glare.  <b>3.</b> The glare control strategy does not increase energy consumption used for lighting. This is achieved by:  <b>a.</b> Maximising daylight levels in all weather, cloudy or sunny AND  <b>b.</b> Ensuring the use or location of shading does not conflict with the operation of lighting control systems.</p>	1	0.78%	1	0.78%
Hea 01: Visual comfort > 2. Daylighting	<p><b>Up to two credits - Daylighting (building type dependent)</b>  <b>4.</b> Daylighting criteria have been met using either of the following options:  <b>a.</b> The relevant building areas meet good practice daylight factors and other criterion as outlined in Table 5.1 and Table 5.2 OR  <b>b.</b> The relevant building areas meet good practice average and minimum point daylight illuminance criteria as outlined in Table</p>	1	0.78%	1	0.78%

	<p>5.3. Additional alternative route for healthcare building types only: c. The relevant building areas meet the median daylight factors and minimum daylight factors in Table 5.4 (see Methodology).</p> <p><b>Exemplary level criteria</b> To achieve an exemplary performance credit for daylighting: <b>14.</b> Daylighting criteria have been met using either of the following options: a. Relevant building areas meet exemplary daylight factors and the relevant criteria in Table 5.8. b. Relevant building areas meet exemplary average and minimum point daylight illuminance criteria in Table 5.9.</p>				
Hea 01: Visual comfort > 3. View out	<p><b>One credit (or two credits healthcare buildings with inpatient areas) - View out</b> <b>5.</b> 95% of the floor area in 95% of spaces for each relevant building area provides an adequate view out (see notes under Adequate View Out) <b>6.</b> In addition, the building type criteria in Table 5.6 are applicable to view out criteria.</p>	1	0.78%	0	0%
Hea 01: Visual comfort > 4. Internal and external lighting levels, zoning and control	<p><b>One credit - Internal and external lighting levels, zoning and control</b> <b>Internal lighting</b> <b>7.</b> Internal lighting in all relevant areas of the building is designed to provide illuminance (lux) levels and colouring rendering index in accordance with the SLL Code for Lighting 2012 and any other relevant industry standard. Internal lighting should be appropriate to the tasks undertaken, accounting for building user concentration and comfort levels. <b>8.</b> For areas where computer screens are regularly used, the lighting design complies with CIBSE Lighting Guide 7 sections 2.4, 2.13 to 2.15, 2.20, and 6.10 to 6.20. This gives recommendations highlighting: a. Limits to the luminance of the luminaires to avoid screen reflections. (Manufacturers' data for the luminaires should be sought to confirm this.) b. Any area where a surface is used to reflect light in to a space, such as uplighting, the</p>	1	0.78%	1	0.78%

	<p>recommendations refer to the luminance of the lit ceiling rather than the luminaire; a design team calculation is usually required to demonstrate this.</p> <p>c. Recommendations for direct lighting, ceiling illuminance, and average wall illuminance.</p> <p><b>External lighting</b></p> <p><b>9.</b> All external lighting located within the construction zone is specified in accordance with BS 5489-1:2013 Code for the practice for the design of road lighting. Lighting of roads and public amenity areas and BS EN 12464-2:2014 Light and lighting - Lighting of work places - Part 2: Outdoor work places. External lighting should provide illuminance levels that enable users to perform outdoor visual tasks efficiently and accurately, especially during the night.</p> <p><b>10.</b> Where no external light fittings are specified (either separate from or mounted on the external building façade or roof), the criteria relating to external lighting do not apply and the credit can be awarded on the basis of compliance with criteria 8 – 9.c above.</p> <p><b>Zoning and occupant control</b></p> <p><b>11.</b> Internal lighting is zoned to allow for occupant control. Zoning is in accordance with the criteria below for relevant areas present within the building:</p> <ul style="list-style-type: none"> <li>a. In office areas, zones of no more than four workplaces</li> <li>b. Workstations adjacent to windows or atria and other building areas separately zoned and controlled</li> <li>c. Seminar and lecture rooms: zoned for presentation and audience areas</li> <li>d. Library spaces: separate zoning of stacks, reading and counter areas</li> <li>e. Teaching space or demonstration area</li> <li>f. Whiteboard or display screen</li> <li>g. Auditoria: zoning of seating areas, circulation space and lectern area</li> <li>h. Dining, restaurant, café areas: separate zoning of servery and seating or dining areas</li> <li>i. Retail: separate zoning of display and counter</li> </ul>				
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	<p>areas</p> <p><b>j.</b> Bar areas: separate zoning of bar and seating areas</p> <p><b>k.</b> Wards or bedded areas: zoned lighting control for individual bed spaces and control for staff over groups of bed spaces</p> <p><b>l.</b> Treatment areas, dayrooms, waiting areas: zoning of seating and activity areas and circulation space with controls accessible to staff.</p> <p><b>12.</b> Areas used for teaching, seminar or lecture purposes have lighting controls provided in accordance with CIBSE Lighting Guide 5.</p> <p><b>13.</b> In addition the building type criteria in Table 5.7 (where relevant).</p> <p><b>Exemplary level criteria</b></p> <p>To achieve an exemplary performance credit for Internal and external lighting levels, zoning and control:</p> <p><b>15.</b> Lighting in each zone can be manually dimmed by occupants down to 20% of the maximum light output using dimmer switches positioned in accessible locations. Dimming and control gear should avoid flicker and noise.</p>				
Hea 02: Indoor air quality > 1. Pre-requisite	<p><b>Pre-requisite - Indoor air quality (IAQ) plan</b></p> <p><b>1.</b> A site-specific indoor air quality plan has been produced and implemented in accordance with the guidance in Guidance Note GN06. The objective of the plan is to facilitate a process that leads to design, specification and installation decisions and actions that minimise indoor air pollution during occupation of the building. The indoor air quality plan must consider the following:</p> <p><b>a.</b> Removal of contaminant sources</p> <p><b>b.</b> Dilution and control of contaminant sources:</p> <p><b>i.</b> Where present, consideration is given to the air quality requirements of specialist areas such as laboratories</p> <p><b>c.</b> Procedures for pre-occupancy flush out</p> <p><b>d.</b> Third party testing and analysis</p> <p><b>e.</b> Maintaining good indoor air quality in-use</p>	0	0%	0	0%
Hea 02: Indoor air quality > 2.	<b>One credit - Ventilation</b>	1	0.78%	1	0.78%

Ventilation	<p>2. The building has been designed to minimise the indoor concentration and recirculation of pollutants in the building as follows:</p> <ul style="list-style-type: none"> <li>a. Provide fresh air into the building in accordance with the criteria of the relevant standard for ventilation.</li> <li>b. Ventilation pathways are designed to minimise the ingress and build-up of air pollutants inside the building (see Methodology).</li> <li>c. Where present, HVAC systems must incorporate suitable filtration to minimise external air pollution, as defined in BS EN 16798:2017. The specified filters should achieve supply air classification of at least SUP 2.</li> <li>d. Areas of the building subject to large and unpredictable or variable occupancy patterns have carbon dioxide (CO<sub>2</sub>) or air quality sensors specified and: <ul style="list-style-type: none"> <li>i. In mechanically ventilated buildings or spaces: sensors are linked to the mechanical ventilation system and provide demand-controlled ventilation to the space.</li> <li>ii. In naturally ventilated buildings or spaces: sensors either have the ability to alert the building owner or manager when CO<sub>2</sub> levels exceed the recommended set point, or are linked to controls with the ability to adjust the quantity of fresh air, i.e. automatic opening windows or roof vents.</li> </ul> </li> <li>e. For naturally ventilated or mixed mode buildings, the design demonstrates that the ventilation strategy provides adequate cross flow of air to maintain the required thermal comfort conditions and ventilation rates in accordance with CIBSE AM10.</li> </ul>				
Hea 02: Indoor air quality > 3.	<b>Up to two credits - Emissions</b>	2	1.56%	1	0.78%

Emissions from construction products	<p><b>from construction products</b></p> <p><b>One credit</b></p> <p><b>3.</b> Three out of the five product types meet the emission limits, testing requirements and any additional requirements listed in Table 5.11. Where wood-based products are not one of three selected product types, all wood-based products used for internal fixtures and fittings must be tested and classified as formaldehyde E1 class as a minimum.</p> <p><b>Two Credits</b></p> <p><b>4.</b> All of the product types listed meet the emission limits, testing requirements and any additional requirements listed in Table 5.11: Emission criteria byproduct type</p> <p><b>Exemplary level criteria</b></p> <p>To achieve one exemplary performance credit:</p> <p><b>11.</b> Three of the product types listed meet the emission limits, testing requirements and any additional requirements listed in Table 5.12. Where wood-based products are not one of the three selected product types, all wood-based products used for internal fixtures and fittings must be tested and classified as formaldehyde E1 class as a minimum</p>				
Hea 02: Indoor air quality > 4. Post-construction indoor air quality measurement	<p><b>One credit - Post-construction indoor air quality measurement</b></p> <p><b>5.</b> The formaldehyde concentration in indoor air is measured post construction (but pre-occupancy) and does not exceed 100µg/m<sup>3</sup> averaged over 30 minutes (World Health Organisation guidelines for indoor air quality: Selected pollutants, 2010).</p> <p><b>6.</b> The formaldehyde sampling and analysis is performed in accordance with ISO 16000-2 and ISO 16000-3.</p> <p><b>7.</b> The total volatile organic compound (TVOC) concentration in indoor air is measured post construction (but pre-occupancy) and does not exceed 500µg/m<sup>3</sup> over 8 hours.</p> <p><b>8.</b> The TVOC sampling and analysis is performed in accordance with ISO 16000-5 and ISO 16000-6 or ISO 16017-1.</p> <p><b>9.</b> Where levels are found to exceed these limits, the project team confirms the measures that have, or will be, undertaken in accordance with the IAQ plan, to reduce the TVOC and formaldehyde levels</p>	1	0.78%	0	0%

	to within the above limits. <b>10.</b> The measured concentration levels of formaldehyde ( $\mu\text{g}/\text{m}^3$ ) and TVOC ( $\mu\text{g}/\text{m}^3$ ) are reported, via the BREEAM Scoring and Reporting Tool.				
Hea 04: Thermal comfort > 1. Thermal modelling	<p><b>One credit - Thermal modelling</b></p> <p><b>1.</b> Thermal modelling has been carried out using software in accordance with CIBSE AM11 Building Energy and Performance Modelling.</p> <p><b>2.</b> The software used to carry out the simulation at the detailed design stage provides full dynamic thermal analysis. For smaller and more basic building designs with less complex heating or cooling systems, an alternative less complex means of analysis may be appropriate (such methodologies must still be in accordance with CIBSE AM11).</p> <p><b>3.</b> The modelling demonstrates that:</p> <p style="margin-left: 20px;"><b>a.</b> For air-conditioned buildings, summer and winter operative temperature ranges in occupied spaces are in accordance with the criteria set out in CIBSE Guide A Environmental design, Table 1.5; or other appropriate industry standard (where this sets a higher or more appropriate requirement or level for the building type).</p> <p style="margin-left: 20px;"><b>b.</b> For naturally ventilated buildings:</p> <p style="margin-left: 40px;"><b>i.</b> Winter operative temperature ranges in occupied spaces are in accordance with the criteria set out in CIBSE Guide A Environmental design, Table 1.5. Or other appropriate industry standard (where this sets a higher or more appropriate requirement or level for the building type).</p> <p style="margin-left: 40px;"><b>ii.</b> The building is designed to limit the risk of overheating, in accordance with the adaptive comfort methodology outlined in either of the following standards as appropriate; CIBSE</p>	1	0.78%	1	0.78%



	<p>TM52: The limits of thermal comfort: avoiding overheating in European buildings or CIBSE TM59: Design methodology for the assessment of overheating risk in homes.</p> <p>4. For air-conditioned buildings, the PMV (predicted mean vote) and PPD (predicted percentage of dissatisfied) indices based on the above modelling are reported via the BREEAM assessment scoring and reporting tool.</p>				
Hea 04: Thermal comfort > 2. Design for future thermal comfort	<p><b>One credit - Design for future thermal comfort</b></p> <p>5. Criteria 1 to 4 are achieved.</p> <p>6. The thermal modelling demonstrates that the relevant requirements set out in criterion 3 above are achieved for a projected climate change environment (see Definitions).</p> <p>7. Where criterion 6 above is not met, the project team demonstrates how the building has been adapted, or designed to be easily adapted in future using passive design solutions in order to subsequently meet the requirements under criterion 6 above</p> <p>8. For air-conditioned buildings, the PMV and PPD indices based on the above modelling are reported via the BREEAM assessment scoring and reporting tool.</p>	1	0.78%	1	0.78%
Hea 04: Thermal comfort > 3. Thermal zoning and controls	<p><b>One credit - Thermal zoning and controls</b></p> <p>9. Criteria 1 to 4 are achieved.</p> <p>10. The thermal modelling analysis (criteria 1 on the previous page to 4 on the previous page) has informed the temperature control strategy for the building and its users.</p> <p>11. The strategy for proposed heating or cooling systems demonstrates that it has addressed the following:</p> <p>a. Zones within the building, and how the building services could efficiently and appropriately heat or cool these areas. For example consider the different requirements for the central core of a building compared with the external perimeter adjacent to the windows.</p> <p>b. The degree of occupant control required for these zones. This is based on discussions with the end</p>	1	0.78%	1	0.78%

	<p>user (or alternatively building type or use specific design guidance, case studies, feedback) and considers:</p> <ul style="list-style-type: none"> <li>i. User knowledge of building services</li> <li>ii. Occupancy type, patterns and room functions (and therefore appropriate level of control required)</li> <li>iii. How the user is likely to operate or interact with the systems, e.g. are they likely to open windows, access thermostatic radiator valves (TRV) on radiators, change air-conditioning settings etc.</li> <li>iv. The user expectations (this may differ in the summer and winter) and degree of individual control (i.e. obtaining the balance between occupant preferences, for example some occupants like fresh air and others dislike draughts).</li> <li>c. How the proposed systems will interact with each other (where there is more than one system) and how this may affect the thermal comfort of the building occupants.</li> <li>d. The need or otherwise for an accessible building user actuated manual override for any automatic systems.</li> </ul>				
<p>Hea 05: Acoustic performance &gt; 1. Sound insulation</p>	<p><b>Up to three credits - Acoustic performance for all building type except Residential institutions (short term and long term stay)</b></p> <p><b>1.</b> The building meets the appropriate acoustic performance standards and testing requirements defined in the relevant table below. These tables define criteria for the acoustic principles of:</p> <ul style="list-style-type: none"> <li>a. Sound insulation</li> <li>b. Indoor ambient noise level</li> <li>c. Room acoustics.</li> </ul> <p>OR</p> <p><b>2.</b> A suitably qualified acoustician (SQA) is appointed to define a bespoke set of</p>	2	1.56%	1	0.78%

	<p>performance requirements for all function areas in the building. The bespoke performance requirements use the three acoustic principles defined in criterion Hea 05 Acoustic performance - Criterion 1 above, setting out the performance requirements for each and the testing regime required.</p> <p><b>Up to four credits - Acoustic performance for Residential institutions (short term and long term stay)</b></p> <p>3. The building meets the appropriate acoustic performance standards and testing requirements defined in the relevant table below. These tables define criteria for the acoustic principles of:</p> <ul style="list-style-type: none"> <li>a. Sound insulation</li> <li>b. Indoor ambient noise level</li> <li>c. Room acoustics.</li> </ul>				
<p>Hea 05: Acoustic performance &gt; 2. Indoor ambient noise level</p>	<p><b>Up to three credits - Acoustic performance for all building type except Residential institutions (short term and long term stay)</b></p> <p>1. The building meets the appropriate acoustic performance standards and testing requirements defined in the relevant table below. These tables define criteria for the acoustic principles of:</p> <ul style="list-style-type: none"> <li>a. Sound insulation</li> <li>b. Indoor ambient noise level</li> <li>c. Room acoustics.</li> </ul> <p>OR</p> <p>2. A suitably qualified acoustician (SQA) is appointed to define a bespoke set of performance requirements for all function areas in the building. The bespoke performance requirements use the three acoustic principles defined in criterion Hea 05 Acoustic performance - Criterion 1 above, setting out the performance requirements for each and the testing regime required.</p> <p><b>Up to four credits - Acoustic performance for Residential institutions (short term and long term stay)</b></p> <p>3. The building meets the appropriate acoustic performance standards and testing requirements defined in the relevant table below. These tables define criteria for the acoustic principles of:</p> <ul style="list-style-type: none"> <li>a. Sound insulation</li> <li>b. Indoor ambient noise</li> </ul>	1	0.78%	1	0.78%

	level c. Room acoustics.				
Hea 05: Acoustic performance > 3. Room acoustics	<p><b>Up to three credits - Acoustic performance for all building type except Residential institutions (short term and long term stay)</b></p> <p>1. The building meets the appropriate acoustic performance standards and testing requirements defined in the relevant table below. These tables define criteria for the acoustic principles of:</p> <ul style="list-style-type: none"> <li>a. Sound insulation</li> <li>b. Indoor ambient noise level</li> <li>c. Room acoustics.</li> </ul> <p>OR</p> <p>2. A suitably qualified acoustician (SQA) is appointed to define a bespoke set of performance requirements for all function areas in the building. The bespoke performance requirements use the three acoustic principles defined in criterion Hea 05 Acoustic performance - Criterion 1 above, setting out the performance requirements for each and the testing regime required.</p> <p><b>Up to four credits - Acoustic performance for Residential institutions (short term and long term stay)</b></p> <p>3. The building meets the appropriate acoustic performance standards and testing requirements defined in the relevant table below. These tables define criteria for the acoustic principles of:</p> <ul style="list-style-type: none"> <li>a. Sound insulation</li> <li>b. Indoor ambient noise level</li> <li>c. Room acoustics.</li> </ul>	1	0.78%	1	0.78%
Hea 06: Security	<p><b>One credit - Security of site and building</b></p> <p>1. A Suitably Qualified Security Specialist (SQSS) conducts an evidence based Security Needs Assessment (SNA) during or prior to Concept Design (RIBA Stage 2 or equivalent). The purpose of the SNA will be to identify attributes of the proposal, site and surroundings which may influence the approach to security for the development .</p> <p>2. The SQSS develops a set of security controls and recommendations for incorporation in to the proposals. Those controls and recommendations shall directly relate to the threats and assets identified in the preceding SNA.</p>	1	0.78%	1	0.78%

	<p><b>3.</b> The controls and recommendations shall be incorporated into proposals and implemented in the as-built development. Any deviation from those controls and recommendations shall be justified and agreed with the SQSS.</p> <p><b>Exemplary level criteria</b> To achieve an exemplary performance credit:</p> <p><b>4.</b> A compliant risk based security rating scheme has been used. The performance against the scheme has been confirmed by independent assessment and verification.</p>				
<p>Hea 07: Safe and healthy surroundings &gt; 1. Safe access</p>	<p><b>One credit - Safe access</b> Where external site areas form part of the assessed development the following apply:</p> <p><b>1.</b> Dedicated and safe cycle paths are provided from the site entrance to any cycle storage, and connect to offsite cycle paths where applicable.</p> <p><b>2.</b> Dedicated and safe footpaths are provided on and around the site providing suitable links for the following:</p> <ul style="list-style-type: none"> <li><b>a.</b> The site entrance to the building entrance,</li> <li><b>b.</b> Car parks (where present) to the building entrance</li> <li><b>c.</b> The building to outdoor space, and</li> <li><b>d.</b> Connecting to off-site paths where applicable.</li> </ul> <p><b>3.</b> Pedestrian drop-off areas are designed off of, or adjoining to, the access road and should provide direct access to other footpaths. Where vehicle delivery access and drop-off areas form part of the assessed development, the following apply:</p> <p><b>4.</b> Delivery areas are not accessed through general parking areas and do not cross or share the following:</p> <ul style="list-style-type: none"> <li><b>a.</b> pedestrian and cyclist paths</li> <li><b>b.</b> outside amenity areas accessible to building users and general public.</li> </ul> <p><b>5.</b> There is a dedicated parking or waiting area for goods vehicles with appropriate separation from the manoeuvring area and staff and visitor car parking.</p> <p><b>6.</b> Parking and turning areas are designed for simple manoeuvring according to the type of delivery vehicle likely to access the site, thus avoiding</p>	<p>1</p>	<p>0.78%</p>	<p>1</p>	<p>0.78%</p>

	the need for repeated shunting.				
Hea 07: Safe and healthy surroundings > 2. Outside space	<b>One credit - Outside space</b> 7. There is an outside space providing building users with an external amenity area.	1	0.78%	1	0.78%
Health and Wellbeing Totals		18	14.00%	14	10.89%

Energy	Compliance Requirements	Available		Targeted	
		Credits	Percent	Credits	Percent
Ene 01: Reduction of energy use and carbon emissions > 1. Energy performance	<p><b>Up to nine credits - Energy performance</b></p> <p>1. Calculate an Energy Performance Ratio for New Constructions (EPR<sub>NC</sub>). Compare the EPR<sub>NC</sub> achieved with the benchmarks in Table 6.1 and award the corresponding number of BREEAM credits.</p> <p><b>Exemplary level criteria</b></p> <p><b>Up to two credits - Beyond zero net regulated carbon</b></p> <p>6. The building achieves an EPR<sub>NC</sub> ≥ 0.9 and zero net regulated CO<sub>2</sub>-eq emissions (see Definitions).</p> <p>7. Energy generation from on-site and near-site LZC sources is sufficient to offset carbon emissions from regulated energy use plus a percentage of emissions from unregulated energy use.</p> <p>8. Award the exemplary credits based on the percentage of additional emissions from unregulated energy that are offset by LZC sources (see Table 6.2).</p> <p><b>Three credits - Carbon negative</b></p> <p>9. The building is deemed carbon negative where &gt; 100% (see Table 6.2) of carbon emissions from unregulated (and regulated) energy use are offset by energy generated from on-site and near-site LZC sources (see Definitions).</p>	9	6.86%	7	5.33%
Ene 01: Reduction of energy use and carbon emissions > 2. Prediction of operational energy consumption	<p><b>Four credits (or two exemplary credits for Simple Buildings) – Prediction of operational energy consumption</b></p> <p>2. Involve relevant members of the design team in an energy design workshop focusing on operational energy performance.</p> <p>3. Undertake additional energy modelling during the design and post construction stage to generate predicted operational energy consumption figures (see Prediction of operational energy consumption).</p> <p>4. Report predicted energy consumption targets by end use, design assumptions and</p>	4	3.05%	4	3.05%

	<p>input data (with justifications).</p> <p><b>5.</b> Carry out a risk assessment to highlight any significant design, technical, and process risks that should be monitored and managed throughout the construction and commissioning process.</p> <p><b>Exemplary level criteria</b></p> <p><b>Two credits – Post-occupancy stage</b></p> <p><b>10.</b> Achieve maximum available credits in Ene 02 Energy monitoring on page 136. In addition, preschools, primary schools, law courts, prisons and multi-residential buildings must meet the requirements of the second credit for sub-metering of high energy load and tenancy areas.</p> <p><b>11.</b> The client or building occupier commits funds to pay for the post occupancy stage. This requires an assessor to be appointed and to report on the actual energy consumption compared with the targets set in 4 above.</p> <p><b>12.</b> The energy model (criterion 3 above) is:</p> <ul style="list-style-type: none"> <li>a. Submitted to BRE and</li> <li>b. Retained by the building owner.</li> </ul>				
<p>Ene 02: Energy monitoring &gt; 1. Sub-metering of end use categories</p>	<p><b>One credit - Sub-metering of end-use categories</b></p> <p><b>1.</b> Install energy metering systems so that at least 90% of the estimated annual energy consumption of each fuel is assigned to the end-use categories (see Methodology).</p> <p><b>2.</b> Meter the energy consumption in buildings according to the total useful floor area:</p> <ul style="list-style-type: none"> <li>a. If the area is greater than 1,000m<sup>2</sup>, by end-use category with an appropriate energy monitoring and management system.</li> <li>b. If the area is less than 1,000m<sup>2</sup>, use either: <ul style="list-style-type: none"> <li>i. an energy monitoring and management system or</li> <li>ii. separate accessible energy sub-meters with pulsed or other open protocol communication outputs, for future connection to an energy monitoring and management system (see Definitions).</li> </ul> </li> </ul>	<p>1</p>	<p>0.76%</p>	<p>1</p>	<p>0.76%</p>



	<p>3. Building users can identify the energy consuming end uses, for example through labelling or data outputs.</p>				
Ene 02: Energy monitoring > 2. Sub-metering of high energy load and tenancy areas	<p><b>One credit - Sub-metering of high energy load and tenancy areas</b></p> <p>4. Monitor a significant majority of the energy supply with:</p> <p>a. An accessible energy monitoring and management system for:</p> <p>i. tenanted areas or</p> <p>ii. relevant function areas or departments in single occupancy buildings.</p> <p>OR</p> <p>b. Separate accessible energy sub-meters with pulsed or other open protocol communication outputs for future connection to an energy monitoring and management system for:</p> <p>i. tenanted areas or</p> <p>ii. relevant function areas or departments in single occupancy buildings.</p> <p>5. Sub-meter per floor plate in large single occupancy or single tenancy buildings with one homogeneous function, for example hotel bedrooms, offices.</p> <p>This credit is not applicable to preschools, primary schools, lawcourts, prisons and multi-residential buildings, unless the post-occupancy stage Ene 01 credits are targeted.</p>	1	0.76%	1	0.76%
Ene 03: External lighting	<p><b>One credit</b></p> <p>1. No external lighting (which includes lighting on the building, at entrances and signs).</p> <p>OR</p> <p>2. External light fittings within the construction zone with:</p> <p>a. Average initial luminous efficacy of no less than 70 luminaire lumens per circuit Watt.</p> <p>b. Automatic control to prevent operation during daylight hours.</p> <p>c. Presence detection in areas of intermittent pedestrian traffic.</p>	1	0.76%	1	0.76%
Ene 04: Low carbon design > 1. Passive design : Passive design analysis	<p><b>One credit - Passive design analysis</b></p> <p>1. Achieve the first credit Hea 04 - One credit - Thermal modelling to demonstrate that the building design delivers appropriate thermal comfort levels in occupied spaces.</p> <p>2. The project team analyses the proposed building design</p>	1	0.76%	1	0.76%

	<p>and development during Concept Design to identify opportunities for the implementation of passive design measures (see Passive design analysis).</p> <p><b>3.</b> Implement passive design measures to reduce the total heating, cooling, mechanical ventilation, lighting loads and energy consumption in line with the passive design analysis findings.</p> <p><b>4.</b> Quantify the reduced total energy demand and carbon dioxide (CO<sub>2</sub>-eq) emissions resulting from the passive design measures.</p>				
Ene 04: Low carbon design > 1. Passive design : Free cooling	<p><b>One credit - Free cooling</b></p> <p><b>5.</b> Achieve the passive design analysis credit.</p> <p><b>6.</b> Include a free cooling analysis (see Free cooling analysis) in the passive design analysis carried out under criterion 2.</p> <p><b>7.</b> Identify opportunities for the implementation of free cooling solutions.</p> <p><b>8.</b> The building is naturally ventilated or uses any combination of the free cooling strategies listed in the Free cooling analysis list.</p>	1	0.76%	1	0.76%
Ene 04: Low carbon design > 2. Low and zero carbon technologies	<p><b>One credit - Low and zero carbon feasibility study</b></p> <p><b>9.</b> An energy specialist (see Definitions) completes a feasibility study (see Low and zero carbon feasibility study) by the end of the Concept Design.</p> <p><b>10.</b> Establish the most appropriate recognised local (on site or near site) low or zero carbon (LZC) energy sources for the building or development, (see Scope of LZC systems and how they are assessed), based on the feasibility study.</p> <p><b>11.</b> Specify local LZC technologies for the building or development in line with the feasibility study recommendations.</p> <p><b>12.</b> Quantify the reduced regulated carbon dioxide (CO<sub>2</sub>-eq) emissions resulting from the feasibility study.</p>	1	0.76%	1	0.76%
Ene 06: Energy Efficient transportation systems > 1. Energy consumption	<p><b>One credit - Energy consumption</b></p> <p><b>1.</b> For specified lifts, escalators or moving walks (transportation types):</p> <p style="padding-left: 20px;"><b>a.</b> Analyse the transportation demand and usage patterns for the building to determine the optimum number and size of lifts, escalators or moving walks.</p>	1	0.76%	1	0.76%

	<p><b>b.</b> Calculate the energy consumption in accordance with BS EN ISO 25745 Part 2 or Part 3 for one of the following:</p> <ul style="list-style-type: none"> <li><b>i.</b> At least two options for each transportation type (e.g. for lifts, hydraulic, traction or machine roomless(MRL)) OR</li> <li><b>ii.</b> At least two options considering different system arrangements and control strategies.</li> </ul> <p><b>c.</b> Consider the use of regenerative drives, subject to the requirements in Regenerative drives below.</p> <p><b>d.</b> Specify the transportation system with the lowest energy consumption.</p>				
Ene 06: Energy Efficient transportation systems > 2. Energy efficient features : Lifts	<p><b>One credit - Energy efficient features : Lifts</b></p> <p><b>2.</b> Achieve criterion 1.</p> <p><b>3.</b> Specify the following three energy efficient features for each lift:</p> <ul style="list-style-type: none"> <li><b>a.</b> A standby condition for off-peak periods.</li> <li><b>b.</b> The lift car lighting and display lighting provides an average luminous efficacy across all fittings in the car of &gt; 70 luminaire lumens per circuit Watt.</li> <li><b>c.</b> Use of a drive controller capable of variable speed, variable-voltage, and variable-frequency (VVVF) control of the drive motor.</li> </ul> <p><b>4.</b> Specify regenerative drives where their use is demonstrated to save energy.</p>	1	0.76%	1	0.76%
<b>Energy Totals</b>		<b>21</b>	<b>16.00%</b>	<b>19</b>	<b>14.48%</b>

Transport	Compliance Requirements	Available		Targeted	
		Credits	Percent	Credits	Percent
Tra 01: Transport assessment and travel plan	<p><b>Two credits - Transport assessment and Travel plan</b></p> <p><b>1.</b> No later than Concept Design stage, undertake a site-specific transport assessment (or develop a travel statement) and draft travel plan, which can demonstrably be used to influence the site layout and built form; see Methodology.</p> <p><b>2.</b> The site-specific travel assessment (or statement) shall cover as a minimum:</p> <ul style="list-style-type: none"> <li><b>a.</b> If relevant, travel patterns and attitudes of existing building or site</li> </ul>	2	1.67%	2	1.67%

	<p>userstowards cycling, walking and public transport, to identify relevant constraints and opportunities.</p> <p><b>b.</b> Predicted travel patterns and transport impact of future building or site users.</p> <p><b>c.</b> Current local environment for pedestrians and cyclists, accounting for any age-related requirements of occupants and visitors.</p> <p><b>d.</b> Reporting of the number and type of existing accessible amenities, see Table 7.1, within 500m of the site.</p> <p><b>e.</b> Disabled access accounting for varying levels and types of disability, including visual impairment.</p> <p><b>f.</b> Calculation of the existing public transport Accessibility Index (AI), see Methodology.</p> <p><b>g.</b> Current facilities for cyclists.</p> <p><b>3.</b> Following a transport assessment (in accordance with the requirements set out in criteria 2), develop a site specific travel plan that provides a long term management strategy which encourages more sustainable travel. The travel plan includes measures to increase or improve more sustainable modes of transport and movement of people and goods during the building's operation see Methodology.</p> <p><b>4.</b> If the occupier is known, involve them in the development of the travel plan.</p> <p><b>5.</b> Demonstrate that the travel plan will be implemented and supported by the building's management in operation.</p>				
Tra 02: Sustainable transport measures	<p><b>Pre-requisite</b></p> <p><b>1.</b> Achieve criteria 3-5 in the Tra 01 Transport assessment and travel plan credit.</p> <p><b>Ten credits – Transport options implementation</b></p> <p><b>2.</b> Identify the sustainable transport measures, see Table 7.4.</p> <p><b>3.</b> Award credits according to the existing Accessible Index (A1) of the project, and the total number of points achieved for the options implemented, see Table 7.3.</p>	10	8.33%	6	5%
Transport Totals		12	10.00%	8	6.67%

Water	Compliance Requirements	Available		Targeted	
		Credits	Percent	Credits	Percent
Wat 01: Water consumption	<p><b>Up to five credits</b></p> <p><b>1.</b> Use the BREEAM Wat 01 calculator to assess the efficiency of the domestic water-consuming components.</p> <p><b>2.</b> Use the standard Wat 01 method (see Methodology on the facing page) to compare the water consumption (litres/person/day) for the assessed building against a baseline performance. Award BREEAM credits based upon Table 8.1.</p> <p>Where it is not possible to use the standard method, complete the assessment using the alternative Wat 01 method.</p> <p><b>3.</b> If a greywater or rainwater system (see Definitions) is specified, use its yield in L/person/day to offset potable water demand from components.</p> <p><b>4.</b> If a greywater or rainwater system is specified and installed:</p> <p style="padding-left: 20px;"><b>a.</b> Greywater systems in compliance with BS 8525-1:2010 Greywater Systems - Part 1 Code of Practice.</p> <p style="padding-left: 20px;"><b>b.</b> Rainwater systems in compliance with BS EN16941-1:2018</p> <p>Achieve Wat 02 - Criterion 6, if you intend to pursue a post occupancy stage certification.</p> <p><b>Additionally for Healthcare building types only:</b></p> <p><b>5.</b> If applicable, the flushing control for each WC or urinal must be suitable for operation by patients with frail or infirm hands or activated by electronic sensors (see 2.0).</p> <p><b>Additionally for Prison building types only:</b></p> <p><b>6.</b> Sanitary components specified within a prison cell have a volume controller specified on the individual fittings or water supply to each cell (see Definitions).</p> <p><b>Exemplary level criteria</b></p> <p>To achieve an exemplary performance credit:</p> <p><b>7.</b> Achieve criteria 1 to 4 on the previous page (and if applicable 5 or 6 above).</p> <p><b>8.</b> The water consumption (litres/person/day) for the assessed building achieves the 65% improvement described as exemplary performance in Table 8.1.</p>	5	4.38%	2	1.75%
Wat 02: Water monitoring	<p><b>One credit</b></p> <p><b>1.</b> Specify a water meter on the</p>	1	0.88%	1	0.88%

	<p>mains water supply to each building. This includes instances where water is supplied via a borehole or other private source.</p> <p>2. For water-consuming plant or building areas consuming 10% or more of the building's total water demand:</p> <ul style="list-style-type: none"> <li>a. Fit easily accessible sub-meters OR</li> <li>b. Install water monitoring equipment integral to the plant or area.</li> </ul> <p>3. For each meter (main and sub):</p> <ul style="list-style-type: none"> <li>a. Install a pulsed or other open protocol communication output AND</li> <li>b. Connect it to an appropriate utility monitoring and management system, e.g. a building management system (BMS), for the monitoring of water consumption. If there is no BMS system in operation at Post-Construction stage, award credits provided that the system used enables connection when the BMS becomes operational.</li> </ul> <p>4. In buildings with swimming pools, or large water tanks and aquariums, fit separate sub-meters on the water supply of the above and any associated changing facilities (toilets, showers etc.) irrespective of their water consumption levels.</p> <p>5. In buildings containing laboratories, fit a separate water meter on the water supply to any process or cooling loop for 'plumbed-in' laboratory process equipment, irrespective of their water consumption levels.</p> <p><b>Additionally for those pursuing a post-occupancy stage certification:</b></p> <p>6. The water monitoring strategy used enables the identification of all water consumption for sanitary uses as assessed under Wat 01 (litres/person/day), if a post occupancy stage certification is sought.</p>				
<p>Wat 03: Water leak detection &gt; 1. Leak detection system</p>	<p><b>One credit - Leak detection system</b></p> <p>1. Install a leak detection system capable of detecting a major water leak:</p> <ul style="list-style-type: none"> <li>a. On the utilities water supply within the buildings, to detect any major leaks within the</li> </ul>	1	0.88%	1	0.88%

	<p>buildings.</p> <p>AND</p> <p><b>b.</b> Between the buildings and the utilities water supply, to detect any major leaks between the utilities supply and the buildings under assessment.</p> <p><b>2.</b> The leak detection system is:</p> <p><b>a.</b> A permanent automated water leak detection system that alerts the building occupants to the leak OR an inbuilt automated diagnostic procedure for detecting leaks.</p> <p><b>b.</b> Activated when the flow of water passing through the water meter or data logger is at a flow rate above a pre-set maximum for a pre-set period of time. This usually involves installing a system which detects higher than normal flow rates at meters or sub-meters. It does not necessarily require a system that directly detects water leakage along part or the whole length of the water supply system.</p> <p><b>c.</b> Able to identify different flow and therefore leakage rates, e.g. continuous, high or low level, over set time periods. Although high and low level leakage rates are not specified, the leak detection equipment installed must have the flexibility to distinguish between different flow rates to enable it to be programmed to suit the building type and owner's or occupier's usage patterns.</p> <p><b>d.</b> Programmable to suit the owner's or occupier's water consumption criteria.</p> <p><b>e.</b> Where applicable, designed to avoid false alarms caused by normal operation of large water consuming plant such as chillers.</p> <p>Where there is physically no space for a leak detection system between the utilities water meter and the building, alternative solutions can be used, provided that a major leak can still be detected.</p>				
<p>Wat 03: Water leak detection &gt; 2. Flow control devices</p>	<p><b>One credit - Flow control devices</b></p>	<p>1</p>	<p>0.88%</p>	<p>1</p>	<p>0.88%</p>



	3. Install flow control devices that regulate the water supply to each WC area or sanitary facility according to demand in order to minimise undetected wastage and leaks from sanitary fittings and supply pipework.				
Water Totals		8	7.00%	5	4.38%

Materials	Compliance Requirements	Available		Targeted	
		Credits	Percent	Credits	Percent
Mat 01: Environmental impacts from construction products - Building life cycle assessment (LCA) > 1. Superstructure	<p><b>Up to six credits – Superstructure (all building types)</b>  <b>Comparison with the BREEAM LCA benchmark during Concept Design (offices, industrial and retail buildings only)</b>            Superstructure (offices, industrial and retail buildings (except for Simple Buildings and where Notes 1.1 and 1.2 apply))  <b>1.</b> During the Concept Design, demonstrate the environmental performance of the building as follows:</p> <ul style="list-style-type: none"> <li>a. Carry out a building LCA on of the superstructure design using either the BREEAM Simplified Building LCA tool or an IMPACT Compliant LCA tool according to the methodology (see Methodology).</li> <li>b. Submit the Mat 01/02 Results Submission Tool to BRE at the end of Concept Design, and before planning permission is applied for (that includes external material or product specifications).</li> </ul> <p><b>Comparison with the BREEAM LCA benchmark during Technical Design (offices, industrial and retail buildings only)</b>  <b>2.</b> During Technical Design, demonstrate the environmental performance of the building as follows:</p> <ul style="list-style-type: none"> <li>a. As criterion 1.a</li> <li>b. Submit the Mat 01/02 Results Submission Tool to BRE at the end of Technical Design.</li> </ul> <p>Where a project has not achieved criterion 1, criterion 2 may still be achieved.  <b>Option appraisal during Concept Design (all building types)</b>  <b>3.</b> For offices, industrial and retail building types, achieve criterion 1 (except where Notes 1.0, 1.1 and 1.2 apply).  <b>4.</b> During Concept Design,</p>	6	6.43%	3	3.21%

	<p>identify opportunities for reducing environmental impacts as follows:</p> <ul style="list-style-type: none"> <li>a. Carry out building LCA options appraisal of 2 to 4 significantly different superstructure design options (applicable to the Concept Design stage, see Methodology).</li> <li>b. Use a building LCA tool that is recognised by BREEAM (as suitable for assessing superstructure during Concept Design) according to the methodology (see Methodology).</li> <li>c. For each design option, fulfil the same functional requirements specified by the client and all statutory requirements (to ensure functional equivalency).</li> <li>d. Integrate the LCA options appraisal activity within the wider design decision-making process. Record this in an options appraisal summary document.</li> <li>e. Record the following in the Mat 01/02 Results Submission Tool: The differences between the design options; the design option selected by the client to be progressed beyond Concept Design; the reasons for selecting it and the reasons for not selecting the other design options.</li> <li>f. Submit the Mat 01/02 Results Submission Tool to BRE at the end of Concept Design, and before planning permission is applied for (that includes external material or product specifications).</li> </ul> <p>If the building LCA tool recognised by BREEAM and used for criteria 3 to 5 (and 6 to 9, if pursued) is not an IMPACT Compliant LCA tool and criteria 1 to 2 are applicable, then the BREEAM Simplified Building LCA tool (or an IMPACT Compliant LCA tool) shall be used for criteria 1 to 2.</p> <p><b>Options appraisal during Technical Design (all building types)</b></p> <p><b>5.</b> During Technical Design identify opportunities for reducing environmental impacts as follows:</p> <ul style="list-style-type: none"> <li>a. Carry out building LCA options appraisal of 2 to 3</li> </ul>				
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	<p>significantly different superstructure design options (based on the selected Concept Design option and as applicable to the Technical Design stage).</p> <p><b>b.</b> Use a building LCA tool that is recognised by BREEAM (as suitable for assessing superstructure during Technical Design) according to the methodology.</p> <p><b>c.</b> As criteria 4.c to 4.e above.</p> <p>Where an options appraisal summary document was produced during Concept Design, update it to include the Technical Design options.</p> <p><b>d.</b> Submit the Mat 01/02 Results Submission Tool to BRE at the end of Technical Design.</p> <p>Where a project has not achieved criteria 3 and 4, criterion 5 may still be achieved.</p> <p><b>Exemplary level criteria</b> To achieve exemplary performance credits</p> <p><b>One credit – Core building services options appraisal during Concept Design (all building types)</b></p> <p><b>8.</b> Criteria 3 to 4 are achieved.</p> <p><b>9.</b> During Concept Design identify opportunities for reducing environmental impacts as follows:</p> <p><b>a.</b> Carry out building LCA options appraisal of at least 3 significantly different core building services design options.</p> <p><b>b.</b> Use a building LCA tool that is recognized by BREEAM (as suitable for assessing core building services during Concept Design) according to the methodology.</p> <p><b>c.</b> As criteria 4.c to 4.f.</p> <p><b>One credit – LCA and LCC alignment (all building types)</b></p> <p><b>10.</b> Achieve criteria 3 to 5.</p> <p><b>11.</b> Achieve Elemental LCC plan and Component Level LCC options appraisal credits (Man 02 Life cycle cost and service life planning).</p> <p><b>12.</b> Include design options appraised for criteria 3 to 4 (and 6 to 7 and 8 to 9, if pursued) during Concept Design in Assessment scope - The elemental LCC plan.</p> <p><b>13.</b> Include the design options appraised for criterion 5 during</p>				
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	<p>Concept Design in the 'Component level LCC option appraisal' (in Man 02 Life cycle cost and service life planning).</p> <p><b>14.</b> Integrate the aligned LCA and LCC options appraisal activity within the wider design decision-making process. Record this in an options appraisal summary document including the relevant cost information from the 'elemental LCC plan' and 'Component level LCC option appraisal'.</p> <p><b>One credit – Third party verification (all building types)</b></p> <p><b>15.</b> Criteria 1 to 7 (as applicable to the building type) are achieved.</p> <p><b>16.</b> A suitably qualified third party (see Definitions) either carries out the building LCA work or verifies the building LCA work (if by others), and produces a report describing how they have checked the building LCA work accurately represent the designs under consideration during Concept Design and Technical Design with reference to the requirements of criteria 1 to 7 (and 8 to 14 if pursued).</p> <p><b>17.</b> For each LCA option, itemise in the report the verification checks made by the suitably qualified third party in the report including, as a minimum, the quality requirements shown in Table 9.4.</p> <p><b>18.</b> Include details of the suitably qualified third party's relevant skills and experience and a declaration of their third party independence from the project client and design team in the report.</p>				
<p>Mat 01: Environmental impacts from construction products - Building life cycle assessment (LCA) &gt; 2. Substructure</p>	<p><b>One credit – Substructure and hard landscaping options appraisal during Concept Design (all building types)</b></p> <p><b>6.</b> Criteria 3 and 4 are achieved.</p> <p><b>7.</b> During Concept Design identify opportunities for reducing environmental impacts as follows:</p> <p><b>a.</b> Carry out building LCA options appraisal of a combined total of at least six significantly different substructure or hard landscaping design options (at least two shall be substructure and at least two shall be hard landscaping).</p> <p><b>b.</b> Using a building LCA</p>	<p>1</p>	<p>1.07%</p>	<p>1</p>	<p>1.07%</p>

	<p>tool that is recognized by BREEAM (as suitable for assessing substructure and hard landscaping during Concept Design) according to the methodology.</p> <p>c. As criteria 4.c to 4.f</p>				
<p>Mat 02: Environmental impacts from construction products - Environmental Product Declarations (EPD)</p>	<p><b>One credit - Specification of products with a recognised environmental product declaration (EPD)</b></p> <p>1. Specify construction products with EPD that achieve a total EPD points score of at least 20, according to the Methodology.</p> <p>2. Enter the details of each EPD into the Mat 01/02 Results Submission Tool, including the material category classification. The Mat 01/02 Results Submission Tool will verify the EPD points score and credit award.</p>	1	1.07%	1	1.07%
<p>Mat 03: Responsible sourcing of construction products &gt; 1. Pre-requisite - Legally harvested and traded timber</p>	<p>1. All timber and timber-based products used on the project are legally harvested and traded timber as per the UK Government's Timber Procurement Policy (TPP) (see Definitions).</p> <p>Compliance with criterion 1 is a minimum requirement for achieving any BREEAM rating. There are no pre-requisite requirements for other materials.</p>	0	0%	0	0%
<p>Mat 03: Responsible sourcing of construction products &gt; 2. Enabling sustainable procurement</p>	<p><b>One credit - Enabling sustainable procurement</b></p> <p>2. A sustainable procurement plan must be used by the design team to guide specification towards sustainable construction products. The plan must:</p> <ul style="list-style-type: none"> <li>a. Be in place before Concept Design.</li> <li>b. Include sustainability aims, objectives and strategic targets to guide procurement activities. Note: targets do not need to be achieved for the credit to be awarded but justification must be provided for targets that are not achieved.</li> <li>c. Include a requirement for assessing the potential to procure construction products locally. There must be a policy to procure construction products locally where possible.</li> <li>d. Include details of procedures in place to check and verify the effective implementation of the sustainable procurement plan.</li> </ul> <p>In addition, if the plan is applied</p>	1	1.07%	1	1.07%

	<p>to several sites or adopted at an organisational level it must:</p> <p>e. Identify the risks and opportunities of procurement against a broad range of social, environmental and economic issues following the process set out in BS ISO20400:2017.</p>				
<p>Mat 03: Responsible sourcing of construction products &gt; 3. Measuring responsible sourcing</p>	<p><b>Up to 3 credits - Measuring responsible sourcing</b></p> <p>3. Use the Mat 03 calculator tool and methodology to determine the number of credits achieved for the construction products specified or procured. Credits are awarded in proportion to the scope of the assessment and the number of points achieved, as set out in Table 9.10.</p>	3	3.21%	0	0%
<p>Mat 05: Designing for durability and resilience</p>	<p><b>One credit</b></p> <p><b>Protecting vulnerable parts of the building from damage</b></p> <p>1. Protection measures are incorporated into the building's design and construction to reduce damage to the building's fabric or materials in case of accidental or malicious damage occurring. These measures must provide protection against:</p> <p>a. Negative impacts of high user numbers in relevant areas of the building (e.g. corridors, lifts, stairs, doors etc.).</p> <p>b. Damage from any vehicle or trolley movements within 1m of the internal building fabric in storage, delivery, corridor and kitchen areas.</p> <p>c. External building fabric damage by a vehicle. Protection where parking or manoeuvring areas are within 1 metre of the building façade and where delivery areas or routes are within 2 metres of the façade, i.e. specifying bollards or protection rails.</p> <p>d. Potential malicious damage to building materials and finishes, in public and common areas where appropriate.</p> <p><b>Protecting exposed parts of the building from material degradation</b></p> <p>2. Key exposed building elements have been designed and specified to limit long and short term degradation due to environmental factors. This can be demonstrated through one of the following:</p> <p>a. The element or product achieving an appropriate</p>	1	1.07%	1	1.07%

	<p>quality or durability standard or design guide, see Table 9.14. If none are available, use BS 7543:2015 as the default appropriate standard OR</p> <p><b>b.</b> A detailed assessment of the element's resilience when exposed to the applicable material degradation and environmental factors.</p> <p><b>3.</b> Include convenient access to the roof and façade for cost-effective cleaning, replacement and repair in the building's design.</p> <p><b>4.</b> Design the roof and façade to prevent water damage, ingress and detrimental ponding. Table 9.14 is a list of relevant industry durability and quality standards that can be used to achieve compliance.</p>				
Mat 06: Material efficiency	<p><b>One credit</b></p> <p><b>1.</b> At the Preparation and Brief and Concept Design stages, set targets and report on opportunities and methods to optimise the use of materials. These must be done for each of the following stages. See Table 9.15</p> <p><b>a.</b> Preparation and Brief <b>b.</b> Concept Design <b>c.</b> Developed Design <b>d.</b> Technical Design <b>e.</b> Construction</p> <p><b>2.</b> Develop and record the implementation of material efficiency, see Table 9.15 below, during</p> <p><b>a.</b> Developed Design <b>b.</b> Technical Design <b>c.</b> Construction</p> <p><b>3.</b> Report the targets and actual material efficiencies achieved.</p>	1	1.07%	1	1.07%
<b>Materials Totals</b>		<b>14</b>	<b>15.00%</b>	<b>8</b>	<b>8.57%</b>

Waste	Compliance Requirements	Available		Targeted	
		Credits	Percent	Credits	Percent
Wst 01: Construction waste management > 1. Pre-demolition audit	<p><b>One credit - Pre-demolition audit</b></p> <p><b>1.</b> Complete a pre-demolition audit of any existing buildings, structures or hard surfaces being considered for demolished. This must be used to determine whether refurbishment or reuse is feasible and, in the case of demolition, to maximise the recovery of material for subsequent high grade or value applications. The audit must cover the content of Pre-demolition audit scope and:</p> <p><b>a.</b> Be carried out at Concept Design stage</p>	1	0.6%	1	0.6%



	<p>(RIBA Stage 2) by a competent person (see Definitions); prior to strip-out or demolition works;</p> <p><b>b.</b> Guide the design, consider materials for reuse and set targets for waste management;</p> <p><b>c.</b> Engage all contractors in the process of maximising high grade reuse and recycling opportunities.</p> <p><b>2.</b> Make reference to the audit in the resource management plan (RMP) (see Definitions).</p> <p><b>3.</b> Compare actual waste arisings and waste management routes used with those forecast and investigate significant deviations from planned targets.</p>				
Wst 01: Construction waste management > 2. Construction resource efficiency	<p><b>Up to three credits - Construction resource efficiency</b></p> <p><b>4.</b> Prepare a compliant Resource Management Plan (RMP) covering:</p> <p><b>a.</b> Non-hazardous waste materials (from on-site construction and dedicated off-site manufacture or fabrication, see Additional information), including demolition and excavation waste.</p> <p><b>b.</b> Accurate data records on waste arisings and waste management routes.</p> <p><b>5.</b> Meet or improve upon the benchmarks in Table 10.1 for non-hazardous construction waste, excluding demolition and excavation waste.</p> <p><b>Exemplary level criteria</b></p> <p>To achieve an exemplary performance credit:</p> <p><b>8.</b> Non-hazardous construction waste generated, excluding demolition and excavation waste, is less than or equal to the exemplary level resource efficiency benchmarks (see Table 10.1).</p> <p><b>9.</b> The percentage of non-hazardous construction, demolition and excavation waste (if relevant) diverted from landfill meets or exceeds the exemplary level percentage benchmarks in Table 10.2.</p> <p><b>10.</b> All key waste groups in Table 10.3 for diversion from landfill are covered in the RMP.</p> <p><b>11.</b> Waste data obtained from licensed external waste contractors is reliable and verifiable, by using data from EA/SEPA/EA Wales/NIEA Waste Return Forms or from a PAS</p>	3	1.8%	1	0.6%

	402:2013 compliant company (see Definitions).				
Wst 01: Construction waste management > 4. Diversion of resources from landfill	<p><b>One credit - Diversion of resources from landfill</b></p> <p>6. Meet, where applicable, the diversion from landfill benchmarks in Table 10.2 for non-hazardous construction waste and demolition and excavation waste generated.</p> <p>7. Sort waste materials into separate key waste groups as per Table 10.3, either on-site or through a licensed contractor for recovery.</p>	1	0.6%	1	0.6%
Wst 02: Use of recycled and sustainably sourced aggregates	<p><b>Pre-requisite</b></p> <p>1. If demolition occurs on site, to encourage the reuse of site-won material on site, when demolition occurs, complete a pre-demolition audit of any existing buildings, structures or hard surfaces to be demolished in accordance with Wst 01 Criterion 1 and Criterion 2.</p> <p><b>One credit - Project Sustainable Aggregate points</b></p> <p>2. Identify all aggregate uses and type on the project Table 10.5 and Table 10.6.</p> <p>3. Determine the quantity in tonnes for each identified use and aggregate type.</p> <p>4. Identify the region in which the aggregate source is located.</p> <p>5. Identify the distance in kilometres travelled by all aggregates by transport type.</p> <p>6. Enter the information into the BREEAM Wst 02 calculator to calculate the Project Sustainable Aggregate points. The corresponding number of BREEAM credits will be awarded as shown in Table 10.4</p> <p><b>Exemplary level criteria</b></p> <p>To achieve an exemplary performance credit:</p> <p>7. The Project Sustainable Aggregate Points score meets or exceeds the exemplary level performance benchmark in Table 10.4.</p>	1	0.6%	0	0%
Wst 03: Operational waste	<p><b>One credit - Operational waste</b></p> <p>1. Provide a dedicated space for the segregation and storage of operational recyclable waste generated. The space is:</p> <p style="margin-left: 20px;">a. Clearly labelled, to assist with segregation, storage and collection of the recyclable waste streams</p> <p style="margin-left: 20px;">b. Accessible to building occupants or facilities operators for the deposit of materials and collections by waste</p>	1	0.6%	1	0.6%

	<p>management contractors</p> <p>c. Of a capacity appropriate to the building type, size, number of units (if relevant) and predicted volumes of waste that will arise from daily or weekly operational activities and occupancy rates.</p> <p>2. For consistent and large amounts of operational waste generated, provide:</p> <p>a. Static waste compactors or balers; situated in a service area or dedicated waste management space</p> <p>b. Vessels for composting suitable organic waste OR adequate spaces for storing segregated food waste and compostable organic material for collection and delivery to an alternative composting facility</p> <p>c. A water outlet provided adjacent to or within the facility for cleaning and hygiene purposes where organic waste is to be stored or composted on site.</p> <p><b>Additionally for healthcare buildings only</b></p> <p>3. The specified or installed operational waste facilities are compliant with the relevant NHS guidelines for that part of the UK.</p> <p><b>Additionally for multi-residential buildings with self-contained dwellings or bedsits only</b></p> <p>4. Provide three internal storage containers for each dwelling or bedsit with:</p> <p>a. A minimum total capacity of 30 litres</p> <p>b. No individual container smaller than 7 litres</p> <p>c. All containers in a dedicated non-obstructive position</p> <p>d. Storage containers for recycling in addition to non-recyclable waste storage.</p> <p>5. Provide home composting facilities and a home composting information leaflet within the kitchen area or communal space for each self-contained dwelling or bedsit.</p> <p><b>Additionally for multi-residential buildings with individual bedrooms and communal facilities only</b></p> <p>6. Meet criteria 4.a and 4.b for self-contained dwellings or bedsits for every six bedrooms.</p>				
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	<p>7. Locate recyclable storage in a dedicated, unobstructive position in communal kitchens or other appropriate communal space.</p> <p>8. Provide home composting facilities and a home composting information leaflet within the kitchen area or communal space.</p> <p>9. Provide a minimum of 10 litres of internal storage for compostable waste.</p>				
Wst 05: Adaptation to climate change	<p><b>One credit - Resilience of structure, fabric, building services and renewables installation</b></p> <p>1. Conduct a climate change adaptation strategy appraisal by the end of Concept Design using:</p> <ul style="list-style-type: none"> <li>a. A systematic risk assessment to identify the impact of expected extreme weather conditions arising from climate change on the building over its projected life cycle. The assessment covers the installation of building services and renewable systems, as well as structural and fabric resilience aspects and includes (see Methodology below): <ul style="list-style-type: none"> <li>i. Hazard identification</li> <li>ii. Hazard assessment</li> <li>iii. Risk estimation</li> <li>iv. Risk evaluation</li> <li>v. Risk management.</li> </ul> </li> </ul> <p>2. Develop recommendations or solutions based on the climate change adaptation strategy appraisal, before or during or prior to Concept Design, that aim to mitigate the identified impact.</p> <p>3. Provide an update during Technical Design demonstrating how the recommendations or solutions proposed at Concept Design have been implemented where practical and cost effective. Omissions have been justified in writing by the assessor.</p> <p><b>Exemplary level criteria – Responding to climate change</b></p> <p>Achievement of the following criteria demonstrates a holistic approach to the design and construction of the building's life cycle to mitigate against the impacts of climate change. To achieve an exemplary performance credit:</p>	1	0.6%	1	0.6%

	<p>4. Meet criteria 1 to 3 above.</p> <p>5. Meet the criteria or achieve credits of the assessment issues given in Table 10.11</p>				
Wst 06: Design for disassembly and adaptability > 1. Recommendations	<p><b>One credit - Design for disassembly and functional adaptability - Recommendations</b></p> <p>1. Conduct a study to explore the ease of disassembly and the functional adaptation potential of different design scenarios (see Methodology) by the end of Concept Design.</p> <p>2. Develop recommendations or solutions (see Methodology) based on the study (criterion 1 above), during or prior to Concept Design, that aim to enable and facilitate disassembly and functional adaptation.</p>	1	0.6%	1	0.6%
Wst 06: Design for disassembly and adaptability > 2. Implementation	<p><b>One credit - Disassembly and functional adaptability – Implementation</b></p> <p>3. Achieve criteria 1 and 2</p> <p>4. Provide an update, during Technical Design, on:</p> <p style="padding-left: 20px;">a. How the recommendations or solutions proposed by Concept Design have been implemented where practical and cost effective. Omissions have been justified in writing to the assessor.</p> <p style="padding-left: 20px;">b. Changes to the recommendations and solutions during the development of the Technical Design.</p> <p>5. Produce a building adaptability and disassembly guide to communicate the characteristics allowing functional adaptability and disassembly to prospective tenants.</p>	1	0.6%	1	0.6%
<b>Waste Totals</b>		<b>10</b>	<b>6.00%</b>	<b>7</b>	<b>4.20%</b>

Land Use and Ecology	Compliance Requirements	Available		Targeted	
		Credits	Percent	Credits	Percent
LE 01: Site selection > 1. Previously occupied land	<p><b>One credit - Previously occupied land</b></p> <p>1. At least 75% of the proposed development's footprint is on an area of land which has previously been occupied (see Definitions).</p>	1	1%	1	1%
LE 01: Site selection > 2. Contaminated land	<p><b>One credit - Contaminated land</b></p> <p>2. A contaminated land professional's site investigation, risk assessment and appraisal has deemed land within the site to be affected by contamination. The site investigation, risk</p>	1	1%	0	0%

	<p>assessment and appraisal have identified:</p> <ul style="list-style-type: none"> <li>a. The degree of contamination</li> <li>b. The contaminant sources or types</li> <li>c. The options for remediating sources of contamination which present an unacceptable risk.</li> </ul> <p>3. The client or principal contractor confirms that remediation of the site will be carried out in accordance with the remediation strategy and its implementation plan as recommended by the contaminated land professional (see Definitions).</p>				
<p>LE 02: Identifying and understanding the risks and opportunities for the project &gt; 1. Assessment route selection</p>	<p><b>Pre-requisite - Assessment route selection</b></p> <p>1. An assessment route (see Definitions) for the project has been determined using BREEAM Guidance Note GN34 BREEAM Ecological Risk Evaluation Checklist.</p> <p>2. The client or contractor confirms compliance is monitored against all relevant UK and EU or international legislation relating to the ecology of the site.</p>	0	0%	0	0%
<p>LE 02: Identifying and understanding the risks and opportunities for the project &gt; 2. Survey and evaluation</p>	<p><b>Survey and evaluation (Route 1)</b></p> <p>3. Assessment route 1 can be used only when indicated by the results of the BREEAM Ecological Risk Evaluation Checklist (see Methodology). Note: for Route 1, two credits are available overall for LE 02 but a maximum of one credit can be awarded where all criteria are met.</p> <p><b>Survey and evaluation (Route 2)</b></p> <p>4. A Suitably Qualified Ecologist (SQE) is appointed at a project stage that ensures early involvement in site configuration and, where necessary, can influence strategic planning decisions.</p> <p>5. Prior to the completion of the Preparation and Brief project stage, an appropriate level of survey and evaluation (see Assessment route 2: For sites where complex ecological systems are likely to be present) has been carried out to determine the ecological baseline of the site taking account of the zone of influence, to establish:</p> <ul style="list-style-type: none"> <li>a. Current and potential ecological value and condition of the site, and</li> </ul>	1	1%	1	1%

	<p>related areas within the zone of influence.</p> <p><b>b.</b> Direct and indirect risks to current ecological value</p> <p><b>c.</b> Capacity and feasibility for enhancement of the ecological value of the site and, where relevant, areas within the zone of influence.</p> <p><b>6.</b> Data are collected and shared with project team to inform the site preparation, design and construction works.</p>				
<p>LE 02: Identifying and understanding the risks and opportunities for the project &gt; 3. Determining the ecological outcomes for the site</p>	<p><b>Determining the ecological outcomes for the site (Routes 1 and 2)</b></p> <p><b>7.</b> Survey and evaluation criteria relevant to the chosen route (criterion 3 or criteria 4-6) have been achieved.</p> <p><b>8.</b> During Concept Design, the project team liaise and collaborate with representative stakeholders to identify the optimal ecological outcome for the site. (For Route 1 assessments, see GN35. For Route 2 assessments, see Methodology).</p> <p><b>9.</b> The ecological outcome for the site is determined by identifying, appraising and selecting specific solutions and measures. The solutions and measures must be identified sufficiently early in the project to influence key project planning decisions and must be done in accordance with the following hierarchy of action, which is dependant on the route being used</p> <p><b>Route 1</b></p> <ol style="list-style-type: none"> <li>1. Avoidance</li> <li>2. Protection</li> </ol> <p><b>Route 2</b></p> <ol style="list-style-type: none"> <li>1. Avoidance</li> <li>2. Protection</li> <li>3. Reduction or limitation of negative impacts</li> <li>4. On site compensation and</li> <li>5. Enhancement, considering the capacity and feasibility within the site, or where viable, offsite</li> </ol> <p><b>10.</b> The optimal ecological outcome for the site is selected after liaising with representative stakeholders and the project team.</p> <p>Note: for Route 1, two credits are available overall for LE 02, but a maximum of one credit can be awarded where all criteria are met.</p> <p><b>Exemplary Level criteria</b> To achieve one exemplary</p>	<p>1</p>	<p>1%</p>	<p>0</p>	<p>0%</p>

	<p>performance credit:</p> <p><b>11.</b> Achieve criteria 8 to 10.</p> <p><b>12.</b> When determining the optimal ecological outcome for the site consider, in addition to those outlined in criteria 8 to 10, the wider site sustainability-related activities and the potential for ecosystem service related benefits. See Methodology for a list of the minimum areas for consideration.</p> <p><b>13.</b> Achieve the credits of the assessment issues outlined below:</p> <p style="padding-left: 20px;"><b>a.</b> Hea 07 - Both credits</p> <p style="padding-left: 20px;"><b>b.</b> Pol 03 - Achieve credits for 'Surface water run-off' and 'Minimising watercourse pollution'</p> <p style="padding-left: 20px;"><b>c.</b> Pol 05</p>				
LE 03: Managing negative impacts on ecology > 1. Pre-requisite	<p><b>Pre-requisite – Identification and understanding the risks and opportunities for the site</b></p> <p><b>1.</b> LE 02 has been achieved.</p>	0	0%	0	0%
LE 03: Managing negative impacts on ecology > 2. Planning, liaison, implementation and data	<p><b>One credit – Planning, liaison and implementation</b></p> <p><b>2.</b> Roles and responsibilities for managing negative impacts on the ecology are clearly defined and allocated to support successful delivery of project outcomes at an early enough stage to influence the Preparation and Brief or Concept Design.</p> <p><b>3.</b> The potential impact of site preparation and construction works on ecology are identified at an early project stage to optimise benefits and outputs.</p> <p><b>4.</b> The project team liaising and collaborating with representative stakeholders and, taking into consideration data collated and shared, proposed solutions and selected measures to be implemented, during site preparation and construction works.</p>	1	1%	1	1%
LE 03: Managing negative impacts on ecology > 3. Managing negative impacts of the project	<p><b>One credit - Managing negative impacts of the project (Route 1)</b></p> <p><b>5.</b> Criteria 2 and 3 have been achieved.</p> <p><b>6.</b> Negative impacts from site preparation and construction works have been managed accordingly to the hierarchy (see Methodology) and no overall loss of ecological value has occurred.</p> <p>Note: for Route 1, three credits are available overall for LE 03, but up to a maximum of two credits can be awarded where all criteria are met.</p> <p><b>Up to two credits – Managing negative impacts of the</b></p>	2	2%	1	1%



	<p><b>project (Route 2)</b></p> <p>7. Criteria 2-4 have been achieved.</p> <p>8. Negative impacts from site preparation and construction works have been managed according to the hierarchy (see Assessment route 2: For sites where complex ecological systems are likely to be present) and either:</p> <p style="padding-left: 20px;">a. No overall loss of ecological value has occurred (2 credits)</p> <p>OR</p> <p style="padding-left: 20px;">b. The loss of ecological value has been minimised (Minimising Loss) (1 credit)</p>				
LE 04: Change and enhancement of ecological value > 1. Pre-requisite - Managing negative impacts on ecology	<p>1. Criteria 2-3 in LE03 have been achieved.</p> <p>2. The client or contractor confirms compliance is monitored against all relevant UK, EU or international legislation relating to the ecology of the site.</p>	0	0%	0	0%
LE 04: Change and enhancement of ecological value > 2. Change and enhancement of ecology	<p><b>One credit - Change and enhancement of ecology (Route 1)</b></p> <p>3. The project team, liaising and collaborating with representative stakeholders and taking into consideration data collated and shared, have implemented locally relevant ecological solutions and measures which enhance the site. The solutions and measures adopted are based on recommendations from recognised 'local' ecological expertise and specialist input and guidance.</p> <p>Note: for Route 1, three credits are available overall for LE 04 but a maximum of one credit can be awarded where all criteria are met.</p> <p><b>Up to three credits - Enhancement of ecology (Route 2)</b></p> <p>6. Up to three credits are awarded based on the calculation of the change in ecological value occurring as a result of the project. This must be calculated in accordance with the process set out in GN36 - BREEAM, CEEQUAL and HQM Ecology Calculation Methodology - Route 2. Credits are awarded as follows:</p> <p style="padding-left: 20px;">a. Minimising loss of ecological value (one credit - percentage score of 75-94)</p> <p style="padding-left: 20px;">b. No net loss of ecological value (two credits - percentage score of 95-</p>	3	3%	1	1%

	<p>104) c. Net gain of ecological value (three credits - percentage score of 105-109)</p> <p><b>Exemplary Level criteria</b> To achieve one exemplary performance credit: 7. The change in ecological value occurring is calculated in accordance with the process set out in GN36 - BREEAM, CEEQUAL and HQM Ecology Calculation Methodology – Route 2. The credit is awarded as follows: a. Significant net gain of ecological value (percentage score of 110 or above)</p>				
LE 04: Change and enhancement of ecological value > 3. Liaison, implementation and data collation	<p><b>One credit - Liaison, implementation and data collation (Route 2)</b> 4. The project team, liaising and collaborating with representative stakeholders (for relevant stakeholders see - "Determining the ecological outcomes for the site - project team liaison and collaboration with relevant stakeholders" in the LE 02 Methodology, and taking into consideration data collated and shared, have implemented the solutions and measures selected in a way that enhances ecological value in the following order: a. On site, and where this is not feasible, b. Off site within the zone of influence. 5. Data collated are provided to the local environmental records centres nearest to, or relevant for, the site</p>	1	1%	0	0%
LE 05: Long term ecology management and maintenance > 1. Pre-requisite - Roles and responsibilities, implementation, statutory obligations	<p>1. The client or contractor has confirmed that compliance is being monitored against all relevant UK, EU and international standards relating to the ecology of the site. 2. The following must be achieved, according to the route being assessed: a. Route 1 - Criteria 2-3 in LE03 have been achieved. b. Route 2 - Criteria 2-3 in LE03 have been achieved, and at least one credit under LE04 for 'Change and Enhancement of Ecology' has been awarded.</p>	0	0%	0	0%
LE 05: Long term ecology management and maintenance > 2. Planning, liaison, data, monitoring and review management and maintenance	<p><b>One credit - Planning, liaison, data, monitoring and review management and maintenance</b> 3. The project team liaise and collaborate with representative</p>	1	1%	0.5	0.5%

	<p>stakeholders (for relevant stakeholders see - "Determining the ecological outcomes for the site - project team liaison and collaboration with relevant stakeholders" in the LE 02 Methodology), taking into consideration data collated and shared, on solutions and measures implemented to:</p> <ul style="list-style-type: none"> <li>a. Monitor and review the effectiveness with which the plans for LE03 &amp; LE04 are implemented.</li> <li>b. develop and review management and maintenance solutions, actions or measures.</li> </ul> <p>4. In support of the above and to help ensure their continued relevance over the period of the project the following should be considered:</p> <ul style="list-style-type: none"> <li>a. Monitoring and reporting of the ecological outcomes for site implemented at the design and construction stage</li> <li>b. Monitoring and reporting of outcomes and successes from the project</li> <li>c. Arrangements for the ongoing management of landscape and habitat connected to the project (on and, where relevant, off site)</li> <li>d. Maintaining the ecological value of the site and its relationship or connection to its zone of influence</li> <li>e. Maintaining the site in line with the any sustainability linked activities, e.g. ecosystems benefits (LE 02).</li> <li>f. Remedial or other management actions are carried out which relate to those identified in LE 02, LE 03 and LE 04.</li> </ul> <p>5. As part of the tenant or building owner information supplied, include a section on Ecology and Biodiversity to inform the owner or occupant of local ecological features, value and biodiversity on or near the site.</p> <p>Note: for Route 1, two credits are available overall for LE 05, but a maximum of one credit can be awarded where all criteria are met.</p>				
LE 05: Long term ecology management and maintenance > 3. Landscape and ecology management plan (or similar) development	<p><b>One credit - Landscape and ecology management plan (or similar) development</b></p> <p>6. Landscape and ecology management plan, or</p>	1	1%	0.5	0.5%

	<p>equivalent, is developed in accordance with BS 42020:2013 Section 11.1 covering as a minimum the first five years after project completion and includes:</p> <ul style="list-style-type: none"> <li>a. Actions and responsibilities, prior to handover, to give to relevant individuals</li> <li>b. The ecological value and condition of the site over the development life.</li> <li>c. Identification of opportunities for ongoing alignment with activities external to the development project and which supports the aims of BREEAM's Strategic Ecology Framework</li> <li>d. Identification and guidance s to trigger appropriate remedial actions to address previously unforeseen impacts</li> <li>e. Clearly defined and allocated roles and responsibilities.</li> </ul> <p>7. The landscape and management plan or similar is updated as appropriate to support maintenance of the ecological value of the site. Note: for Route 1, two credits are available overall for LE 05, but a maximum of one credit can be awarded where all criteria are met.</p>				
Land Use and Ecology Totals		13	13.00%	6	6.00%

Polution	Compliance Requirements	Available		Targeted	
		Credits	Percent	Credits	Percent
Pol 01: Impact of refrigerants > 1. No refrigerant use	<p><b>Three credits - No refrigerant use</b></p> <p>1. No refrigerant use within the installed plant or systems. Shell only assessments are designed to avoid the need for refrigerant containing services. OR alternatively, where the building does use refrigerants, the three credits can be awarded in line with criteria 2-7</p>	3	2%	3	2%
Pol 02: Local air quality	<p><b>Up to two credits</b></p> <p>1. All heating and hot water is supplied by non-combustion systems. For example only powered by electricity. OR alternatively; 2. Emissions from all installed combustion plant that provide space heating and domestic hot water do not exceed the levels set in Table 12.4 and Table 12.5. The measurements must be provided by manufacturers, following the labelling</p>	2	1.33%	1	0.67%

	requirements of the European directive 2009/125/EC. No credits can be awarded for Pol 02 if any of the combustion appliances are not covered in Table 12.4 and Table 12.5.				
Pol 03: Flood and surface water management > 1. Pre-requisite	1. An appropriate consultant is appointed to carry out and demonstrate the development's compliance with all criteria.	0	0%	0	0%
Pol 03: Flood and surface water management > 2. Flood resilience	<p><b>Two credits - Low flood risk</b></p> <p>2. A site-specific flood risk assessment (FRA) confirms the development is in a flood zone that is defined as having a low annual probability of flooding. The FRA takes all current and future sources of flooding into consideration (see Sources of flooding).</p> <p><b>One credit - Medium or high flood risk</b></p> <p>3. A site-specific FRA confirms the development is in a flood zone that is defined as having a medium or high annual probability of flooding and is not in a functional floodplain. . The FRA must take all current and future sources of flooding into consideration (see Sources of flooding). For smaller sites refer to Level of detail required in the FRA for smaller sites, which overrides criterion 2 above.</p> <p>4. To increase the resilience and resistance of the development to flooding, one of the following must be achieved:</p> <p style="margin-left: 20px;">a. The ground level of the building and access to both the building and the site, are designed (or zoned) so they are at least 600mm above the design flood level of the site's flood zone (see 600mm threshold).</p> <p style="margin-left: 20px;">b. The final design of the building and the wider site reflects the recommendations made by an appropriate consultant in accordance with the hierarchy approach outlined in section 5 of BS 8533:2011.</p>	2	1.33%	2	1.33%
Pol 03: Flood and surface water management > 3. Surface water run-off : Pre-requisite	<p><b>Pre-requisite for surface water run-off credits</b></p> <p>5. Surface water run-off design solutions must be bespoke, i.e. they must take account of the specific site requirements and natural or man-made environment of and surrounding the site. The priority levels detailed in the Methodology must be followed, with justification given by the</p>	0	0%	0	0%

	<p>appropriate consultant where water is allowed to leave the site.</p> <p>Note: For Simple Buildings, achieving criteria 5-15 will also achieve an Exemplary credit.</p>				
<p>Pol 03: Flood and surface water management &gt; 3. Surface water run-off : Rate</p>	<p><b>One credit - Surface Water Run-Off - Rate</b></p> <p><b>6.</b> For brownfied sites, drainage measures are specified so that the peak rate of run-off from the site to the watercourses (natural or municipal) shows a 30% improvement for the developed site compared with the pre-developed site. This should comply at the 1-year and 100-year return period events.</p> <p><b>7.</b> For Greenfield sites, drainage measures are specified so that the peak rate of run-off from the site to the watercourses (natural or municipal) is no greater for the developed site than it was for the pre-development site. This should comply at the 1-year and 100-year return period events.</p> <p><b>8.</b> Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified Sustainable Drainage Systems (SuDS) are in place.</p> <p><b>9.</b> Calculations include an allowance for climate change. This should be made in accordance with current best practice planning guidance (see definitions).</p> <p>Note: For Simple Buildings, achieving criteria 5-16 will also achieve an Exemplary credit.</p>	1	0.67%	1	0.67%
<p>Pol 03: Flood and surface water management &gt; 3. Surface water run-off : Volume</p>	<p><b>One credit - Surface Water Run-Off - Volume</b></p> <p><b>10.</b> Flooding of property will not occur in the event of local drainage system failure (caused either by extreme rainfall or a lack of maintenance); AND EITHER</p> <p><b>11.</b> Drainage design measures are specified so that the post-development run-off volume, over the development lifetime, is no greater than it would have been prior to the assessed site's development. This must be for the 100-year 6-hour event, including an allowance for climate change (see criterion 15).</p> <p><b>12.</b> Any additional predicted volume of run-off for this event is prevented from leaving the site by using infiltration or other SuDS techniques.</p> <p>OR (only where criteria 11 and 12 cannot be achieved):</p> <p><b>13.</b> Justification from the</p>	1	0.67%	1	0.67%

	<p>appropriate consultant indicating why the above criteria cannot be achieved, i.e. where infiltration or other SuDS techniques are not technically viable options.</p> <p><b>14.</b> Drainage design measures are specified so that the post-development peak rate of run-off is reduced to the limiting discharge. The limiting discharge is defined as the highest flow rate from the following options:</p> <ul style="list-style-type: none"> <li>a. The pre-development one-year peak flow rate</li> <li>b. The mean annual flow rate (Qbar)</li> <li>c. 2L/s/ha.</li> </ul> <p>For the one-year peak flow rate, the one-year return period event criterion applies.</p> <p><b>15.</b> Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified SuDS are in place.</p> <p><b>16.</b> For either option, above calculations must include an allowance for climate change; this should be made in accordance with current best practice planning guidance. Note: For Simple Buildings, achieving criteria 5-16 will also achieve an Exemplary credit.</p>				
<p>Pol 03: Flood and surface water management &gt; 5. Minimising watercourse pollution</p>	<p><b>One credit - Minimising watercourse pollution</b></p> <p><b>17.</b> There is no discharge from the developed site for rainfall up to 5mm (confirmed by the appropriate consultant).</p> <p><b>18.</b> Areas with a low risk source of watercourse pollution have an appropriate level of pollution prevention treatment is provided, using appropriate SuDS techniques.</p> <p><b>19.</b> Areas with a high risk of contamination or spillage of substances such as petrol and oil, have separators (or an equivalent system) are installed in surface water drainage systems.</p> <p><b>20.</b> Chemical or liquid gas storage areas have a means of containment fitted to the site drainage system (i.e. shut-off valves). This is to prevent the escape of chemicals to natural watercourses in the event of a spillage or bunding failure.</p> <p><b>21.</b> All water pollution prevention systems have been designed and installed in accordance with the recommendations of documents such as the SuDS manual (227) and other relevant industry best</p>	<p>1</p>	<p>0.67%</p>	<p>0</p>	<p>0%</p>

	<p>practice. They must be bespoke solutions taking account of the specific site requirements and natural or man-made environment of and surrounding the site.</p> <p><b>22.</b> A comprehensive and up to date drainage plan of the site will be made available for the building or site occupiers.</p> <p><b>23.</b> Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified SuDS must be in place.</p> <p><b>24.</b> All external storage and delivery areas are designed and detailed in accordance with the current best practice planning guidance.</p>				
Pol 04: Reduction of night time light pollution	<p><b>One credit</b></p> <p><b>1.</b> External lighting pollution has been eliminated through effective design that removes the need for external lighting. This does not adversely affect the safety and security of the site and its users. OR alternatively, where the building does have external lighting, one credit can be awarded as follows:</p> <p><b>2.</b> The external lighting strategy has been designed in compliance with Table 2 (and its accompanying notes) of the Institute of Lighting Professionals (ILP) Guidance notes for the reduction of obtrusive light, 2011. Buildings</p> <p><b>3.</b> All external lighting (except for safety and security lighting) can be automatically switched off between 23:00 and 07:00.</p> <p><b>4.</b> If safety or security lighting is provided and will be used between 23:00 and 07:00, this part of the lighting system complies with the lower levels of lighting recommended during these hours in Table 2 of the ILP guidance notes.</p> <p><b>5.</b> Illuminated advertisements are designed in compliance with ILP PLG05 The Brightness of Illuminated Advertisements.</p>	1	0.67%	1	0.67%
Pol 05: Reduction of noise pollution	<p><b>One credit</b></p> <p><b>1.</b> There are no noise-sensitive areas within the assessed building or within 800m radius of the assessed site. OR</p> <p><b>2.</b> Where there are noise-sensitive areas within the assessed building or noise-sensitive areas within 800m radius of the assessed site, a noise impact assessment compliant with BS4142:2014 is commissioned. Noise levels</p>	1	0.67%	1	0.67%



	<p>must be measured or determined for:</p> <p>a. Existing background noise levels:</p> <p>i. at the nearest or most exposed noise-sensitive development to the proposed assessed site</p> <p>ii. including existing plant on a building, where the assessed development is an extension to the building</p> <p>b. Noise rating level from the assessed building.</p> <p>3. The noise impact assessment must be carried out by a suitably qualified acoustic consultant.</p> <p>4. The noise level from the assessed building, as measured in the locality of the nearest or most exposed noise-sensitive development, must be at least 5dB lower than the background noise throughout the day and night.</p> <p>5. If the noise sources from the assessed building are greater than the levels described in criterion 4, measures have been installed to attenuate the noise at its source to a level where it will comply with the criterion.</p>				
Polution Totals		12	8.00%	10	6.67%

Innovation	Compliance Requirements	Available		Targeted	
		Credits	Percent	Credits	Percent
Inn 01: Innovation	<p><b>Up to a maximum of 10 credits are available in aggregate from a combination of the following:</b></p> <p><b>Exemplary level of performance in existing BREEAM issues</b></p> <p>1. Where the building demonstrates exemplary performance by meeting defined exemplary level performance criteria in one or more of following BREEAM assessment issues:</p> <p>a. Man 01 Project brief and design (Simple buildings only)</p> <p>b. Man 03 Responsible construction practices</p> <p>c. Hea 01 Visual comfort</p> <p>d. Hea 02 Indoor air quality</p> <p>e. Hea 06 Security</p> <p>f. Ene 01 Reduction of energy use and carbon emissions</p> <p>g. Wat 01 Water</p>	10	10%	0	0%

	<p>consumption</p> <p><b>h.</b> Mat 01 Environmental impacts from construction products - Building life cycle assessment (LCA)</p> <p><b>i.</b> Mat 03 Responsible sourcing of construction products</p> <p><b>j.</b> Wst 01 Construction waste management</p> <p><b>k.</b> Wst 02 Use of recycled and sustainably sourced aggregates</p> <p><b>l.</b> Wst 05 Adaptation to climate change</p> <p><b>m.</b> LE 02 Identifying and understanding the risks and opportunities for the site</p> <p><b>n.</b> Pol 03 Flood and surface water management (Simple buildings only).</p> <p>Please refer to the relevant BREEAM issue within this scheme document for details of the exemplary level performance assessment criteria.</p> <p><b>Approved innovations</b></p> <p><b>2.</b> One innovation credit can be awarded for each innovation application approved by BRE Global, where the building complies with the criteria defined within an approved innovation application form.</p>				
Man 03: Responsible construction practices > 1. Responsible construction management	<p><b>Assessment criteria</b></p> <p>See compliance requirements for Man 03</p>	1	1%	0	0%
Hea 01: Visual comfort > 1. Daylighting	<p><b>Assessment criteria</b></p> <p>See compliance requirements for Hea 01</p>	1	1%	0	0%
Hea 01: Visual comfort > 2. Internal and external lighting	<p><b>Assessment criteria</b></p> <p>See compliance requirements for Hea 01</p>	1	1%	0	0%
Hea 02: Indoor air quality	<p><b>Assessment criteria</b></p> <p>See compliance requirements for Hea 02</p>	1	1%	0	0%
Hea 06: Security	<p><b>Assessment criteria</b></p> <p>See compliance requirements for Wat 01</p>	1	1%	0	0%
Ene 01: Reduction of energy use and carbon emissions > 1. Energy performance	<p><b>Exemplary level criteria</b></p> <p><b>Up to two credits - Beyond zero net regulated carbon</b></p> <p><b>6.</b> The building achieves an EPR NC ≥ 0.9 and zero net regulated CO<sub>2</sub>-eq emissions (see Definitions).</p> <p><b>7.</b> Energy generation from on-site and near-site LZC sources is sufficient to offset carbon emissions from regulated energy use plus a percentage of emissions from unregulated energy use.</p> <p><b>8.</b> Award the exemplary credits based on the percentage of additional emissions from</p>	3	3%	0	0%

	<p>unregulated energy that are offset by LZC sources (see Table 6.2).</p> <p><b>Three credits - Carbon negative</b></p> <p><b>9.</b> The building is deemed carbon negative where &gt; 100% (see Table 6.2) of carbon emissions from unregulated (and regulated) energy use are offset by energy generated from on-site and near-site LZC sources (see Definitions).</p>				
Ene 01: Reduction of energy use and carbon emissions > 2. Prediction of operational energy consumption : Post-occupancy stage	<p><b>Exemplary level criteria</b></p> <p><b>Two credits – Post-occupancy stage</b></p> <p><b>10.</b> Achieve maximum available credits in Ene 02 Energy monitoring on page 136. In addition, preschools, primary schools, law courts, prisons and multi-residential buildings must meet the requirements of the second credit for sub-metering of high energy load and tenancy areas.</p> <p><b>11.</b> The client or building occupier commits funds to pay for the post occupancy stage. This requires an assessor to be appointed and to report on the actual energy consumption compared with the targets set in 4 above.</p> <p><b>12.</b> The energy model (criterion 3 above) is:</p> <ul style="list-style-type: none"> <li>a. Submitted to BRE and</li> <li>b. Retained by the building owner.</li> </ul>	2	2%	0	0%
Wat 01: Water consumption	<p><b>Assessment criteria</b></p> <p>See compliance requirements for Wat 01</p>	1	1%	0	0%
Mat 01: Environmental impacts from construction products - Building life cycle assessment (LCA) > 1. Core building services options appraisal during Concept Design	<p><b>Assessment criteria</b></p> <p>See compliance requirements for Mat 01</p>	1	1%	0	0%
Mat 01: Environmental impacts from construction products - Building life cycle assessment (LCA) > 2. LCA and LCC alignment	<p><b>Assessment criteria</b></p> <p>See compliance requirements for Mat 01</p>	1	1%	0	0%
Mat 01: Environmental impacts from construction products - Building life cycle assessment (LCA) > 3. Third party verification	<p><b>Assessment criteria</b></p> <p>See compliance requirements for Mat 01</p>	1	1%	0	0%
Mat 03: Responsible sourcing of construction products	<p><b>Assessment criteria</b></p> <p>See compliance requirements for Mat 03</p>	1	1%	0	0%
Wst 01: Construction waste management > 1. Construction resource efficiency	<p><b>Assessment criteria</b></p> <p>See compliance requirements for Wst 01</p>	1	1%	0	0%
Wst 02: Use of recycled and sustainably sourced aggregates	<p><b>Assessment criteria</b></p> <p>See compliance requirements for Wst 02</p>	1	1%	0	0%
Wst 05: Adaptation to climate change	<p><b>Assessment criteria</b></p> <p>See compliance requirements</p>	1	1%	0	0%

	for Wst 05				
LE 02: Identifying and understanding the risks and opportunities for the site	<b>Assessment criteria</b> See compliance requirements for LE 02	1	1%	0	0%
LE 04: Change and enhancement of ecological value	<b>Assessment criteria</b> See compliance requirements for LE 04	1	1%	0	0%
Innovation Totals (Up to a maximum of 10 credits)		10	10.00%	0	0.00%
<b>Overall Totals</b>		<b>139</b>	<b>110.00%</b>	<b>95</b>	<b>71.27%</b>