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Energy & Sustainability Report
Panda House E14 7HS

March 2019

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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

This energy & sustainability statement has been produced by MES Building Solutions for Wayview Limited in order to support a planning application to Tower Hamlets Council.

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

The proposal is for demolition of the existing building and construction of a new building providing a total of 109 rooms over seven levels (including the lower ground floor) for hostel and large HMO use.

To ensure compliance with the Greater London Authority and Tower Hamlets planning policy a number of sustainability strategies will be incorporated in the design and construction of the development. A BREEAM Pre-Assessment has been completed that demonstrates how the proposal can achieve an 'Excellent' rating in BREEAM New Construction 2018.

The design and specification for Panda House follows the energy hierarchy and promotes a 'fabric' first holistic approach. This ensures an energy efficient building that is not totally reliant on renewable generation to achieve a reduction in emissions. When compared to a Building Regulations baseline, this approach results in an overall reduction in emissions of 44%. The recommended LZC strategy specifies micro CHP in conjunction with solar PV.

1a: Summary of Carbon emissions savings	
Building Regulations CO_2 emissions	**139.4 Tonnes/year**
CO_2 emissions from Proposed Specification	**77.9 Tonnes/year**
Saving (%)	**44%**
Saving in tonnes per year	**61.5 Tonnes**
Equivalent BREEAM Rating	**OUTSTANDING**

The proposed strategy offsets a total of 61.5 tonnes CO_2 per year, a reduction of 44%.

This development fully complies with National and Local Policy along with meeting all adopted policy and also delivering a sustainable scheme in all aspects through a fabric first holistic approach.

1.2 Introduction

The purpose of this report is to provide an overview of how energy and sustainability will be promoted both during and after construction and to establish the predicted energy requirements for the proposed development. It illustrates how energy efficiency measures, in conjunction with renewable generation, can be used to reduce the predicted energy consumption and associated carbon dioxide emissions.

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

In line with the favoured approach of tower hamlets Council we will calculate the total energy requirement for the development and show how the energy hierarchy will be used to reduce energy demand and CO_2 emissions from the development.

We will demonstrate how the development will achieve at least a 35% 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.

Planning Policy

Tower Hamlets Core Strategy 2010 Policy SP11

1. Implement a borough-wide carbon emission reduction target of 60% below 1990 levels by 2025.

2. Ensure that all new homes are built in-line with government guidance to reach zero carbon by 2016, and that all new non-domestic development reaches zero-carbon by 2019.

3. Promote low and zero-carbon energy generation through:
   a. Safeguarding existing renewable energy decentralised energy systems.
   b. Implementing a network of decentralised heat and energy facilities that connect into a heat and power network, including working with the LDA to link with the Olympic Park Energy Centre and the wider East London Heat Network.
   c. Promoting the development of new decentralised energy facilities that have the potential to link into a wider sub-regional network.
   d. Exploring the use of waste-to-energy facilities, particularly in the east of the borough, to support the borough's waste management and recycling targets.
   e. Working with partners inside and outside the borough to explore ways of implementing decentralised energy systems.
   f. Supporting development that uses intelligent design to make use of renewable-energy technologies.

4. Reducing carbon emissions in non-domestic buildings by:
   a. Working with partners to implement ways to reduce carbon emissions particularly large businesses in the borough
   b. Supporting non-domestic developments that promote the use of renewable energy technologies
   c. Reducing the carbon emissions of all public buildings in the borough

5. Implement an area-based approach in which new development should achieve higher levels of carbon reductions than elsewhere in the borough.

6. Maximising the energy efficiency of existing housing stock by:
   a. Working with housing providers to ensure regeneration of existing housing stock and redevelopment promotes carbon emissions reductions and is adapted for climate change
   b. Seeking to establish Energy Opportunity Areas in places likely to be affected by fuel poverty.

7. Require all new developments to provide 20% reduction of carbon dioxide emissions through on-site renewable energy generation where feasible.

8. Ensure the built environment adapts to the effects of climate change. Please refer to SP04 and the Development Management DPD for more detail.

Tower Hamlets Development Management Plan 2013 Policy DM29

1. Development will be required to be accompanied by an Energy Assessment to demonstrate its compliance with the following:

Residential development	
Year	Improvement on 2010 Building Regulations
2011-2013	35% CO2 emissions reduction
2013-2016	50% CO2 emissions reduction
2016-2031	Zero Carbon

Non-residential development	
Year	Improvement on 2010 Building Regulations
2011-2013	35% CO2 emissions reduction
2013-2016	50% CO2 emissions reduction
2016-2019	As per building regulations
2019-2031	Zero Carbon

2. Development will be required to connect to or demonstrate a potential connection to a decentralised energy system unless it can be demonstrated that this is not feasible or viable.

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

4. Sustainable design assessment tools will be used to ensure climate change mitigation measures are maximised within development.

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-residential buildings from 2019.

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.

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.

National Planning Policy Framework (February 2019)

Plans and decisions should apply a presumption in favour of sustainable development.

For plan-making this means that:

a) plans should positively seek opportunities to meet the development needs of their area, and be sufficiently flexible to adapt to rapid change;

b) strategic policies should, as a minimum, provide for objectively assessed needs for housing and other uses, as well as any needs that cannot be met within neighbouring areas5, unless:

i. the application of policies in this Framework that protect areas or assets of particular importance provides a strong reason for restricting the overall scale, type or distribution of development in the plan area; or

ii. any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this Framework taken as a whole.

For decision-taking this means:

c) approving development proposals that accord with an up-to-date development plan without delay; or

d) where there are no relevant development plan policies, or the policies which are most important for determining the application are out-of-date, granting permission unless:

i. the application of policies in this Framework that protect areas or assets of particular importance provides a clear reason for refusing the development proposed6; or

ii. any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this Framework taken as a whole.

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.

2.2 Details of proposal

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

The proposal is for demolition of the existing building and construction of a new building providing a total of 109 rooms over seven levels (including the lower ground floor) for hostel and large HMO use.

Figure 2.1: Proposed lower ground floor plan (Create February 2019)

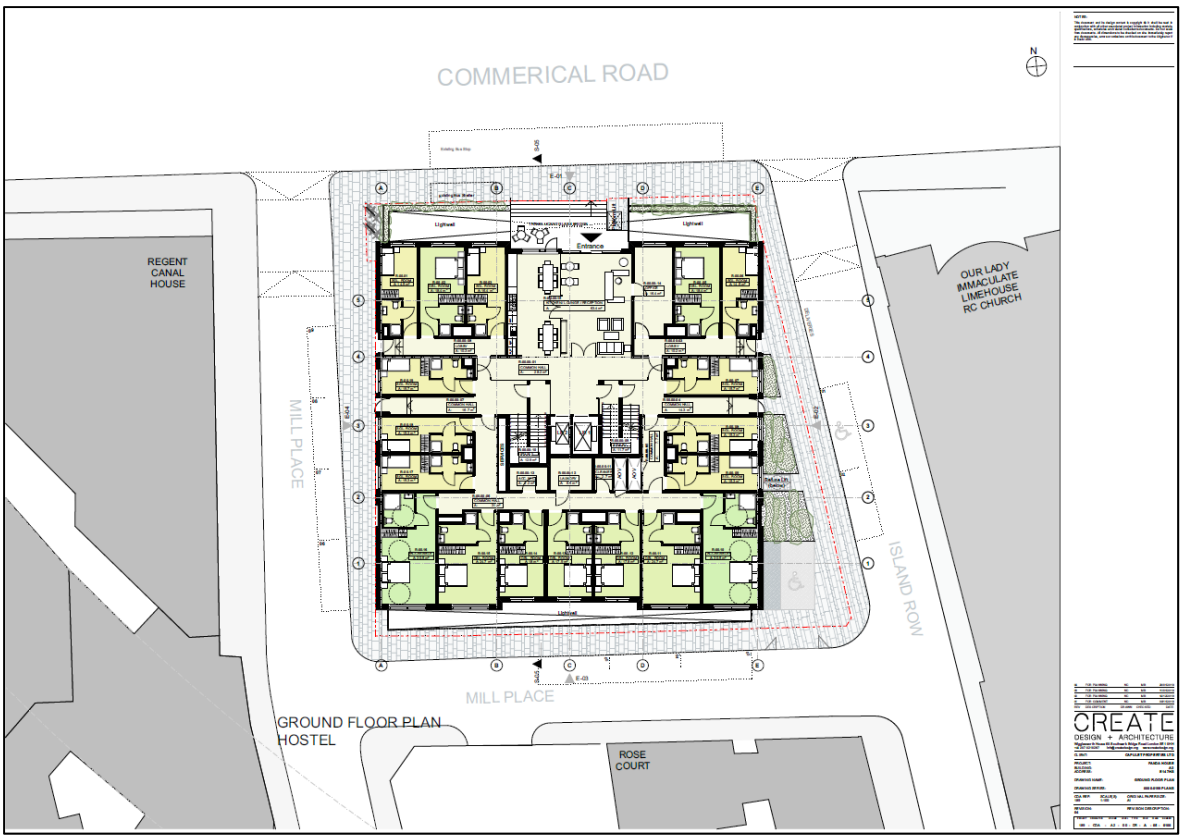


Figure 2.2: Proposed ground floor plan (Create January 2019)

Figure 2.3: Typical intermediate floor plan (Create January 2019)

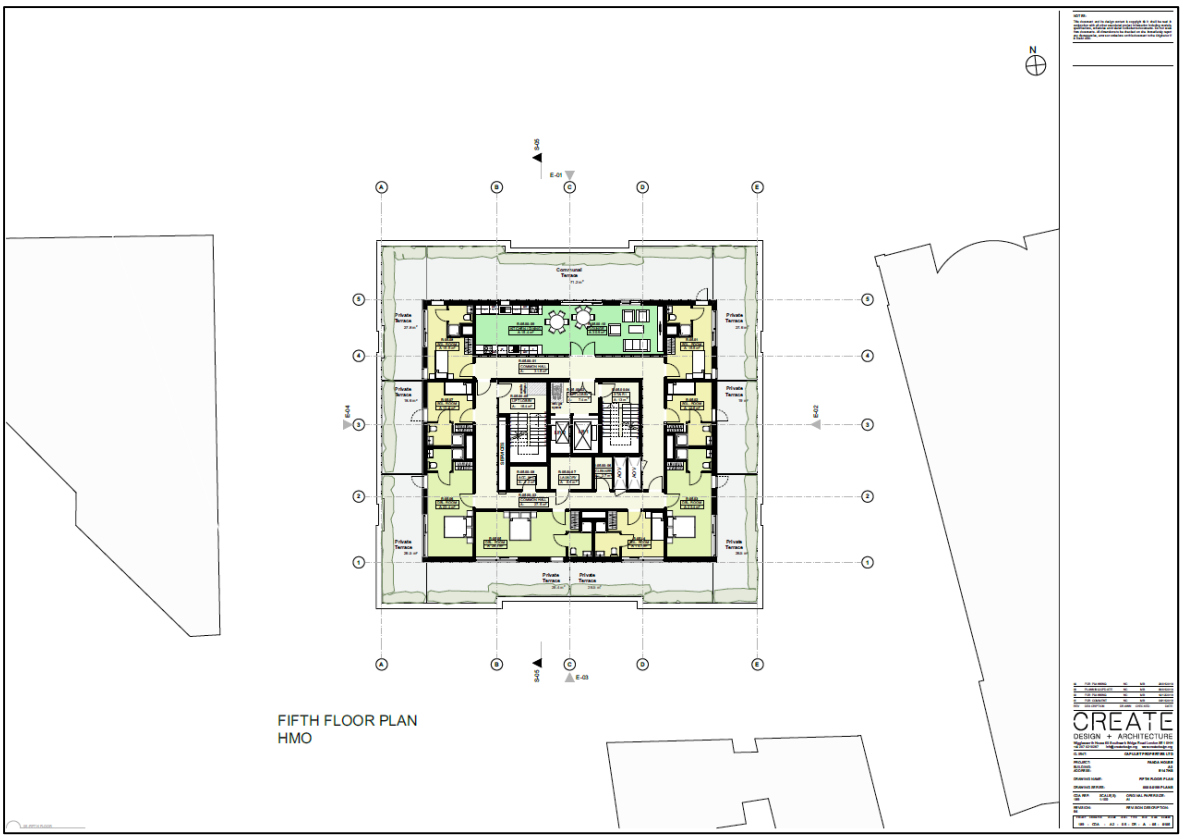


Figure 2.4: Proposed fifth floor plan (Create January 2019)

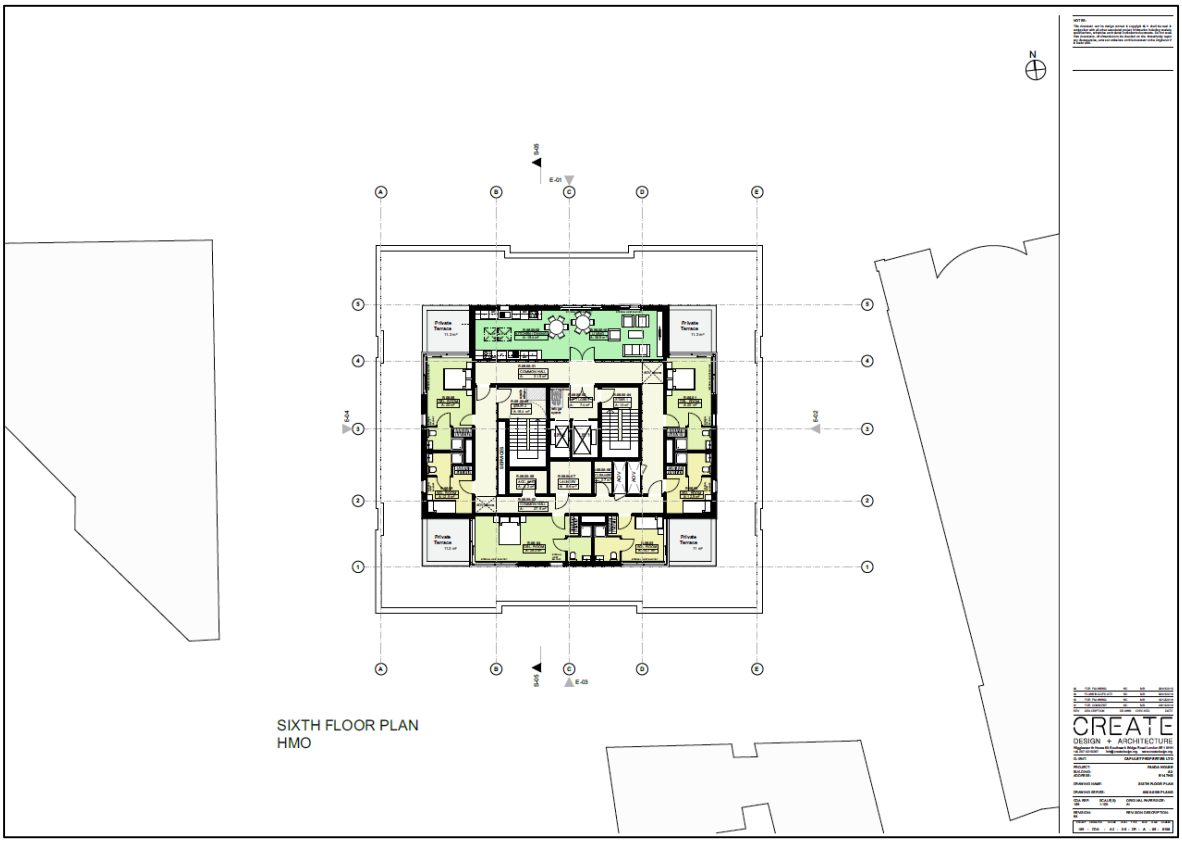


Figure 2.5: Proposed sixth floor plan (Create January 2019)

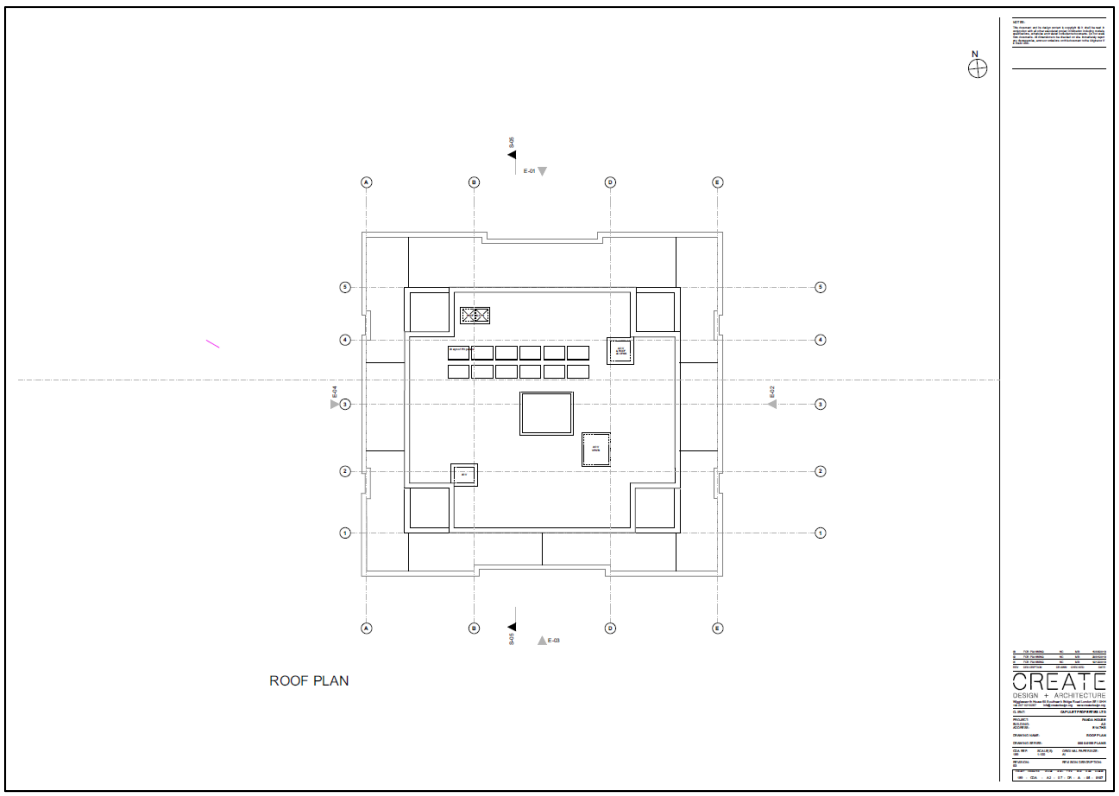


Figure 2.6: Proposed roof plan (Create January 2019)

Section 3: Energy

3.1 The Energy Hierarchy

London Plan policy 5.2 requires major developments to reduce carbon emissions by 35% compared to a 2013 Part L Building regulations baseline. London Plan policy 5.7 and Tower Hamlet Policy SP11 also requires this development to target a 20% contribution from renewable technology. In order to address these targets 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.

Development proposals should:

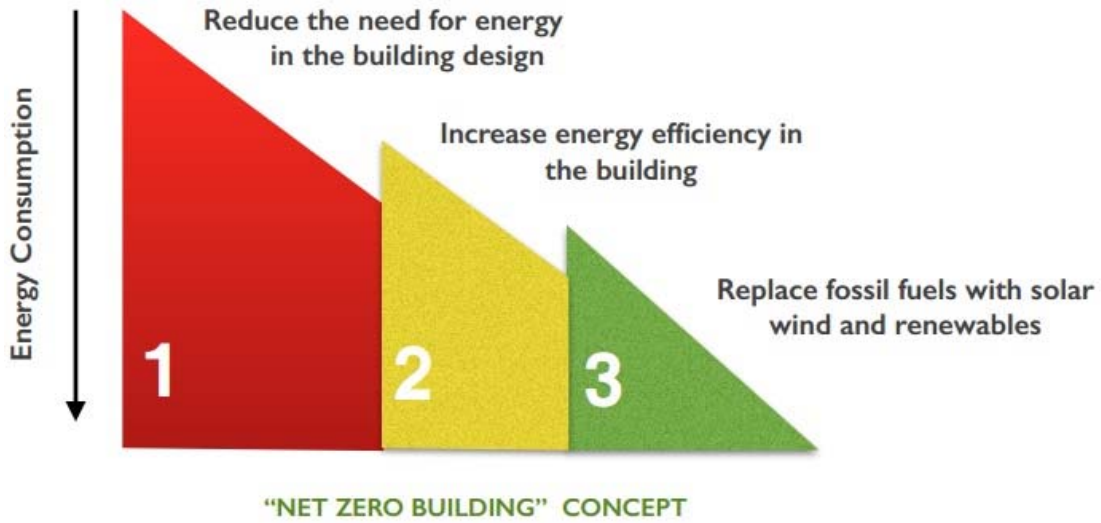


Figure 3.1: The Energy Hierarchy

- ***Reducing energy demand***

  The first step in the process of reducing the overall energy used and CO_2 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 and appliances***

  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.

3.2 Calculating Baseline Energy Demand

Before implementing the energy hierarchy it is necessary to calculate a baseline based upon a Building Regulations Part L 2013 minimum standards compliant specification.

As the development will be required to achieve a 35% improvement over 2013 Building Regulations, baseline figures are calculated using the most appropriate SBEM model. In order to demonstrate that the proposed specification meets this requirement we must first calculate a Building Regulations Part L2A 2013 compliant specification and establish baseline emissions for the development.

Government approved IES DSM software was used to produce a 3D model of the proposed care home and a specification developed that complied with the minimum standards required by Part L2A of Building Regulations.

3a: Base Model		
U Values		
	Ext. Walls	**0.26**
	Gnd Floor	**0.22**
	Windows	**1.60**
	Roofs	**0.18**
	Doors	**2.20**
Mech Services		
	Space Heating	**Gas Fired LPHW**
	Seasonal Efficiency	**93%**
	Space Cooling	**None**
	Seasonal EER	**N/A**
	DHW	**Demand**
	Delivery Efficiency	**95%**
	Ventilation	
	General	**Nat Vent**
	WCs/Bathrooms	**Remote Zone Extract**
	Lighting	**70 lm/W**
	Control	**Occupancy sensors**
	Renewable	**None**
Air Tightness		**10 m³/hr/m²**
Electrical Power Factor		**>0.90**
Lighting Metering Prov?		**No**
Lighting Out-of range Warning?		**No**
	TER	**31.5**
	BER	**31.5**
	Improvement	**0%**

3.3 Energy Efficiency Measures (Be lean)

The first step of the energy hierarchy requires the reduction of energy consumption in the building through improvements to its fabric; to be 'lean'. This reduces the energy demand to run the building and thus the emissions associated with that energy use.

Improvements are possible by considering the following steps:

- Reduce elemental U-Values
- Careful detailing to minimise thermal bridging
- Reducing heat loss through uncontrolled ventilation (air leakage)

3b: 'Be Lean' Model		
U Values		
	Ext. Walls	**0.20**
	Gnd Floor	**0.16**
	Windows	**1.40**
	Roofs	**0.16**
	Doors	**1.50**
Mech Services		
	Space Heating	**Gas Fired LPHW**
	Seasonal Efficiency	**93%**
	Space Cooling	**None**
	Seasonal EER	**N/A**
	DHW	**Demand**
	Delivery Efficiency	**95%**
	Ventilation	
	General	**Nat Vent**
	WCs/Bathrooms	**Remote Zone Extract**
	Lighting	**70 lm/W**
	Control	**Occupancy sensors**
	Renewable	**None**
Air Tightness		**5 m³/hr/m²**
Electrical Power Factor		**>0.90**
Lighting Metering Prov?		**No**
Lighting Out-of range Warning?		**No**
	TER	**31.5**
	BER	**30.3**
	Improvement	**3.8%**

By implementing the steps outlined, emissions have been reduced by 3.8% compared to a Part L2A elemental minimum standards baseline. Table 3e details the efficiency improvements to the building fabric and services proposed.

3.4 Use of clean technologies (Be clean)

The second step of the energy hierarchy requires improvements be made to existing/conventional building services in order to increase their efficiency and an investigation into the use of 'clean' technologies such as district heating and CHP. These technologies, although not necessarily renewable, reduce the carbon emissions associated with building systems by providing heat and power with a lower carbon co-efficient than conventional supplies.

London Plan Policy 5.6 requires that 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.

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;

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.

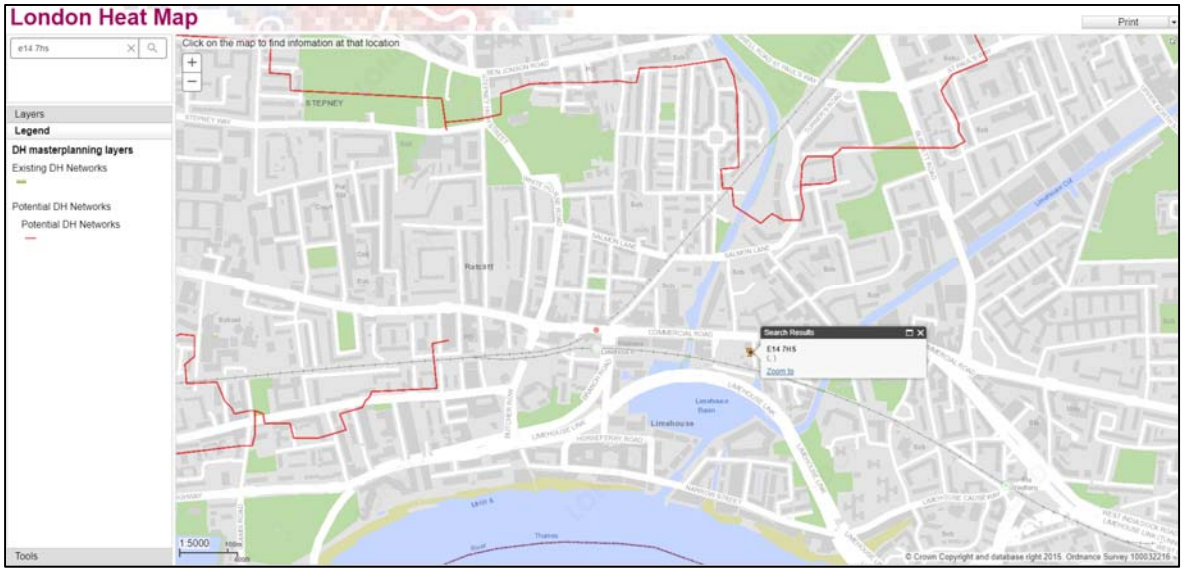


Figure 3.4: Selection form London Heat map. Site identified in centre.

An investigation of the London Heat Map confirms that the closest identified potential DH networks are those proposed to the North & West of the site. These are approximately 1km from the site and not

viable for connection. Communication with the Sustainable Development Team at Tower Hamlets confirmed that there is no operational district heating network in the area of the proposed development or any currently planned for delivery. The Sustainable Development Team recommended that instead; site wide proposals should be designed to allow future connection to a district system should one become available.

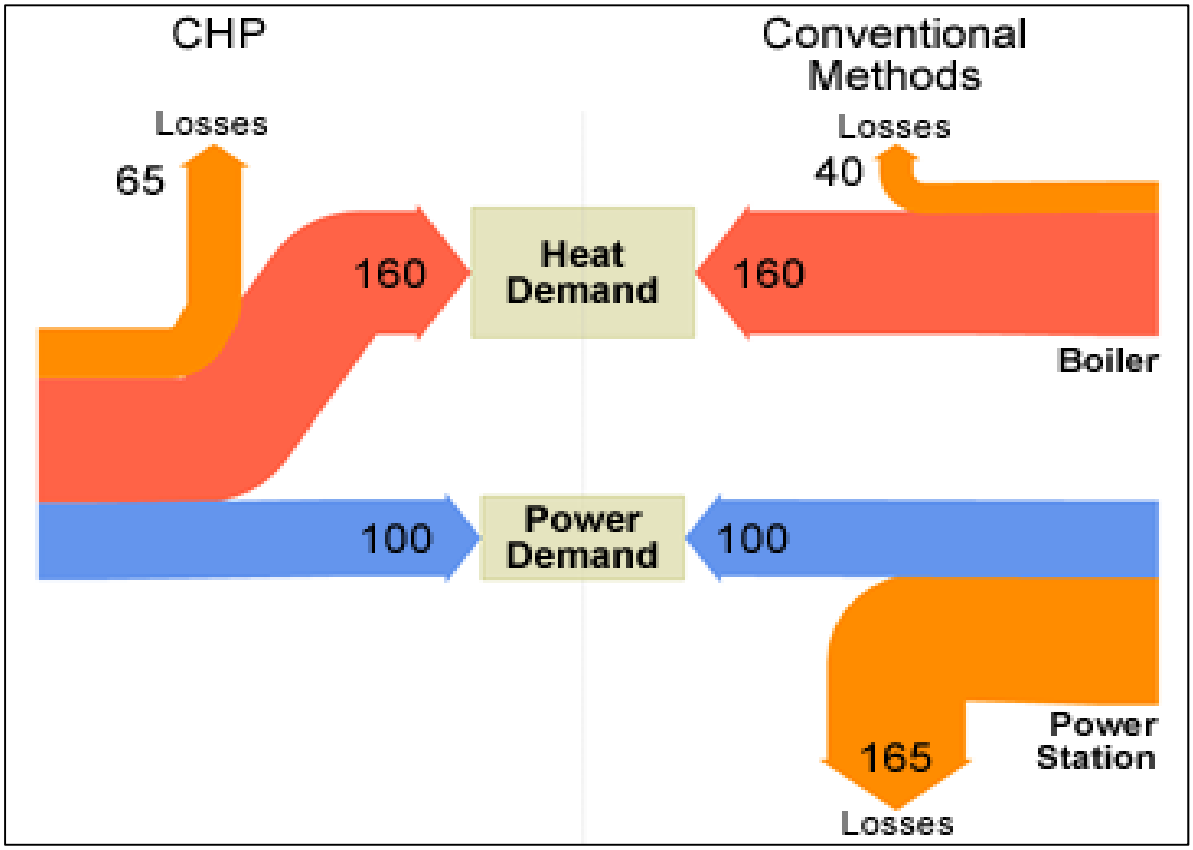


Figure 3.5: CHP schematic showing advantage over conventional systems. (www.energyinternational.co.uk)

CHP (or combined heat and power) uses a single fuel for directly providing both heat and energy on site. Most commonly for small to medium sized systems a mains gas powered internal combustion engine is used to drive an electric generator. The otherwise 'waste' heat from the engines exhaust and cooling system is then utilised to directly heat water. This has an advantage over more conventional systems, where heat and power are provided via separate systems, as it eliminates the losses associated with grid supplied power (demonstrated in Figure 3.4 above).

As can be seen from the schematic diagram, CHP relies on a constant heat baseload to achieve an efficiency benefit over conventional systems. If this is not available then the system efficiency drops significantly as any heat generated that cannot be utilised has to be

dumped. For dwellings and multi-residential buildings, such as the proposed development, the heating baseload during the summer is small being only that required for domestic hot water. This limits the size of CHP unit that can be specified under normal circumstances. CHP units are also tuned so that the electricity generated can be used on site with little or none being exported to the grid.

On this occasion, Shenton Group (CHP Specialists) have been contacted to assess the viability of CHP for the development and size a unit should CHP prove to be viable. Using the daily heating load profile taken from the dynamic simulation model produced by MES, Shenton Group concluded that Micro CHP is a viable option and recommended a suitably sized unit.

Given that, on this occasion, there is a planning requirement for the building to reduce carbon dioxide emissions by 35% the system has not been tuned to minimise the generation of excess electricity, but has been sized to provide the heating baseload. This will result in some of the generated power being exported rather than being used onsite. Although the result of this will be a longer payback period on the plant, it will also offset a greater amount of carbon dioxide, complying with the GLA's required target.
The unit proposed is a Tedom Micro T50 with electrical output of 48kW and thermal output of 91kW.

In addition to the specification of CHP, it is also proposed to make efficiency improvements to the conventional gas boilers that will be retained to provide heating demand beyond the baseload by

specifying more efficient boilers with improved control. It is also intended to provide more efficient lighting & lighting controls.

3c: 'Be Clean' Model		
U Values		
	Ext. Walls	0.20
	Gnd Floor	0.16
	Windows	1.40
	Roofs	0.16
	Doors	1.50
Mech Services		
	Space Heating	Shenton T50 Micro-CHP & Gas Fired LPHW
	CHP efficiency	E: 32.5% T: 61.6%
	Boiler Seasonal Efficiency	95%
	Space Cooling	None
	Seasonal EER	N/A
	DHW	Demand
	Delivery Efficiency	95%
	Ventilation	
	General	Nat Vent
	WCs/Bathrooms	Remote Zone Extract
	Lighting	90 lm/W
	Control	Occupancy sensors
		Daylight dimming
	Renewable	None
Air Tightness		5 $m^3/hr/m^2$
Electrical Power Factor		>0.90
Lighting Metering Prov?		YES
Lighting Out-of range Warning?		YES
	TER	31.5
	BER	17.9
	Improvement	43%

3.5 CO_2 reduction through the use of renewable or low carbon technology (Be green)

The final stage of the energy hierarchy considers the benefit of specifying renewable energy technology to off-set some, or all, of the remaining emissions.

London Plan policy 5.2 requires major developments to reduce carbon emissions by 35% compared to a 2013 Part L Building regulations baseline. London Plan policy 5.7 and Tower Hamlet policy SP11 also requires this development to target a 20% contribution from renewable technology.

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

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

As can be seen; micro CHP is considered a low carbon technology by the Department of Energy & Climate Change, so if this definition is accepted then the requirement for a 20% contribution (as stated in London Plan policy 5.7 and Tower Hamlet policy SP11) has already been comfortably achieved. The Micro CHP unit reduces emissions by 35% when compared to a 'be clean' specification without the CHP unit.

When considering LZC technologies to be used in conjunction with CHP it is important to ensure that the chosen technology does not conflict with the CHP. As CHP requires a heating baseload, thermal technologies are not suited for use with CHP in most circumstances. This leaves the power generating technologies:

- Solar photovoltaics
- Wind turbines
- Small hydro

Wind power & hydro are not suitable on this occasion due to the site location which leaves solar PV as the only viable option.

It is proposed to install a 20m² PV array on the roof of the new development. This is sized to maximise on site power use while not negatively impacting on the efficiency of the CHP unit.

3d: 'Be Green' Model		
U Values		
	Ext. Walls	0.20
	Gnd Floor	0.16
	Windows	1.40
	Roofs	0.16
	Doors	1.50
Mech Services		
	Space Heating	Shenton T50 Micro-CHP & Gas Fired LPHW
	CHP efficiency	E: 32.5% T: 61.6%
	Boiler Seasonal Efficiency	95%
	Space Cooling	None
	Seasonal EER	N/A
	DHW	Demand
	Delivery Efficiency	95%
	Ventilation	
	General	Nat Vent
	WCs/Bathrooms	Remote Zone Extract
	Lighting	90 lm/W
	Control	Occupancy sensors
		Daylight dimming
	Renewable	20m² PV
Air Tightness		5 m³/hr/m²
Electrical Power Factor		>0.90
Lighting Metering Prov?		YES
Lighting Out-of range Warning?		YES
	TER	**31.5**
	BER	**17.6**
	Improvement	**44%**

The proposed specification results in a 44% reduction in carbon dioxide emissions, saving 61 tonnes of CO_2 per year compared to a building constructed to Building Regulations minimum standards. This achieves the requirements for a BREEAM Outstanding rating in ENE1. This is in full compliance with the requirements of GLA & Local Authority planning policy.

3e: Summary of Carbon emissions savings	
Building Regulations CO_2 emissions	139.4 Tonnes/year
CO_2 emissions from Proposed Specification	77.9 Tonnes/year
Saving (%)	44%
Saving in tonnes per year	61.5 Tonnes
Equivalent BREEAM Rating	OUTSTANDING

Solar Photovoltaics

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

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.

A range of Photovoltaic products and colours are available, varying in efficiency and cost. These include Monocrystalline, Polycrystalline, Thin Film and Hybrid Panels. Hybrid panels are the most energy efficient and thin Film the least.

All of the above technologies can be installed in roof and wall mounted arrays or as integrated building members, giving the additional benefit of offsetting the cost of other construction materials, such as weather proof roof membranes or integrated into glazed wall constructions.

Solar PV panels are a viable option for this development and have been incorporated into the design strategy. The incorporation of P.V. panels will ensure the building has an element of future proofing designed in from conception.

This is the chosen renewable technology on the site.

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. Suburban sites such as the location of this development can be considered for wind turbine installations. There are, however, possible issues with turbulence from surrounding buildings, noise and 'flicker' which will need to be evaluated and commonly make wind turbines unsuitable for urban locations.
The NOABL wind resource database for the site location records average wind speeds as shown in Table 3n below.

The British Wind Energy Association (BWEA) generally recommends an average wind speed of at least 7m/s for viable system performance.

Table 3f: Average wind speeds for E14 7HS	
45m above ground level	6.0m/s
25m above ground level	5.5m/s
10m above ground level	4.7m/s

Due to low wind speeds we cannot recommend wind turbines 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 buildings should this approach be considered.

Small Hydro Generation

Hydroelectricity generation uses running water to generate electricity, whether it is a small stream or a larger river. All streams and rivers flow downhill. Before the water flows down the hill, it has potential energy because of its height. Hydro power systems convert this potential energy into kinetic energy in a turbine, which drives a generator to produce electricity. Small, or 'micro' hydro generation requires a reliable source of flowing water with a reasonably constant flow velocity. Systems of this nature are normally installed in locations with a natural moving

water source such as a river, stream or spring where part of the flow can be diverted through a generator.

There is no such source of flowing water on this site small hydro generation is not an option for this development.

Solar Water heating

Solar water heating systems use radiation from the sun to heat domestic hot water. Solar hot water heating can generate a large proportion of a dwelling's annual DHW requirement. The displaced fuel would be mains gas meaning that the CO_2 savings of this type of system are relatively low due to the low carbon intensity of the displaced fuel when compared to that which can be achieved through the use of solar PV. 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 they cannot be considered to be zero carbon unless the supplied electricity is from renewable sources; they do however have very good efficiencies; energy produced by heat pumps is typically in the region of 2.5 times that which is required to run them, giving efficiencies of 250%.

Because the 'fuel' for heat pumps is usually grid supplied electricity there is not necessarily any substantial reduction in carbon emissions when compared to an efficient gas condensing heating system where gas is available on site.

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)

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:

Table 4.1 BREEAM 2018 rating benchmarks	
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).

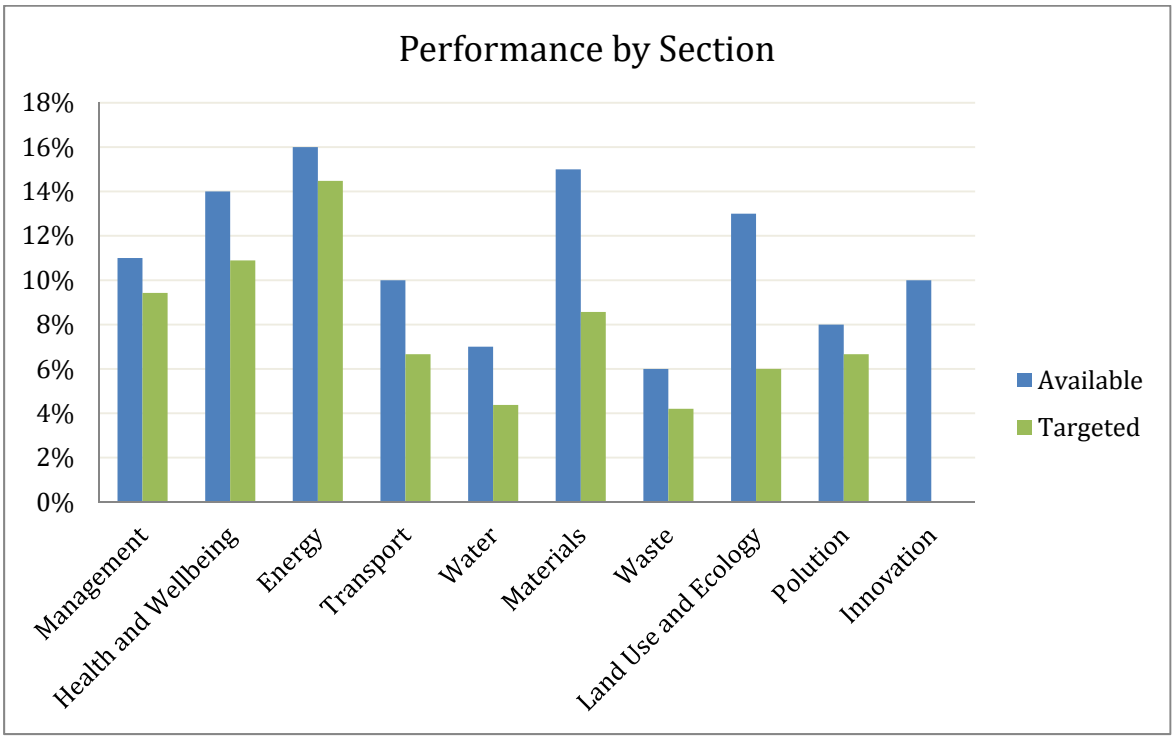
The weighted category scores are then totalled to give an overall score, and any additional score for innovation is added to give the final BREEAM score which is used to determine the BREEAM rating.

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%
Total	**139**	**110.00%**	**95**	**71.27%**



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.

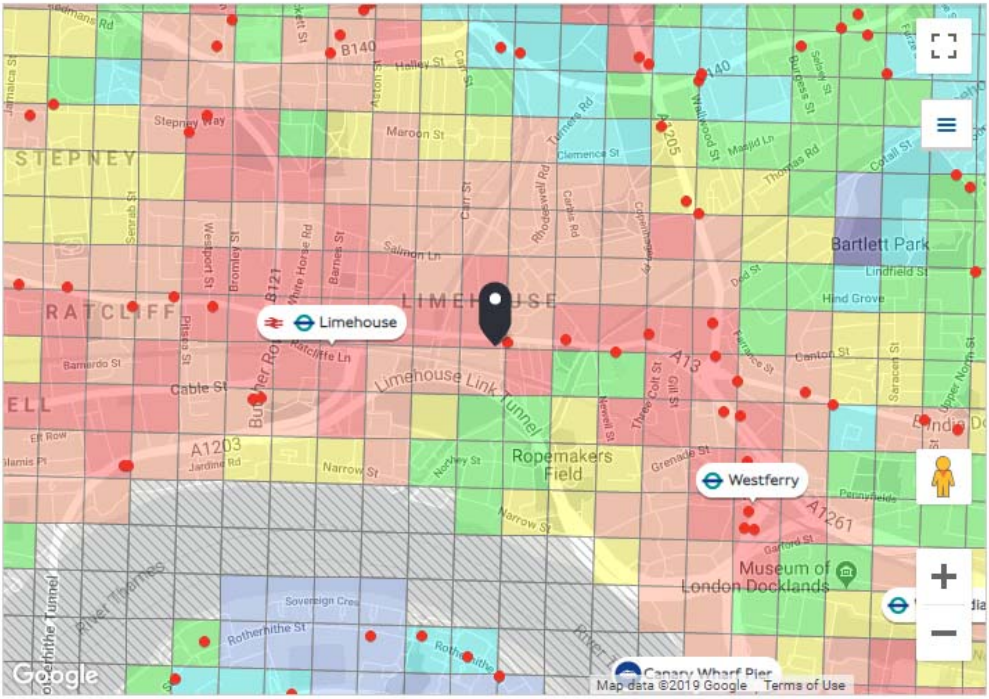
4.5 Transport

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.



You can click anywhere on the map to change the selected location.

PTAL output for Base Year
5

E14 7HS
Commercial Rd, London E14 7HS, UK
Easting: **536472**, Northing: **181093**

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.

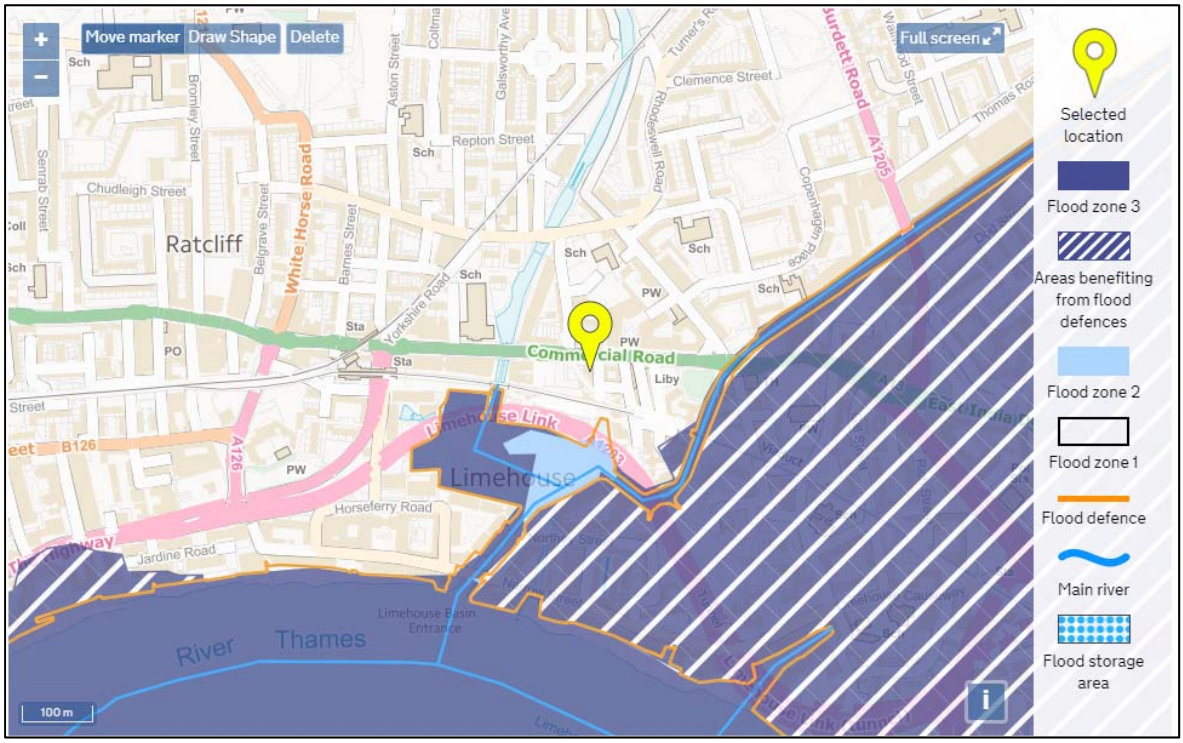


Figure 4.1: Environment Agency Flood Map for the Mill Lane area.

Section 5: Summary

To ensure compliance with the greater London Authority and Tower Hamlets planning policy a number of sustainability strategies will be incorporated in the design and construction of the development. A BREEAM Pre-Assessment has been completed that demonstrates how the proposal can achieve an 'Excellent' rating in BREEAM New Construction 2018.

The design and specification for Panda House follows the energy hierarchy and promotes a 'fabric' first holistic approach. This ensures an energy efficient building that is not totally reliant on renewable generation to achieve a reduction in emissions. When compared to a Building Regulations baseline, this approach results in an overall reduction in emissions of 44%. The recommended LZC strategy specifies micro CHP in conjunction with solar PV.

5a: Summary of Carbon emissions savings	
Building Regulations CO_2 emissions	**139.4 Tonnes/year**
CO_2 emissions from Proposed Specification	**77.9 Tonnes/year**
Saving (%)	**44%**
Saving in tonnes per year	**61.5 Tonnes**
Equivalent BREEAM Rating	**OUTSTANDING**

The proposed strategy offsets a total of 61 tonnes CO_2 per year, a reduction of 44%.

This development fully complies with National and Local Policy along with meeting all adopted policy and also delivering a sustainable scheme in all aspects through a fabric first holistic approach.

Appendix

SBEM Summary
CHP Unit drawings
BRUKL Documents
BREEAM Pre-Assessment

SBEM Summary

Panda House, London 2019

Base Model		Red. Energy Demand *Changes over Base Model*	Inc. Energy Efficiency *Changes over Base Model*	LZC Sources *Changes over Base Model*
Drawings *numbers*		**1**	**2**	**3**
U Values				
Ext. Walls	**0.26**	**0.20**		
Gnd Floor	**0.22**	**0.16**		
Windows	**1.60**	**1.40**		
Access Doors	**2.20**	**1.50**		
Roof	**0.18**	**0.16**		
Mech Services				
Space Heating	**Gas Fired LPHW**			
Seasonal Efficiency	**93%**		**95%**	
DHW	**Demand**		**Pump with sensors**	
Delivery Efficiency	**95%**		**Weather Comp**	
Ventilation				
General	**Nat Vent**			
WCs/Bathrooms	**Remote Zone Extract**			
Lighting	**70.0 Lm/W**		**90.0 Lm/W, D/L Dimming**	
Control	**Occup Senors**		**Shenton T50 Micro-CHP Unit (Std)**	
Renewables	**None**			**20.0 m2 P.V.**
Air Tightness	**10 $m^3/hr/m^2$**	**5.0**		
Electrical Power Factor	**<0.9**		**>0.95**	
Lighting Metering Prov?	**No**		**Yes**	
Lighting Out-of range Warning?	**No**		**Yes**	
BER	**31.5**	**30.3**	**17.9**	**17.6**
		Impmnt. 4%	**Impmnt. 43%**	**Impmnt. 44%**

Without CHP	**27.9**
	11%

CHP Technical Data Sheet for

T50 Natural Gas Indoor Canopy

Micro Series

Power Therm

The Micro series benefits from having Tedom's own built in-house high performance gas engines. Available to run on a variety of gas fuels. Multiple units can be run in synch, and high-end digital controllers make synchronising with the mains simple.

Standard Features

- High performance electrical efficiency
- Fully modulating output
- Compact footprint indoor canopy
- Sophisticated web remote monitoring
- Digital engine management
- Long service intervals
- 27 month warranty
- Standby power options
- Low noise options

ELECTRICITY OUTPUT	THERMAL OUTPUT	ELECTRIC EFFICIENCY	THERMAL EFFICIENCY	TOTAL EFFICIENCY
48 kWe	91 kWt	32.5 %	61.6 %	94.1 %

shenton**group** has the exclusive distributorship for Tedom products in the UK, Ireland and Channel Islands.

We provide dedicated services for CHP projects, ranging from design assistance, through project management, to commissioning and long-life support.

Tedom is a global CHP manufacturer with 600 employees. There are over 2,000 Tedom CHP units in service in over 35 countries worldwide.

t. +44 (0)844 888 444 5 e. info@shentongroup.co.uk www.shentongroup.co.uk
Shenton House, Walworth Road, Walworth Business Park, Andover, SP10 5LH

Micro Series Features

The TEDOM Micro series of CHP units are machines for the combined production heat and power in terms of gas combustion. Basic features of the Micro series of units are: high efficiency, compact design, long life-time of oil filling and service interval. Due to all characteristics mentioned, these products are used as modern power sources for heating small buildings of many types.

According to statement of notified body certificate certifying conformity of Micro series products with requests of directive 2009/142/EC (government regulation no. 22/2003 Col.) was edited. TEDOM is also the holder of QMS and EMS Certificates.

TEDOM CHP Unit Merits:

- Automatic air-fuel ratio control - this method of reducing emissions is in the standard supply of CHP unit.
- CHP units are equipped with digital engine-management which optimises engine operation.
- CHP units form easily connect-able compact complex.
- By use of acoustic enclosure, CHP units are characterized by low noise output.
- Ability to adapt to different temperature gradients of heating systems.
- Due to modular arrangement of control system, the number of binary and analogue inputs for monitoring and controlling following devices can be extended easily.
- Basic signals for CHP unit control (external emergency stop, external start, etc) can be connected to the customer's terminal box.
- Units are functionally tested for operation in production plant.
- TEDOM CHP units are continuously innovated from the knowledge of previous projects.

Design	Sound Enclosure
Operation	SP - synchronous, parallel with mains
Fuel	Natural gas

Basic Technical Data

Design	Standard	With Condenser
Electrical output	48 kW	48 kW
Heat output	91 kW	106.8 kW
Fuel input	148 kW	148 kW
Electrical efficiency	32.5 %	32.5 %
Heat efficiency	61.6 %	72.2 %
Total efficiency (fuel use)	94.1 %	104.7 %(1)
Fuel consumption at 100% output	15.6 m^3/h	15.6 m^3/h
Fuel consumption at 75% output	12.6 m^3/h	12.6 m^3/h
Fuel consumption at 50% output	9.5 m^3/h	9.5 m^3/h

Basic technical data above is valid for standard conditions according to the 'Technical Instructions' document.

The minimum permanent electric output is 50% of nominal output.

Gas consumption is expressed under standard conditions (15°C, 101,325 kPa).

Technical data is specified for temperatures 65/85°C.

(1) Valid for return water temperature 35°C.

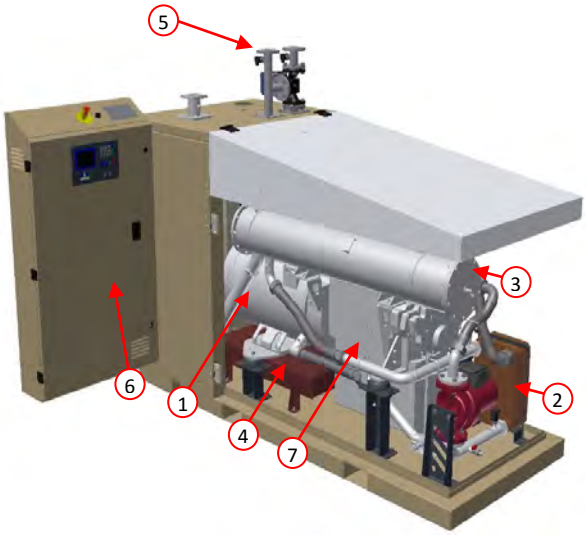
Emissions

Emissions	CO	NO_x
At 5% of O_2 in exhaust gas	300 mg/Nm^3	95 mg/Nm^3

Orientation Description of CHP Unit

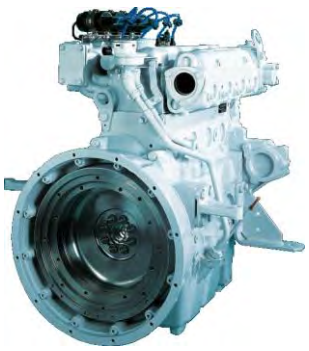
The unit consists of engine-generator set, complete heat equipment, including electro switchboard enabling parallel operation with mains 400V/50Hz. All parts are built in noise silencing enclosure. Warm-water circuits are designed for temperature gradient 70/90°C as standard.

1. Generator
2. Plate heat exchanger
3. Exhaust gas exchanger
4. Oil tank
5. Connecting points (see last page)
6. Electric switchboard
7. Combustion engine



Engine

Model	E0834 E302
Manufacturer	MAN
Number of cylinders	4
Arrangement of cylinders	In Line
Bore × stroke	108 × 125 mm
Displacement	4580 cm^3
Compression ratio	13 : 1
Speed	1500 rpm
Oil consumption normal / maximum	1.4 g/kWh
Maximum output of engine	54 kW



Illustrative picture

Generator

Type	Synchronous
Model	ATEW 34/4 1L
Manufacturer	Zanardi
Generator output	56 kW / 70 kVA
Cos φ	1.0 / 0.8
Efficiency in working point	92.8 %
Voltage	400 V
Frequency	50 Hz

Heating System

Heating system of CHP unit is formed in view of heat output transfer (heat gained by cooling of engine and exhaust gas) by hydraulic circuit, from which heat from unit is transferred to heating system of user. Unit enables operation by different temperatures. Heating system of the unit is equipped with circuit pump.

Parameters of Hydraulic Circuit:

Heating output of circuit	91 kW
Nominal flow rate	66 l/min
Maximum working pressure	600 kPa
Water volume in CHP unit circuit	28 litres
Pressure loss at nominal flow rate(1)	35 kPa
Pressure reserve at nominal flow rate(2)	80 kPa
Maximum temperature of return water	70 °C
Minimum allowed temperature of return water	40 °C
Nominal temperature drop	20 °C

(1) If the circuit pump is not used.

(2) If the circuit pump is used.

If it is not possible to use heat produced by the unit, this output or its part can be removed by cooling unit for emergency cooling, which can be also supplied.

Fuel & Gas Inlet

Fuel type	Natural Gas
Heat value	34 MJ/m^3
Minimum methane number	80
Gas pressure	2- 10 kPa
Maximum pressure change under varying consumption	10 %
Maximum gas temperature	30 °C

Gas line of the unit is constructed in conformity to TPG 811 01 and contains gas filter and combined gas armature, which fulfil following functions:

- Double quick-closing electromagnetic valve for gas Inlet closing at unit stop.
- Gas pressure regulation suitable for mixing.
- Elastic connection by metal hose with mixer of engine.

For correct operation of CHP unit, gas connection of suitable size and with adequate accumulation volume is required as a protection against gas pressure drop in system after abrupt changes in consumption. Gas connection must be equipped with hand valve and manometer.

Combustion Air & Exhaust Gas Outlet

Combustion air is sucked from surroundings through cold space of the unit. The exhaust gases are removed from unit by the exhaust piping (duct system) connected on the CHP unit flange. Exhaust piping from unit flange to chimney uptake has to be tight. The piping must be down-grade in the direction from the CHP unit. Eventually, the condensate, which could arise at CHP unit operation is evaporated and blow-off together with exhaust gases. Material of exhaust piping and heat insulation of duct system in plant room must be resistant to temperatures up to 200°C at least. Maximum pressure loss of whole duct system must not exceed 10 mbar. Machine construction does not require any forced air ventilation.

Quantity of combustion air	150 Nm^3/h
Requested temperature of combustion air	10 - 35 °C
Exhaust gas temperature nominal / max	110 / 140 °C
Maximum back-pressure of exhaust gas behind flange	10 mbar
Quantity of exhaust gas	164 Nm^3/h

Heating water in hydraulic circuit must be modified, its composition must be according to the 'Technical Instructions' document.

Noise Parameters

Quantity of lubricating oil in engine	50 litres
Volume of oil tank	60 litres
Quantity of cooling liquid in primary circuit	16 litres

Noise Parameters

Noise parameters specify the acoustic pressure level measured in free field conditions. Determination of measuring point and method of evaluation comply with ČSN 09 0862. The noise contains the tone element with a frequency of 50 Hz.

CHP unit 1m from sound enclosure	65 dB(A)
Exhaust gas outlet 1m from flange	62 dB(A)

Colour Design

Engine, generator, internal parts of unit, frame and oil tank	RAL 7035 (White)
Sound enclosure	RAL 1001, 1013 (Beige)

Dimensions & Weight Information

Dimensions vary depending on optional extras included. Please see GA drawing for full details.

Length (standard design)	2400 mm
Width (total with switchboard)	1780 mm
Height	1730 mm
Transport weight	1800 Kg

Additional Documents

- Dimension drawing: Micro T50 GA Drawing_R1243C.
- P&ID: Micro T50 P&ID_S0713A.
- Generally binding source materials according to the 'Technical Instructions' document.

Scope of Delivery

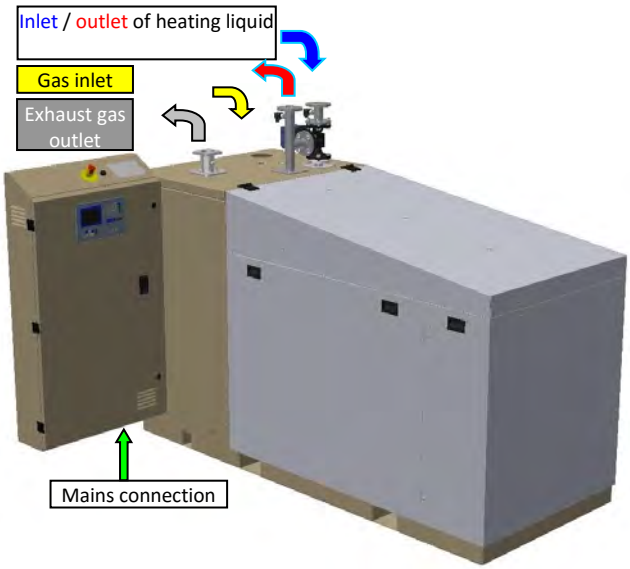
Standard

- Complete module of CHP unit.

Out of Standard Range

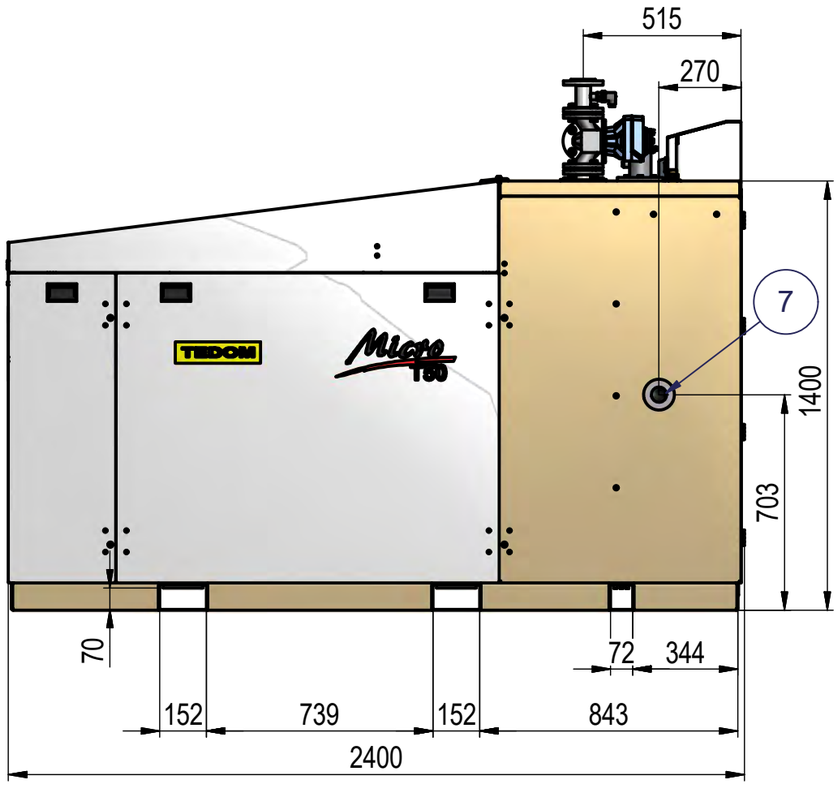
- Cooling unit for emergency cooling.
- Additional exhaust silencer.

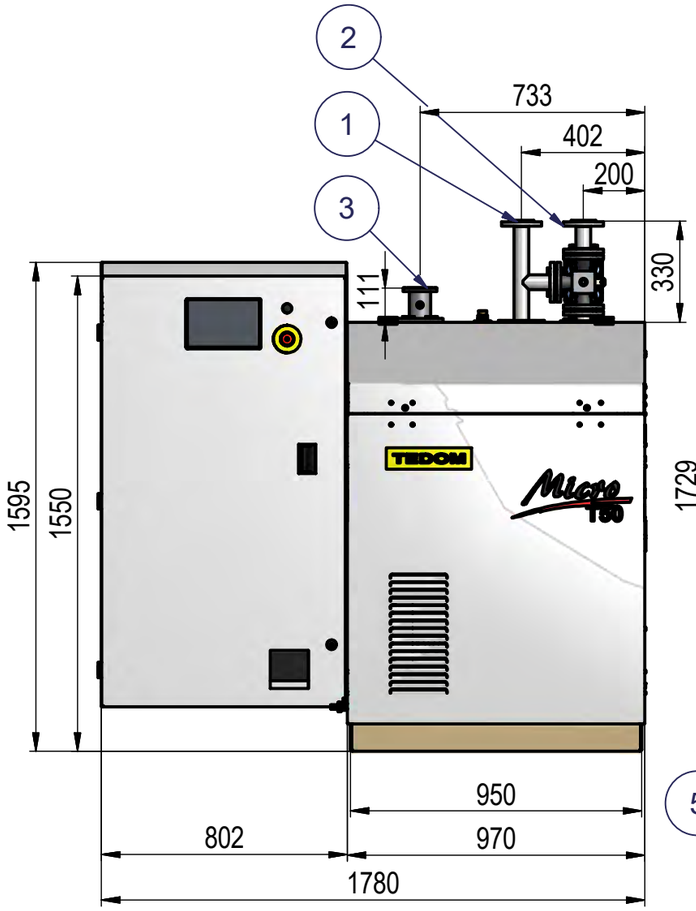
Connecting Points

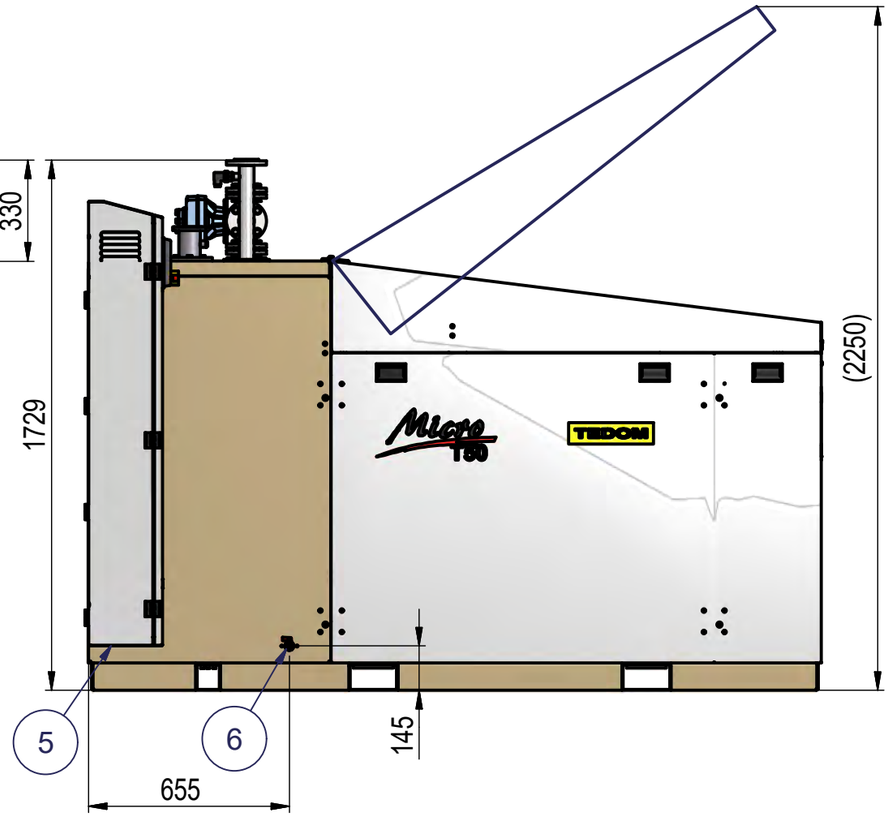


Amendments

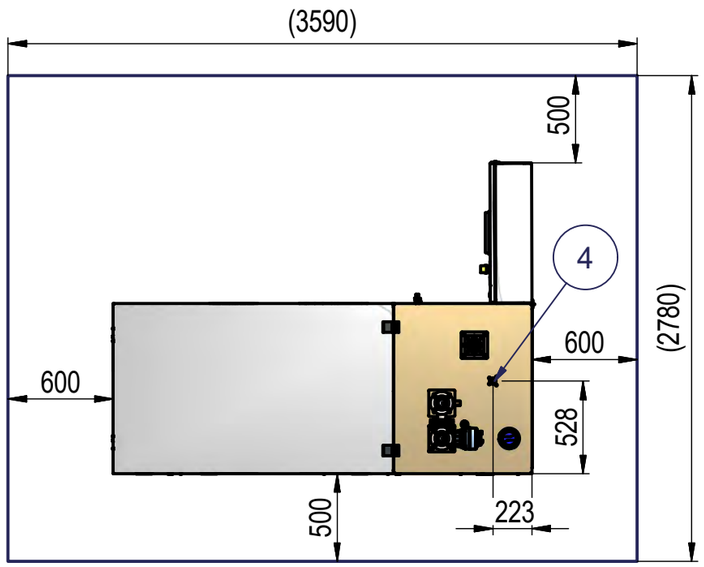
Due to our policy of continual improvement, we reserve the privilege to change this document and consequential documents without notice.

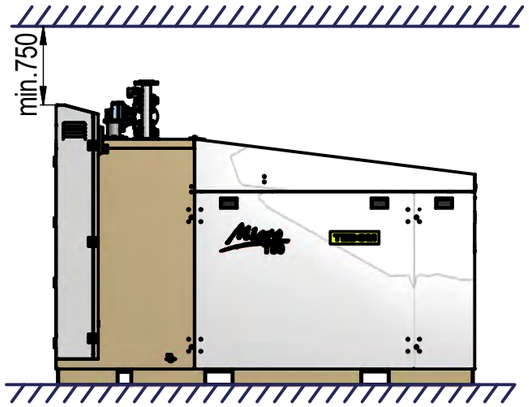


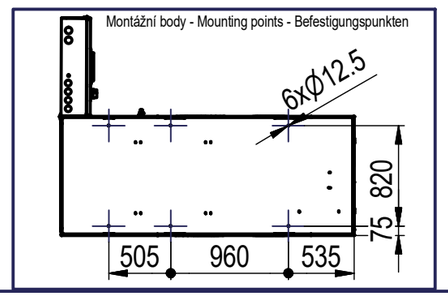




OBSLUŽNÉ PROSTORY - SERVICE SPACES - BEDIENUNGSRAUM







Přepravní rozměry / Transport dimensions 980x2650x1730

Navržená čerpadla SO / The proposed pump SO / Die vorgeschlange Pumpe SO			
Typ čerpadla / Type of pump / Pumpentyp			
MAGNA1 40 - 120			
Připojovací místa / Connecting points / Anschlussstellen			
1	Sekundární výstup vody Příruba DN40 PN6	Secondary water - outlet Flange DN40 PN6	Sekundärwasser - Vorlauf Flansche DN40 PN6
2	Sekundární vstup vody Příruba DN40 PN6	Secondary water - inlet Flange DN40 PN6	Sekundärwasser - Rücklauf Flansche DN40 PN6
3	Výstup spalin Příruba 78x78 D.11 / DN65	Exhaust gas - outlet Flange 78x78 D.11 / DN65	Abgasflash Flansche 78x78 D.11 / DN65
4	Přívod plynu Vnitřní závit G3/4"	Gas inlet Internal thread G3/4"	Gasanschluss Innengewinde G3/4"
5	Kabelový vstup Průchodky Pg29, Pg21	Cable inlet Bushing Pg29, Pg21	Kabeleingang Durchführung Pg29, Pg21
6	Odvod kondenzátu Kulový kohout G1/2"	Condensate - outlet Ball Valve G1/2"	Kondensatablauf Kugelhahn G1/2"
7	Vstup sání	Air inlet	Ansaugrohr

TEDOM	projekt / project STANDARD	provedení / design SP/NG	datum / date 17/10/2013	list / page 1/1
výrobek / product **Kogenerační jednotka** **Combine Heat and Power Unit**		typ / type **MICRO T50**	výk.č. / DRG No. **R1243**	rev. **C**

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Panda House BASE

As designed

Date: Tue Sep 27 17:08:51 2016

Administrative information

Building Details

Address: 628 Commercial Road, LONDON, E14 7HS

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.6

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.6

BRUKL compliance check version: v5.2.g.3

Owner Details

Name: Capulet Properties

Telephone number: ---

Address: ---, ---, ---

Certifier details

Name: MES Building Solutions

Telephone number: 01636 653 055

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

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	48.5
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	48.5
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	48.4
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 the building services should achieve reasonable overall standards of energy efficiency

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

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.26	0.26	LW00000F:Surf[7]
Floor	0.25	0.22	0.22	LW000001:Surf[0]
Roof	0.25	0.18	0.18	LW000001:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.6	1.6	LW00000F:Surf[1]
Personnel doors	2.2	2.2	2.2	GN00001C: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

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

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

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	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- LPHW NG NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	0.02	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

2- LPHW NG Mech Vent

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	0.02	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

"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		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
LwGnd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
LwGnd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
LwGnd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
LwGnd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
LwGnd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
LwGnd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
LwGnd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
LwGnd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
LwGnd_Communal Kitchen Prep	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	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
Gnd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Communal Kitchen Prep	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Accessible Toilet	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Comnunal Kitchen Prep	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
2nd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
2nd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
2nd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
2nd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
2nd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
2nd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
2nd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
2nd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
2nd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
2nd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Communal Kitchen Prep	-	-	0.5	-	-	-	-	-	-	-	N/A
2nd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
2nd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
2nd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
2nd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
3rd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
3rd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
3rd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
3rd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	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
3rd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Communal Kitchen Prep	-	-	0.5	-	-	-	-	-	-	-	N/A
3rd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
3rd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
3rd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
3rd_Bedrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
3rd_Bedrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
3rd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
3rd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
3rd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
3rd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
4th_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
4th_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
4th_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
4th_Communal Kitchen Prep	-	-	0.5	-	-	-	-	-	-	-	N/A
4th_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
4th_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
4th_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
4th_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
4th_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
4th_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
5th_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
5th_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
5th_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
5th_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
5th_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
5th_Communal Kitchen Prep	-	-	0.5	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
LwGnd_Plant Rooms	70	-	-	440
LwGnd_Cupboard	70	-	-	2
LwGnd_Cupboard	70	-	-	4
LwGnd_Cupboard	70	-	-	4
LwGnd_Cupboard	70	-	-	2
LwGnd_Cupboard	70	-	-	2
LwGnd_Cupboard	70	-	-	4
LwGnd_Cupboard	70	-	-	4
LwGnd_Cupbard	70	-	-	2
LwGnd_Bathroom	-	70	-	28
LwGnd_Bathrooms	-	70	-	44
LwGnd_Bathrooms	-	70	-	44

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
LwGnd_Bedrooms	-	70	-	249
LwGnd_Bathroom	-	70	-	28
LwGnd_Bathroom	-	70	-	27
LwGnd_Bathrooms	-	70	-	43
LwGnd_Bathrooms	-	70	-	43
LwGnd_Bedrooms	-	70	-	246
LwGnd_Bathroom	-	70	-	27
LwGnd_Comms Room	70	-	-	52
LwGnd_Laundry	-	70	-	81
LwGnd_Stairs	-	70	-	86
LwGnd_Communal Kitchen Prep	-	70	-	103
Gnd_Cupboard	70	-	-	2
Gnd_Cupboard	70	-	-	2
Gnd_Cupboard	70	-	-	4
Gnd_Cupboard	70	-	-	4
Gnd_Cupboard	70	-	-	2
Gnd_Cupboard	70	-	-	3
Gnd_Cupboard	70	-	-	2
Gnd_Cupboard	70	-	-	4
Gnd_Cupboard	70	-	-	4
Gnd_Cupboard	70	-	-	4
Gnd_Cupboard	70	-	-	3
Gnd_Bathroom	-	70	-	31
Gnd_Bathroom	-	70	-	28
Gnd_Bathrooms	-	70	-	44
Gnd_Bathrooms	-	70	-	44
Gnd_Bathrooms	-	70	-	43
Gnd_Bathroom	-	70	-	29
Gnd_Bedrooms	-	70	-	372
Gnd_Bathroom	-	70	-	31
Gnd_Bathroom	-	70	-	27
Gnd_Bathrooms	-	70	-	43
Gnd_Bathrooms	-	70	-	43
Gnd_Bedrooms	-	70	-	244
Gnd_Staff Office	70	-	-	123
Gnd_Reception	70	-	-	178
Gnd_Stairs	-	70	-	86
Gnd_Communal Kitchen Prep	-	70	-	103
Gnd_Post Room	70	-	-	102
Gnd_Comms Room	70	-	-	52
Gnd_Accessible Toilet	-	70	-	53
Gnd_Laundry	-	70	-	81
Gnd_Corridor	-	70	-	279

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
LwGnd_Corridor	-	70	-	249
1st_Cupboard	70	-	-	2
1st_Cupboard	70	-	-	2
1st_Cupboard	70	-	-	4
1st_Cupboard	70	-	-	4
1st_Cupboard	70	-	-	2
1st_Cupboard	70	-	-	3
1st_Cupboard	70	-	-	2
1st_Cupboard	70	-	-	4
1st_Cupboard	70	-	-	4
1st_Cupboard	70	-	-	4
1st_Cupboard	70	-	-	3
1st_Bathroom	-	70	-	31
1st_Bathroom	-	70	-	28
1st_Bathrooms	-	70	-	44
1st_Bathrooms	-	70	-	44
1st_Bathrooms	-	70	-	43
1st_Bathroom	-	70	-	29
1st_Bathroom	-	70	-	372
1st_Bathroom	-	70	-	31
1st_Bathroom	-	70	-	27
1st_Bathrooms	-	70	-	43
1st_Bathrooms	-	70	-	43
1st_Stairs	-	70	-	86
1st_Comnunal Kitchen Prep	-	70	-	103
1st_Comms Room	70	-	-	52
1st_Laundry	-	70	-	81
1st_Bathroom	-	70	-	27
1st_Bedrooms	-	70	-	283
1st_Bathroom	-	70	-	39
1st_Accessible Bedroom	-	70	-	49
1st_Bathroom	-	70	-	41
2nd_Cupboard	70	-	-	2
2nd_Cupboard	70	-	-	2
2nd_Cupboard	70	-	-	4
2nd_Cupboard	70	-	-	4
2nd_Cupboard	70	-	-	3
2nd_Cupboard	70	-	-	2
2nd_Cupboard	70	-	-	4
2nd_Cupboard	70	-	-	4
2nd_Cupboard	70	-	-	4
2nd_Cupboard	70	-	-	3
2nd_Bathroom	-	70	-	31

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
2nd_Bathroom	-	70	-	28
2nd_Bathrooms	-	70	-	44
2nd_Bathrooms	-	70	-	44
2nd_Bathrooms	-	70	-	43
2nd_Bathroom	-	70	-	29
2nd_Bathroom	-	70	-	372
2nd_Bathroom	-	70	-	31
2nd_Bathroom	-	70	-	27
2nd_Bathrooms	-	70	-	43
2nd_Bathrooms	-	70	-	43
2nd_Stairs	-	70	-	86
1st_Communal Kitchen Prep	-	70	-	103
2nd_Comms Room	70	-	-	52
2nd_Laundry	-	70	-	81
2nd_Bathroom	-	70	-	27
2nd_Bathroom	-	70	-	39
2nd_Accessible Bedroom	-	70	-	49
2nd_Bathroom	-	70	-	41
1st_Corridor	-	70	-	303
2nd_Corridor	-	70	-	303
2nd_Cupboard	70	-	-	4
2nd_Bathroom	-	70	-	27
2nd_Bedrooms	-	70	-	323
3rd_Cupboard	70	-	-	2
3rd_Cupboard	70	-	-	2
3rd_Cupboard	70	-	-	4
3rd_Cupboard	70	-	-	3
3rd_Cupboard	70	-	-	3
3rd_Bathroom	-	70	-	31
3rd_Bathroom	-	70	-	29
3rd_Bathroom	-	70	-	31
3rd_Bathroom	-	70	-	27
3rd_Bathrooms	-	70	-	43
3rd_Stairs	-	70	-	86
1st_Communal Kitchen Prep	-	70	-	103
3rd_Comms Room	70	-	-	52
3rd_Laundry	-	70	-	81
3rd_Bathroom	-	70	-	39
3rd_Accessible Bedroom	-	70	-	49
3rd_Bathroom	-	70	-	41
3rd_Cupboard	70	-	-	2
3rd_Cupboard	70	-	-	2
3rd_Cupboard	70	-	-	4

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
3rd_Cupboard	70	-	-	2
3rd_Bathroom	-	70	-	28
3rd_Cupboard	70	-	-	2
3rd_Cupboard	70	-	-	4
3rd_Bedrooms	-	70	-	27
3rd_Bedrooms	-	70	-	42
3rd_Bedrooms	-	70	-	274
3rd_Bathroom	-	70	-	28
3rd_Bathrooms	-	70	-	44
3rd_Bathroom	-	70	-	28
3rd_Bedrooms	-	70	-	277
3rd_Bathroom	-	70	-	24
4th_Cupboard	70	-	-	2
4th_Cupboard	70	-	-	2
4th_Cupboard	70	-	-	4
4th_Bathroom	-	70	-	31
4th_Bathroom	-	70	-	27
4th_Bathrooms	-	70	-	43
4th_Stairs	-	70	-	86
4th_Communal Kitchen Prep	-	70	-	103
4th_Comms Room	70	-	-	52
4th_Laundry	-	70	-	81
4th_Bathroom	-	70	-	39
4th_Accessible Bedroom	-	70	-	49
4th_Bathroom	-	70	-	41
4th_Cupboard	70	-	-	4
4th_Cupboard	70	-	-	2
4th_Cupboard	70	-	-	4
4th_Bathrooms	-	70	-	43
4th_Bathroom	-	70	-	28
4th_Bathrooms	-	70	-	44
4th_Bedrooms	-	70	-	199
4th_Cupboard	70	-	-	4
4th_Bedrooms	-	70	-	239
4th_Bathrooms	-	70	-	43
4th_Corridor	-	70	-	127
4th_Corridor	-	70	-	192
5th_Laundry	-	70	-	81
5th_Bathroom	-	70	-	39
5th_Cupboard	70	-	-	4
5th_Cupboard	70	-	-	2
5th_Cupboard	70	-	-	4
5th_Bathrooms	-	70	-	43

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
5th_Bathroom	-	70	-	28
5th_Bathrooms	-	70	-	44
5th_Bedrooms	-	70	-	199
5th_Accessible Bedroom	-	70	-	48
5th_Comms Room	70	-	-	49
3rd_Corridor	-	70	-	164
3rd_Corridor	-	70	-	161
5th_Bathroom	-	70	-	38
5th_Corridor	-	70	-	190
5th_Stairs	-	70	-	84
5th_Communal Kitchen Prep	-	70	-	102
Gnd_Entrance Hall	-	70	-	112
5th_Communal Kitchen Eat	-	70	-	71
5th_Lobby	-	70	-	20
4th_Communal Kitchen Eat	-	70	-	71
4th_Lobby	-	70	-	20
3rd_Communal Kitchen Eat	-	70	-	71
3rd_Lobby	-	70	-	20
2nd_Communal Kitchen Eat	-	70	-	71
2nd_Lobby	-	70	-	20
Gnd_Communal Kitchen Eat	-	70	-	71
Gnd_Lobby	-	70	-	20
Gnd_Comnunal Kitchen Eat	-	70	-	71
Gnd_Lobby	-	70	-	20
LwGnd_Communal Kitchen Eat	-	70	-	71
LwGnd_Lobby	-	70	-	20

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?
LwGnd_Bedrooms	NO (-58%)	NO
LwGnd_Bedrooms	NO (-74.7%)	NO
Gnd_Bedrooms	NO (-50%)	NO
Gnd_Bedrooms	NO (-62.9%)	NO
Gnd_Staff Office	N/A	N/A
Gnd_Reception	N/A	N/A
Gnd_Post Room	N/A	N/A
1st_Bathroom	NO (-50%)	NO
1st_Bedrooms	NO (-61.9%)	NO
1st_Accessible Bedroom	NO (-42%)	NO
2nd_Bathroom	NO (-50%)	NO
2nd_Accessible Bedroom	NO (-42%)	NO
2nd_Bedrooms	NO (-68.9%)	NO
3rd_Accessible Bedroom	NO (-41.9%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
3rd_Bedrooms	NO (-73.1%)	NO
3rd_Bedrooms	NO (-56.5%)	NO
4th_Accessible Bedroom	NO (-41.6%)	NO
4th_Bedrooms	YES (+39.3%)	NO
4th_Bedrooms	NO (-28%)	NO
5th_Bedrooms	YES (+40.1%)	NO
5th_Accessible Bedroom	NO (-54.2%)	NO
5th_Communal Kitchen Eat	N/A	N/A
4th_Communal Kitchen Eat	N/A	N/A
3rd_Communal Kitchen Eat	N/A	N/A
2nd_Communal Kitchen Eat	N/A	N/A
Gnd_Communal Kitchen Eat	N/A	N/A
Gnd_Comnunal Kitchen Eat	N/A	N/A
LwGnd_Communal Kitchen Eat	N/A	N/A

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

Were alternative energy systems considered and analysed as part of the design process?	NO
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 [m²]	3913.8	3913.8
External area [m²]	3488.3	3488.3
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	10	3
Average conductance [W/K]	1873.83	0
Average U-value [W/m²K]	0.54	0
Alpha value* [%]	10.01	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
1	**B1 Offices and Workshop businesses**
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Inst.: Hospitals and Care Homes
	C2 Residential Inst.: Residential schools
99	**C2 Residential Inst.: Universities and colleges**
	C2A Secure Residential Inst.
	Residential spaces
	D1 Non-residential Inst.: Community/Day Centre
	D1 Non-residential Inst.: Libraries, Museums, and Galleries
	D1 Non-residential Inst.: Education
	D1 Non-residential Inst.: Primary Health Care Building
	D1 Non-residential Inst.: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others - Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	63.87	63.92
Cooling	0	0
Auxiliary	3.54	1.91
Lighting	8.36	13.3
Hot water	131.73	125.14
Equipment*	25.95	25.95
TOTAL**	**207.5**	**204.28**

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

Energy Production by Technology [kWh/m²]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	186.69	198.39
Primary energy* [kWh/m²]	275.18	276.19
Total emissions [kg/m²]	48.4	48.5

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	118	0	40.4	0	3	0.81	0	0.91	0
	Notional	107.7	0	34.7	0	1.4	0.86	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	769.6	0	263.3	0	8.1	0.81	0	0.91	0
	Notional	968.4	0	312	0	6	0.86	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/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = 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 BCO can give particular attention to items with specifications that are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.22	LW000001:Surf[2]
Floor	0.2	0.22	LW000001:Surf[0]
Roof	0.15	0.18	LW000001:Surf[1]
Windows, roof windows, and rooflights	1.5	1.6	LW00000F:Surf[1]
Personnel doors	1.5	2.2	GN00001C: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

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

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

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	10

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Panda House THREE

As designed

Date: Fri Oct 14 10:52:27 2016

Administrative information

Building Details

Address: 628 Commercial Road, LONDON, E14 7HS

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.6

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.6

BRUKL compliance check version: v5.2.g.3

Owner Details

Name: Capulet Properties

Telephone number: ---

Address: ---, ---, ---

Certifier details

Name: MES Building Solutions

Telephone number: 01636 653 055

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

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	48.5
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	48.5
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	28.3
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 the building services should achieve reasonable overall standards of energy efficiency

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

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.2	0.2	LW00000F:Surf[7]
Floor	0.25	0.16	0.16	LW000001:Surf[0]
Roof	0.25	0.16	0.16	LW000001:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.4	1.4	LW00000F:Surf[1]
Personnel doors	2.2	0.15	0.15	GN00001C: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

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	5

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- LPHW NG NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.95	-	0.02	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

2- LPHW NG Mech Vent

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.95	-	0.02	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

1- LPHW NG NV

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.95	-
Standard value	0.8	N/A

2- LPHW NG Mech Vent

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.95	-
Standard value	0.8	N/A

1- CHECK2-CHP

	CHPQA quality index	CHP electrical efficiency
This building	0	0.33
Standard value	Not provided	N/A

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		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
LwGnd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	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
LwGnd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
LwGnd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
LwGnd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
LwGnd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
LwGnd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
LwGnd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
LwGnd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
LwGnd_Communal Kitchen Prep	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Communal Kitchen Prep	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Accessible Toilet	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Comnunal Kitchen Prep	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
2nd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
2nd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
2nd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
2nd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
2nd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
2nd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
2nd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
2nd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
2nd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	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
2nd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Communal Kitchen Prep	-	-	0.5	-	-	-	-	-	-	-	N/A
2nd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
2nd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
2nd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
2nd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
3rd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
3rd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
3rd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
3rd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
3rd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Communal Kitchen Prep	-	-	0.5	-	-	-	-	-	-	-	N/A
3rd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
3rd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
3rd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
3rd_Bedrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
3rd_Bedrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
3rd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
3rd_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
3rd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
3rd_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
4th_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
4th_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
4th_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
4th_Communal Kitchen Prep	-	-	0.5	-	-	-	-	-	-	-	N/A
4th_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
4th_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
4th_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
4th_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
4th_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
4th_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
5th_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
5th_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
5th_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
5th_Bathrooms	-	-	0.5	-	-	-	-	-	-	-	N/A
5th_Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
5th_Communal Kitchen Prep	-	-	0.5	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
LwGnd_Plant Rooms	90	-	-	342
LwGnd_Cupboard	90	-	-	2

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
LwGnd_Cupboard	90	-	-	3
LwGnd_Cupboard	90	-	-	3
LwGnd_Cupboard	90	-	-	2
LwGnd_Cupboard	90	-	-	2
LwGnd_Cupboard	90	-	-	3
LwGnd_Cupboard	90	-	-	3
LwGnd_Cupbard	90	-	-	2
LwGnd_Bathroom	-	90	-	22
LwGnd_Bathrooms	-	90	-	34
LwGnd_Bathrooms	-	90	-	34
LwGnd_Bedrooms	-	90	-	194
LwGnd_Bathroom	-	90	-	22
LwGnd_Bathroom	-	90	-	21
LwGnd_Bathrooms	-	90	-	33
LwGnd_Bathrooms	-	90	-	33
LwGnd_Bedrooms	-	90	-	191
LwGnd_Bathroom	-	90	-	21
LwGnd_Comms Room	90	-	-	40
LwGnd_Laundry	-	90	-	63
LwGnd_Stairs	-	90	-	67
LwGnd_Communal Kitchen Prep	-	90	-	80
Gnd_Cupboard	90	-	-	2
Gnd_Cupboard	90	-	-	2
Gnd_Cupboard	90	-	-	3
Gnd_Cupboard	90	-	-	3
Gnd_Cupboard	90	-	-	2
Gnd_Cupboard	90	-	-	2
Gnd_Cupboard	90	-	-	2
Gnd_Cupboard	90	-	-	3
Gnd_Cupboard	90	-	-	3
Gnd_Cupboard	90	-	-	3
Gnd_Cupboard	90	-	-	2
Gnd_Bathroom	-	90	-	24
Gnd_Bathroom	-	90	-	22
Gnd_Bathrooms	-	90	-	34
Gnd_Bathrooms	-	90	-	34
Gnd_Bathrooms	-	90	-	34
Gnd_Bathroom	-	90	-	22
Gnd_Bedrooms	-	90	-	289
Gnd_Bathroom	-	90	-	24
Gnd_Bathroom	-	90	-	21
Gnd_Bathrooms	-	90	-	33
Gnd_Bathrooms	-	90	-	33

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
Gnd_Bedrooms	-	90	-	190
Gnd_Staff Office	90	-	-	96
Gnd_Reception	90	-	-	138
Gnd_Stairs	-	90	-	67
Gnd_Communal Kitchen Prep	-	90	-	80
Gnd_Post Room	90	-	-	80
Gnd_Comms Room	90	-	-	40
Gnd_Accessible Toilet	-	90	-	41
Gnd_Laundry	-	90	-	63
Gnd_Corridor	-	90	-	217
LwGnd_Corridor	-	90	-	194
1st_Cupboard	90	-	-	2
1st_Cupboard	90	-	-	2
1st_Cupboard	90	-	-	3
1st_Cupboard	90	-	-	3
1st_Cupboard	90	-	-	2
1st_Cupboard	90	-	-	2
1st_Cupboard	90	-	-	2
1st_Cupboard	90	-	-	3
1st_Cupboard	90	-	-	3
1st_Cupboard	90	-	-	3
1st_Cupboard	90	-	-	2
1st_Bathroom	-	90	-	24
1st_Bathroom	-	90	-	22
1st_Bathrooms	-	90	-	34
1st_Bathrooms	-	90	-	34
1st_Bathrooms	-	90	-	34
1st_Bathroom	-	90	-	22
1st_Bathroom	-	90	-	289
1st_Bathroom	-	90	-	24
1st_Bathroom	-	90	-	21
1st_Bathrooms	-	90	-	33
1st_Bathrooms	-	90	-	33
1st_Stairs	-	90	-	67
1st_Comnunal Kitchen Prep	-	90	-	80
1st_Comms Room	90	-	-	40
1st_Laundry	-	90	-	63
1st_Bathroom	-	90	-	21
1st_Bedrooms	-	90	-	220
1st_Bathroom	-	90	-	30
1st_Accessible Bedroom	-	90	-	38
1st_Bathroom	-	90	-	32
2nd_Cupboard	90	-	-	2

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
2nd_Cupboard	90	-	-	2
2nd_Cupboard	90	-	-	3
2nd_Cupboard	90	-	-	3
2nd_Cupboard	90	-	-	2
2nd_Cupboard	90	-	-	2
2nd_Cupboard	90	-	-	3
2nd_Cupboard	90	-	-	3
2nd_Cupboard	90	-	-	3
2nd_Cupboard	90	-	-	2
2nd_Bathroom	-	90	-	24
2nd_Bathroom	-	90	-	22
2nd_Bathrooms	-	90	-	34
2nd_Bathrooms	-	90	-	34
2nd_Bathrooms	-	90	-	34
2nd_Bathroom	-	90	-	22
2nd_Bathroom	-	90	-	289
2nd_Bathroom	-	90	-	24
2nd_Bathroom	-	90	-	21
2nd_Bathrooms	-	90	-	33
2nd_Bathrooms	-	90	-	33
2nd_Stairs	-	90	-	67
1st_Communal Kitchen Prep	-	90	-	80
2nd_Comms Room	90	-	-	40
2nd_Laundry	-	90	-	63
2nd_Bathroom	-	90	-	21
2nd_Bathroom	-	90	-	30
2nd_Accessible Bedroom	-	90	-	38
2nd_Bathroom	-	90	-	32
1st_Corridor	-	90	-	236
2nd_Corridor	-	90	-	236
2nd_Cupboard	90	-	-	3
2nd_Bathroom	-	90	-	21
2nd_Bedrooms	-	90	-	252
3rd_Cupboard	90	-	-	2
3rd_Cupboard	90	-	-	2
3rd_Cupboard	90	-	-	3
3rd_Cupboard	90	-	-	2
3rd_Cupboard	90	-	-	2
3rd_Bathroom	-	90	-	24
3rd_Bathroom	-	90	-	22
3rd_Bathroom	-	90	-	24
3rd_Bathroom	-	90	-	21
3rd_Bathrooms	-	90	-	33

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
3rd_Stairs	-	90	-	67
1st_Communal Kitchen Prep	-	90	-	80
3rd_Comms Room	90	-	-	40
3rd_Laundry	-	90	-	63
3rd_Bathroom	-	90	-	30
3rd_Accessible Bedroom	-	90	-	38
3rd_Bathroom	-	90	-	32
3rd_Cupboard	90	-	-	2
3rd_Cupboard	90	-	-	2
3rd_Cupboard	90	-	-	3
3rd_Cupboard	90	-	-	2
3rd_Bathroom	-	90	-	21
3rd_Cupboard	90	-	-	2
3rd_Cupboard	90	-	-	3
3rd_Bedrooms	-	90	-	21
3rd_Bedrooms	-	90	-	33
3rd_Bedrooms	-	90	-	213
3rd_Bathroom	-	90	-	21
3rd_Bathrooms	-	90	-	34
3rd_Bathroom	-	90	-	21
3rd_Bedrooms	-	90	-	216
3rd_Bathroom	-	90	-	18
4th_Cupboard	90	-	-	2
4th_Cupboard	90	-	-	2
4th_Cupboard	90	-	-	3
4th_Bathroom	-	90	-	24
4th_Bathroom	-	90	-	21
4th_Bathrooms	-	90	-	33
4th_Stairs	-	90	-	67
4th_Communal Kitchen Prep	-	90	-	80
4th_Comms Room	90	-	-	40
4th_Laundry	-	90	-	63
4th_Bathroom	-	90	-	30
4th_Accessible Bedroom	-	90	-	38
4th_Bathroom	-	90	-	32
4th_Cupboard	90	-	-	3
4th_Cupboard	90	-	-	2
4th_Cupboard	90	-	-	3
4th_Bathrooms	-	90	-	34
4th_Bathroom	-	90	-	21
4th_Bathrooms	-	90	-	34
4th_Bedrooms	-	90	-	155
4th_Cupboard	90	-	-	3

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
4th_Bedrooms	-	90	-	186
4th_Bathrooms	-	90	-	33
4th_Corridor	-	90	-	99
4th_Corridor	-	90	-	150
5th_Laundry	-	90	-	63
5th_Bathroom	-	90	-	30
5th_Cupboard	90	-	-	3
5th_Cupboard	90	-	-	2
5th_Cupboard	90	-	-	3
5th_Bathrooms	-	90	-	34
5th_Bathroom	-	90	-	21
5th_Bathrooms	-	90	-	34
5th_Bedrooms	-	90	-	155
5th_Accessible Bedroom	-	90	-	37
5th_Comms Room	90	-	-	38
3rd_Corridor	-	90	-	128
3rd_Corridor	-	90	-	125
5th_Bathroom	-	90	-	30
5th_Corridor	-	90	-	147
5th_Stairs	-	90	-	65
5th_Communal Kitchen Prep	-	90	-	80
Gnd_Entrance Hall	-	90	-	87
5th_Communal Kitchen Eat	-	90	-	55
5th_Lobby	-	90	-	15
4th_Communal Kitchen Eat	-	90	-	55
4th_Lobby	-	90	-	15
3rd_Communal Kitchen Eat	-	90	-	55
3rd_Lobby	-	90	-	15
2nd_Communal Kitchen Eat	-	90	-	55
2nd_Lobby	-	90	-	15
Gnd_Communal Kitchen Eat	-	90	-	55
Gnd_Lobby	-	90	-	15
Gnd_Comnunal Kitchen Eat	-	90	-	55
Gnd_Lobby	-	90	-	15
LwGnd_Communal Kitchen Eat	-	90	-	55
LwGnd_Lobby	-	90	-	15

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?
LwGnd_Bedrooms	NO (-69.6%)	NO
LwGnd_Bedrooms	NO (-81.6%)	NO
Gnd_Bedrooms	NO (-63.7%)	NO
Gnd_Bedrooms	NO (-73%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Gnd_Staff Office	N/A	N/A
Gnd_Reception	N/A	N/A
Gnd_Post Room	N/A	N/A
1st_Bathroom	NO (-63.7%)	NO
1st_Bedrooms	NO (-72.2%)	NO
1st_Accessible Bedroom	NO (-57.4%)	NO
2nd_Bathroom	NO (-63.7%)	NO
2nd_Accessible Bedroom	NO (-57.3%)	NO
2nd_Bedrooms	NO (-77.3%)	NO
3rd_Accessible Bedroom	NO (-57.3%)	NO
3rd_Bedrooms	NO (-80.4%)	NO
3rd_Bedrooms	NO (-68.5%)	NO
4th_Accessible Bedroom	NO (-57.1%)	NO
4th_Bedrooms	YES (+1.8%)	NO
4th_Bedrooms	NO (-47.3%)	NO
5th_Bedrooms	YES (+2.4%)	NO
5th_Accessible Bedroom	NO (-66.4%)	NO
5th_Communal Kitchen Eat	N/A	N/A
4th_Communal Kitchen Eat	N/A	N/A
3rd_Communal Kitchen Eat	N/A	N/A
2nd_Communal Kitchen Eat	N/A	N/A
Gnd_Communal Kitchen Eat	N/A	N/A
Gnd_Comnunal Kitchen Eat	N/A	N/A
LwGnd_Communal Kitchen Eat	N/A	N/A

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

Were alternative energy systems considered and analysed as part of the design process?	NO
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 [m²]	3913.8	3913.8
External area [m²]	3488.3	3488.3
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	5	3
Average conductance [W/K]	1567.97	1769.47
Average U-value [W/m²K]	0.45	0.51
Alpha value* [%]	6.72	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
1	**B1 Offices and Workshop businesses**
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Inst.: Hospitals and Care Homes
	C2 Residential Inst.: Residential schools
99	**C2 Residential Inst.: Universities and colleges**
	C2A Secure Residential Inst.
	Residential spaces
	D1 Non-residential Inst.: Community/Day Centre
	D1 Non-residential Inst.: Libraries, Museums, and Galleries
	D1 Non-residential Inst.: Education
	D1 Non-residential Inst.: Primary Health Care Building
	D1 Non-residential Inst.: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others - Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	69.01	63.92
Cooling	0	0
Auxiliary	1.94	1.91
Lighting	6.27	13.3
Hot water	167.43	125.14
Equipment*	25.95	25.95
TOTAL**	**193.27**	**204.28**

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0.45	0
Wind turbines	0	0
CHP generators	51.37	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	167.81	198.39
Primary energy* [kWh/m²]	155.31	276.19
Total emissions [kg/m²]	28.3	48.5

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	101.7	0	16	0	1.5	0.85	0	0.95	0
	Notional	107.7	0	34.7	0	1.4	0.86	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	729.4	0	132.7	0	5.7	0.85	0	0.95	0
	Notional	968.4	0	312	0	6	0.86	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/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = 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 BCO can give particular attention to items with specifications that are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.16	LW000001:Surf[2]
Floor	0.2	0.16	LW000001:Surf[0]
Roof	0.15	0.16	LW000001:Surf[1]
Windows, roof windows, and rooflights	1.5	1.4	LW00000F:Surf[1]
Personnel doors	1.5	0.15	GN00001C: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

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

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

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5

GREEN BUILDING RATINGS ONLINE

Criteria Summary

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

Management	Compliance Requirements	Available		Targeted	
		Credits	Percent	Credits	Percent
Man 01: Project brief and design > 1. Project delivery planning	**One credit - Project delivery planning** **1.** 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: **a.** Roles **b.** Responsibilities **c.** Contributions. **2.** Consider each one of the following items when defining roles, responsibilities and contributions for each key phase of the project: **a.** End user requirements **b.** Aims of the design and design strategy **c.** Particular installation and construction requirements or limitations **d.** Occupiers' budget and technical expertise in maintaining any proposed systems **e.** Maintainability and adaptability of the proposals **f.** Operational energy (see Assessment scope) **g.** Requirements for the production of project and end user documentation **h.** Requirements for commissioning, training and aftercare support. 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. **3.** The project team demonstrates how the project delivery stakeholders' contributions and the consultation process outcomes influence the following: **a.** Initial Project Brief **b.** Project Execution Plan (see Definitions) **c.** Communication Strategy (see Definitions) **d.** Concept Design.	1	0.52%	1	0.52%

Man 01: Project brief and design > 2. Stakeholder consultation	**One credit - Stakeholder consultation (interested parties)** **4.** 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). **5.** Demonstrate how the stakeholder contributions and consultation exercise outcomes influence the Initial Project Brief and Concept Design. **6.** Prior to completion of the detailed design (RIBA Stage 4, Technical Design or equivalent), all interested parties (see Definitions) give and receive consultation feedback. **Additionally for Education, Healthcare, Law courts and Major transportation hub building types only:** **7.** 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. **Prerequisite for BREEAM Advisory Professional credits (Concept and Developed Design)** **8.** 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).	1	0.52%	1	0.52%
Man 01: Project brief and design > 3. BREEAM Advisory Professional : BREEAM AP (Concept Design)	**One credit (or one exemplary credit for Simple Buildings) - BREEAM AP (Concept Design)** **9.** Involve a BREEAM AP in the project at an appropriate time and level to: **a.** 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.** Monitor progress against the performance targets (see Definitions on the next page) agreed under criterion 8 throughout all stages after their appointment where	1	0.52%	0	0%

	decisions critically impact BREEAM performance. **c.** Proactively identify risks and opportunities related to the achievement of the targets agreed under criterion 8. **d.** Provide feedback to the project team as appropriate, to support them in taking corrective actions and achieving their agreed performance targets. **e.** Monitor and, where relevant, coordinate the generation of appropriate evidence by the project team.				
Man 01: Project brief and design > 3. BREEAM Advisory Professional : BREEAM AP (Developed Design)	**One credit (or one exemplary credit for Simple Buildings) - BREEAM AP (Developed Design)** **10.** Criteria 8 and 9 are achieved. **11.** Involve the BREEAM AP in the project at an appropriate time and level to: **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. **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. **c.** Proactively identify risks and opportunities related to the achievement of the targets agreed under criterion 8. **d.** Provide feedback to the project team as appropriate, to support them in taking corrective actions and achieving their agreed performance targets. **e.** Monitor and, where relevant, coordinate the generation of appropriate evidence by the project team.	1	0.52%	0	0%
Man 02: Life cycle cost and service life planning > 1. Elemental life cycle cost (LCC)	**Two credits - Elemental LCC** **1.** A competent person (see Definitions) carries out an outline, entire asset LCC plan at Process Stage 2 (equivalent to Concept Design - RIBA Stage 2)	2	1.05%	2	1.05%

	together with any design options appraisals in line with 'Standardised method of life cycle costing for construction procurement' PD 156865: 2008. **2.** The elemental LCC plan: **a.** 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); **b.** Includes service life, maintenance and operation cost estimates. 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). **3.** 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.				
Man 02: Life cycle cost and service life planning > 2. Component level life options appraisal	**One credit - Component level LCC options appraisal** **4.** 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): **a.** Envelope, e.g. cladding, windows, or roofing **b.** Services, e.g. heat source cooling source, or controls **c.** Finishes, e.g. walls, floors or ceilings **d.** External spaces, e.g. alternative hard landscaping, boundary protection. 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.	1	0.52%	1	0.52%

	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	**One credit - Capital cost reporting** **6.** Report the capital cost for the building in pounds per square metre of gross internal floor area (£k/m²) 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	**One credit – Environmental management** **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	**Pre-requisite for the BREEAM AP credit** **5.** The client and the contractor	1	0.52%	0	0%

(Site)	formally agree performance targets. **One credit – BREEAM AP (site)** **6.** Involve a BREEAM AP in the project at an appropriate time and level to: **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. **b.** Monitor construction progress against the performance targets agreed under criterion 5 throughout all stages where decisions critically impact BREEAM performance. **c.** Proactively identify risks and opportunities related to the procurement and construction process and the achievement of the targets agreed under criterion 5. **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. **e.** Monitor and, where relevant, coordinate the generation of appropriate evidence by the project team and the provision to the assessor.				
Man 03: Responsible construction practices > 5. Responsible construction management	**One credit** **7.** Achieve items listed as required for one credit in Table 4.1 Responsible construction management items **Two credits** **8.** Achieve criterion 7. **9.** Achieve six additional items in table 4.1 **Exemplary level criteria: one credit** To achieve an exemplary performance credit: **23.** Achieve all items in Table 4.1.	2	1.05%	2	1.05%
Man 03: Responsible construction practices > 6. Monitoring of construction site impacts : Pre-requisite	**10.** Assign responsibility to an individual for monitoring, recording and reporting energy use, water consumption and transportation data (where	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	**One credit - Utility consumption** **Energy Consumption** **11.** Achieve criterion 10. **12.** 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. **13.** Monitor and record data for the energy consumption described in criterion 12. **14.** Report the total carbon dioxide emissions (total kgCO2/project value) from the construction process via BREEAM Projects (for the purposes of potential future BREEAM performance benchmarking). **Water consumption** **15.** Achieve criterion 10. **16.** Set targets for the potable water consumption (m^3) arising from the use of construction plant, equipment (mobile and fixed) and site accommodation. **17.** Monitor and record data for the potable water consumption described in criterion 16. **18.** Use the collated data to report the total net water consumption (m^3), i.e. consumption minus any recycled water use from the construction process via BREEAM Projects (for the purposes of potential future BREEAM performance benchmarking).	1	0.52%	1	0.52%
Man 03: Responsible construction practices > 6. Monitoring of construction site impacts : Transportation of construction materials and waste	**One credit (or one exemplary credit for Simple Buildings) - Transportation of construction materials and waste** **19.** Achieve criterion 10. **20.** 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: **a.** transportation of materials from the point of supply to the building site, including any transport,	1	0.52%	1	0.52%

	intermediate storage and point of supply (see Definitions). Monitor as a minimum: **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)). **ii.** Ground works and landscaping materials. **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. **21.** Monitor and record data for the transportation movements as described in criterion 20 above. **22.** Using the collated data, report separately for materials and waste, the total transport-related carbon dioxide emissions (kgCO2eq), plus total distance travelled (km) via BREEAM Projects (for the purposes of potential future BREEAM performance benchmarking).				
Man 04: Commissioning and handover > 1. Commissioning - testing schedule and responsibilities	**One credit - Commissioning - testing schedule and responsibilities** **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. **2.** The schedule identifies the appropriate standards for all commissioning activities to be conducted, where applicable, in accordance with: **a.** Current Building Regulations **b.** BSRIA guidelines **c.** CIBSE guidelines **d.** Other appropriate standards (see Methodology) Exclude from the assessment any process or manufacture-related equipment specified as part of the project. However, include such	1	0.52%	1	0.52%

	equipment in cases where they form an integral part of the building HVAC services, such as some heat recovery systems. **3.** Where a building management system (BMS) is specified: **a.** Carry out commissioning of air and water systems when all control devices are installed, wired and functional **b.** Include physical measurements of room temperatures, off-coil temperatures and other key parameters, as appropriate, in commissioning results **c.** The BMS or controls installation should be running in auto with satisfactory internal conditions prior to handover **d.** All BMS schematics and graphics (if BMS is present) are fully installed and functional to user interface prior to handover **e.** Fully train the occupier or facilities team in the operation of the system. **4.** 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. **5.** 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.				
Man 04: Commissioning and handover > 2. Commissioning - design and preparation	**One credit - Commissioning - design and preparation** **6.** Achieve criteria 1 to 5. **7.** 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: **a.** Undertaking design reviews and giving advice on suitability for ease of commissioning. **b.** Providing commissioning management input to construction programming	1	0.52%	1	0.52%

	and during installation stages. **c.** Management of commissioning, performance testing and handover or post-handover stages. For buildings with complex building services and systems, this role needs to be carried out by a specialist commissioning manager (see Definitions).				
Man 04: Commissioning and handover > 3. Testing and inspecting building fabric	**One credit - Testing and inspecting building fabric** **8.** Achieve criteria 1 to 5. **9.** 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. **10.** 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).	1	0.52%	1	0.52%
Man 04: Commissioning and handover > 4. Handover	**One credit - Handover** **11.** Prior to handover, develop two building user guides (see Methodology) for the following users: **a.** A non-technical user guide for distribution to the building occupiers. **b.** A technical user guide for the premises facilities managers. 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. **12.** Prepare two training schedules timed appropriately around handover and proposed occupation plans for the following users: **a.** A non-technical training schedule for the building occupiers. **b.** A technical training schedule for the premises facilities managers.	1	0.52%	1	0.52%
Man 05: Aftercare > 1. Aftercare support	**One credit - Aftercare support** **1.** Provide aftercare support to	1	0.52%	1	0.52%

	the building occupiers through having in place operational infrastructure and resources. This includes as a minimum: **a.** 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: **i.** Introduce the aftercare support available, including the content of the building user guide (where it exists) and training schedule and their content. **ii.** 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. **b.** On-site facilities management training including: **i.** a walkabout of the building AND **ii.** introduction to and familiarisation with the building systems, their controls and how to operate them in accordance with the design intent and operational demands. **c.** 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). **d.** 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. **2.** Establish operational infrastructure and resources to coordinate the collection and				

	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.				
Man 05: Aftercare > 2. Commissioning - implementation	**One credit - Commissioning - implementation** **3.** Complete the following commissioning activities over a minimum 12-month period, once the building becomes substantially occupied: **a.** Complex systems: The specialist commissioning manager will: **i.** Identify changes made by the owner or operator that might have caused impaired or improved performance. **ii.** 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). **iii.** Where applicable, carry out testing during periods of extreme (high or low) occupancy. **iv.** Interview building occupants (where they are affected by the complex services) to identify problems or concerns regarding the effectiveness of the systems. **v.** Produce monthly reports comparing sub-metered energy performance to the predicted one (see Ene 01 Reduction of energy use and carbon emissions). **vi.** Identify inefficiencies and areas in need of improvement. **vii.** Re-commission systems (following any work needed to serve revised loads), and incorporate any revisions in operating procedures into the operations and	1	0.52%	1	0.52%

	maintenance (O&M) manuals. **b.** Simple systems (naturally ventilated): The external consultant, aftercare team or facilities manager will: **i.** Review thermal comfort, ventilation, and lighting, at three, six and nine month intervals after initial occupation, either by measurement or occupant feedback. **ii.** Identify deficiencies and areas in need of improvement. **iii.** Re-commission systems and incorporate any relevant revisions in operating procedures into the O&M manuals.				
Man 05: Aftercare > 3. Post Occupancy Evaluation (POE)	**One credit - Post-occupancy evaluation (POE)** **4.** 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. **5.** An independent party (see Definitions) carries out the POE covering: **a.** A review of the design intent and construction process (review of design, procurement, construction and handover processes). **b.** Feedback from a wide range of building users including facilities management on the design and environmental conditions of the building covering: **i.** Internal environmental conditions (light, noise, temperature, air quality) **ii.** Control, operation and maintenance **iii.** Facilities and amenities **iv.** Access and layout **v.** Energy and water consumption (see	1	0.52%	1	0.52%

	criterion 2 and Methodology) **vi.** Other relevant issues, where appropriate (see Definitions) **6.** The independent party provides a report with lessons learned to the client and building occupiers. **7.** 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.				
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	**One credit - Control of glare from sunlight** **1.** 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. **2.** 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. **3.** The glare control strategy does not increase energy consumption used for lighting. This is achieved by: **a.** Maximising daylight levels in all weather, cloudy or sunny AND **b.** Ensuring the use or location of shading does not conflict with the operation of lighting control systems.	1	0.78%	1	0.78%
Hea 01: Visual comfort > 2. Daylighting	**Up to two credits - Daylighting (building type dependent)** **4.** Daylighting criteria have been met using either of the following options: **a.** The relevant building areas meet good practice daylight factors and other criterion as outlined in Table 5.1 and Table 5.2 OR **b.** The relevant building areas meet good practice average and minimum point daylight illuminance criteria as outlined in Table	1	0.78%	1	0.78%

	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). **Exemplary level criteria** To achieve an exemplary performance credit for daylighting: **14.** 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.				
Hea 01: Visual comfort > 3. View out	**One credit (or two credits healthcare buildings with inpatient areas) - View out** **5.** 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) **6.** In addition, the building type criteria in Table 5.6 are applicable to view out criteria.	1	0.78%	0	0%
Hea 01: Visual comfort > 4. Internal and external lighting levels, zoning and control	**One credit - Internal and external lighting levels, zoning and control** **Internal lighting** **7.** 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. **8.** 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	1	0.78%	1	0.78%

	recommendations refer to the luminance of the lit ceiling rather than the luminaire; a design team calculation is usually required to demonstrate this. **c.** Recommendations for direct lighting, ceiling illuminance, and average wall illuminance. **External lighting** **9.** 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. **10.** 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. **Zoning and occupant control** **11.** Internal lighting is zoned to allow for occupant control. Zoning is in accordance with the criteria below for relevant areas present within the building: **a.** In office areas, zones of no more than four workplaces **b.** Workstations adjacent to windows or atria and other building areas separately zoned and controlled **c.** Seminar and lecture rooms: zoned for presentation and audience areas **d.** Library spaces: separate zoning of stacks, reading and counter areas **e.** Teaching space or demonstration area **f.** Whiteboard or display screen **g.** Auditoria: zoning of seating areas, circulation space and lectern area **h.** Dining, restaurant, café areas: separate zoning of servery and seating or dining areas **i.** Retail: separate zoning of display and counter				

	areas **j.** Bar areas: separate zoning of bar and seating areas **k.** Wards or bedded areas: zoned lighting control for individual bed spaces and control for staff over groups of bed spaces **l.** Treatment areas, dayrooms, waiting areas: zoning of seating and activity areas and circulation space with controls accessible to staff. **12.** Areas used for teaching, seminar or lecture purposes have lighting controls provided in accordance with CIBSE Lighting Guide 5. **13.** In addition the building type criteria in Table 5.7 (where relevant). **Exemplary level criteria** To achieve an exemplary performance credit for Internal and external lighting levels, zoning and control: **15.** 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.				
Hea 02: Indoor air quality > 1. Pre-requisite	**Pre-requisite - Indoor air quality (IAQ) plan** **1.** 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: **a.** Removal of contaminant sources **b.** Dilution and control of contaminant sources: **i.** Where present, consideration is given to the air quality requirements of specialist areas such as laboratories **c.** Procedures for pre-occupancy flush out **d.** Third party testing and analysis **e.** Maintaining good indoor air quality in-use	0	0%	0	0%
Hea 02: Indoor air quality > 2.	**One credit - Ventilation**	1	0.78%	1	0.78%

Ventilation	**2.** The building has been designed to minimise the indoor concentration and recirculation of pollutants in the building as follows: **a.** Provide fresh air into the building in accordance with the criteria of the relevant standard for ventilation. **b.** Ventilation pathways are designed to minimise the ingress and build-up of air pollutants inside the building (see Methodology). **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. **d.** Areas of the building subject to large and unpredictable or variable occupancy patterns have carbon dioxide (CO2) or air quality sensors specified and: **i.** In mechanically ventilated buildings or spaces: sensors are linked to the mechanical ventilation system and provide demand-controlled ventilation to the space. **ii.** In naturally ventilated buildings or spaces: sensors either have the ability to alert the building owner or manager when CO2 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. **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.				
Hea 02: Indoor air quality > 3.	**Up to two credits - Emissions**	2	1.56%	1	0.78%

Emissions from construction products	**from construction products** **One credit** **3.** 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. **Two Credits** **4.** 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 **Exemplary level criteria** To achieve one exemplary performance credit: **11.** 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				
Hea 02: Indoor air quality > 4. Post-construction indoor air quality measurement	**One credit - Post-construction indoor air quality measurement** **5.** The formaldehyde concentration in indoor air is measured post construction (but pre-occupancy) and does not exceed 100μg/m^3 averaged over 30 minutes (World Health Organisation guidelines for indoor air quality: Selected pollutants, 2010). **6.** The formaldehyde sampling and analysis is performed in accordance with ISO 16000-2 and ISO 16000-3. **7.** The total volatile organic compound (TVOC) concentration in indoor air is measured post construction (but pre-occupancy) and does not exceed 500μg/m^3 over 8 hours. **8.** The TVOC sampling and analysis is performed in accordance with ISO 16000-5 and ISO 16000-6 or ISO 16017-1. **9.** 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	1	0.78%	0	0%

	to within the above limits. **10.** The measured concentration levels of formaldehyde (µg/m³) and TVOC (µg/m³) are reported, via the BREEAM Scoring and Reporting Tool.				
Hea 04: Thermal comfort > 1. Thermal modelling	**One credit - Thermal modelling** **1.** Thermal modelling has been carried out using software in accordance with CIBSE AM11 Building Energy and Performance Modelling. **2.** 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). **3.** The modelling demonstrates that: **a.** 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). **b.** For naturally ventilated buildings: **i.** 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). **ii.** 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	1	0.78%	1	0.78%

	TM52: The limits of thermal comfort: avoiding overheating in European buildings or CIBSE TM59: Design methodology for the assessment of overheating risk in homes. **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.				
Hea 04: Thermal comfort > 2. Design for future thermal comfort	**One credit - Design for future thermal comfort** **5.** Criteria 1 to 4 are achieved. **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). **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 **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.	1	0.78%	1	0.78%
Hea 04: Thermal comfort > 3. Thermal zoning and controls	**One credit - Thermal zoning and controls** **9.** Criteria 1 to 4 are achieved. **10.** The thermal modelling analysis (criteria1 on the previous page to 4 on the previous page) has informed the temperature control strategy for the building and its users. **11.** The strategy for proposed heating or cooling systems demonstrates that it has addressed the following: **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. **b.** The degree of occupant control required for these zones. This is based on discussions with the end	1	0.78%	1	0.78%

	user (or alternatively building type or use specific design guidance, case studies, feedback) and considers: **i.** User knowledge of building services **ii.** Occupancy type, patterns and room functions (and therefore appropriate level of control required) **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. **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). **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. **d.** The need or otherwise for an accessible building user actuated manual override for any automatic systems.				
Hea 05: Acoustic performance > 1. Sound insulation	**Up to three credits - Acoustic performance for all building type except Residential institutions (short term and long term stay)** **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: **a.** Sound insulation **b.** Indoor ambient noise level **c.** Room acoustics. OR **2.** A suitably qualified acoustician (SQA) is appointed to define a bespoke set of	2	1.56%	1	0.78%

	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. **Up to four credits - Acoustic performance for Residential institutions (short term and long term stay)** **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: **a.** Sound insulation **b.** Indoor ambient noise level **c.** Room acoustics.				
Hea 05: Acoustic performance > 2. Indoor ambient noise level	**Up to three credits - Acoustic performance for all building type except Residential institutions (short term and long term stay)** **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: **a.** Sound insulation **b.** Indoor ambient noise level **c.** Room acoustics. OR **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. **Up to four credits - Acoustic performance for Residential institutions (short term and long term stay)** **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: **a.** Sound insulation **b.** Indoor ambient noise	1	0.78%	1	0.78%

	level **c.** Room acoustics.				
Hea 05: Acoustic performance > 3. Room acoustics	**Up to three credits - Acoustic performance for all building type except Residential institutions (short term and long term stay)** **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: **a.** Sound insulation **b.** Indoor ambient noise level **c.** Room acoustics. OR **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. **Up to four credits - Acoustic performance for Residential institutions (short term and long term stay)** **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: **a.** Sound insulation **b.** Indoor ambient noise level **c.** Room acoustics.	1	0.78%	1	0.78%
Hea 06: Security	**One credit - Security of site and building** **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 . **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.	1	0.78%	1	0.78%

	3. 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. **Exemplary level criteria** To achieve an exemplary performance credit: **4.** A compliant risk based security rating scheme has been used. The performance against the scheme has been confirmed by independent assessment and verification.				
Hea 07: Safe and healthy surroundings > 1. Safe access	**One credit - Safe access** Where external site areas form part of the assessed development the following apply: **1.** Dedicated and safe cycle paths are provided from the site entrance to any cycle storage, and connect to offsite cycle paths where applicable. **2.** Dedicated and safe footpaths are provided on and around the site providing suitable links for the following: **a.** The site entrance to the building entrance, **b.** Car parks (where present) to the building entrance **c.** The building to outdoor space, and **d.** Connecting to off-site paths where applicable. **3.** 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: **4.** Delivery areas are not accessed through general parking areas and do not cross or share the following: **a.** pedestrian and cyclist paths **b.** outside amenity areas accessible to building users and general public. **5.** There is a dedicated parking or waiting area for goods vehicles with appropriate separation from the manoeuvring area and staff and visitor car parking. **6.** Parking and turning areas are designed for simple manoeuvring according to the type of delivery vehicle likely to access the site, thus avoiding	1	0.78%	1	0.78%

	the need for repeated shunting.				
Hea 07: Safe and healthy surroundings > 2. Outside space	**One credit - Outside space** **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	**Up to nine credits - Energy performance** **1.** Calculate an Energy Performance Ratio for New Constructions (EPR $_{NC}$). Compare the EPR $_{NC}$ achieved with the benchmarks in Table 6.1 and award the corresponding number of BREEAM credits. **Exemplary level criteria** **Up to two credits - Beyond zero net regulated carbon** **6.** The building achieves an EPR NC≥ 0.9 and zero net regulated CO_2-eq emissions (see Definitions). **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. **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). **Three credits - Carbon negative** **9.** The building is deemed carbon negative where > 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).	9	6.86%	7	5.33%
Ene 01: Reduction of energy use and carbon emissions > 2. Prediction of operational energy consumption	**Four credits (or two exemplary credits for Simple Buildings) – Prediction of operational energy consumption** **2.** Involve relevant members of the design team in an energy design workshop focusing on operational energy performance. **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). **4.** Report predicted energy consumption targets by end use, design assumptions and	4	3.05%	4	3.05%

	input data (with justifications). **5.** 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. **Exemplary level criteria** **Two credits – Post-occupancy stage** **10.** 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. **11.** 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. **12.** The energy model (criterion 3 above) is: **a.** Submitted to BRE and **b.** Retained by the building owner.				
Ene 02: Energy monitoring > 1. Sub-metering of end use categories	**One credit - Sub-metering of end-use categories** **1.** 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). **2.** Meter the energy consumption in buildings according to the total useful floor area: **a.** If the area is greater than 1,000m², by end-use category with an appropriate energy monitoring and management system. **b.** If the area is less than 1,000m², use either: **i.** an energy monitoring and management system or **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).	1	0.76%	1	0.76%

	3. Building users can identify the energy consuming end uses, for example through labelling or data outputs.				
Ene 02: Energy monitoring > 2. Sub-metering of high energy load and tenancy areas	**One credit - Sub-metering of high energy load and tenancy areas** **4.** Monitor a significant majority of the energy supply with: **a.** An accessible energy monitoring and management system for: **i.** tenanted areas or **ii.** relevant function areas or departments in single occupancy buildings. OR **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: **i.** tenanted areas or **ii.** relevant function areas or departments in single occupancy buildings. **5.** Sub-meter per floor plate in large single occupancy or single tenancy buildings with one homogeneous function, for example hotel bedrooms, offices. 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.	1	0.76%	1	0.76%
Ene 03: External lighting	**One credit** **1.** No external lighting (which includes lighting on the building, at entrances and signs). OR **2.** External light fittings within the construction zone with: **a.** Average initial luminous efficacy of no less than 70 luminaire lumens per circuit Watt. **b.** Automatic control to prevent operation during daylight hours. **c.** Presence detection in areas of intermittent pedestrian traffic.	1	0.76%	1	0.76%
Ene 04: Low carbon design > 1. Passive design : Passive design analysis	**One credit - Passive design analysis** **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. **2.** The project team analyses the proposed building design	1	0.76%	1	0.76%

	and development during Concept Design to identify opportunities for the implementation of passive design measures (see Passive design analysis). **3.** 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. **4.** Quantify the reduced total energy demand and carbon dioxide (CO_2-eq) emissions resulting from the passive design measures.				
Ene 04: Low carbon design > 1. Passive design : Free cooling	**One credit - Free cooling** **5.** Achieve the passive design analysis credit. **6.** Include a free cooling analysis (see Free cooling analysis) in the passive design analysis carried out under criterion 2. **7.** Identify opportunities for the implementation of free cooling solutions. **8.** The building is naturally ventilated or uses any combination of the free cooling strategies listed in the Free cooling analysis list.	1	0.76%	1	0.76%
Ene 04: Low carbon design > 2. Low and zero carbon technologies	**One credit - Low and zero carbon feasibility study** **9.** An energy specialist (see Definitions) completes a feasibility study (see Low and zero carbon feasibility study) by the end of the Concept Design. **10.** 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. **11.** Specify local LZC technologies for the building or development in line with the feasibility study recommendations. **12.** Quantify the reduced regulated carbon dioxide (CO_2-eq) emissions resulting from the feasibility study.	1	0.76%	1	0.76%
Ene 06: Energy Efficient transportation systems > 1. Energy consumption	**One credit - Energy consumption** **1.** For specified lifts, escalators or moving walks (transportation types): **a.** Analyse the transportation demand and usage patterns for the building to determine the optimum number and size of lifts, escalators or moving walks.	1	0.76%	1	0.76%

	b. Calculate the energy consumption in accordance with BS EN ISO 25745 Part 2 or Part 3 for one of the following: **i.** At least two optionsfor each transportation type (e.g. for lifts, hydraulic, traction or machine roomless(MRL)) OR **ii.** At least two options considering different system arrangements and controlstrategies. **c.** Consider the use of regenerative drives, subject to the requirements in Regenerative drives below. **d.** Specify the transportation system with the lowest energy consumption.				
Ene 06: Energy Efficient transportation systems > 2. Energy efficient features : Lifts	**One credit - Energy efficient features : Lifts** **2.** Achieve criterion 1. **3.** Specify the following three energy efficient features for each lift: **a.** A standby condition for off-peak periods. **b.** The lift car lighting and display lighting provides an average luminous efficacy across all fittings in the car of > 70 luminaire lumens per circuit Watt. **c.** Use of a drive controller capable of variable speed, variable-voltage, and variable-frequency (VVVF) control of the drive motor. **4.** Specify regenerative drives where their use is demonstrated to save energy.	1	0.76%	1	0.76%
Energy Totals		21	16.00%	19	14.48%

Transport	Compliance Requirements	Available		Targeted	
		Credits	Percent	Credits	Percent
Tra 01: Transport assessment and travel plan	**Two credits - Transport assessment and Travel plan** **1.** 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. **2.** The site-specific travel assessment (or statement) shall cover as a minimum: **a.** If relevant, travel patterns and attitudes of existing building or site	2	1.67%	2	1.67%

	userstowards cycling, walking and public transport, to identify relevant constraints and opportunities. **b.** Predicted travel patterns and transport impact of future building or site users. **c.** Current local environment for pedestrians and cyclists, accounting for any age-related requirements of occupants and visitors. **d.** Reporting of the number and type of existing accessible amenities, see Table 7.1, within 500m of the site. **e.** Disabled access accounting for varying levels and types of disability, including visual impairment. **f.** Calculation of the existing public transport Accessibility Index (AI), see Methodology. **g.** Current facilities for cyclists. **3.** 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. **4.** If the occupier is known, involve them in the development of the travel plan. **5.** Demonstrate that the travel planwill be implemented and supported by the building's management in operation.				
Tra 02: Sustainable transport measures	**Pre-requisite** **1.** Achieve criteria 3-5 in the Tra 01 Transport assessment and travel plan credit. **Ten credits – Transport options implementation** **2.** Identify the sustainable transport measures, see Table 7.4. **3.** 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.	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	**Up to five credits** **1.** Use the BREEAM Wat 01 calculator to assess the efficiency of the domestic water-consuming components. **2.** 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. Where it is not possible to use the standard method, complete the assessment using the alternative Wat 01 method. **3.** If a greywater or rainwater system (see Definitions) is specified, use its yield in L/person/day to offset potable water demand from components. **4.** If a greywater or rainwater system is specified and installed: **a.** Greywater systems in compliance with BS 8525-1:2010 Greywater Systems - Part 1 Code of Practice. **b.** Rainwater systems in compliance with BS EN16941-1:2018 Achieve Wat 02 - Criterion 6, if you intend to pursue a post occupancy stage certification. **Additionally for Healthcare building types only:** **5.** 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). **Additionally for Prison building types only:** **6.** Sanitary components specified within a prison cell have a volume controller specified on the individual fittings or water supply to each cell (see Definitions). **Exemplary level criteria** To achieve an exemplary performance credit: **7.** Achieve criteria 1 to 4 on the previous page (and if applicable 5 or 6 above). **8.** The water consumption (litres/person/day) for the assessed building achieves the 65% improvement described as exemplary performance in Table 8.1.	5	4.38%	2	1.75%
Wat 02: Water monitoring	**One credit** **1.** Specify a water meter on the	1	0.88%	1	0.88%

	mains water supply to each building. This includes instances where water is supplied via a borehole or other private source. **2.** For water-consuming plant or building areas consuming 10% or more of the building's total water demand: **a.** Fit easily accessible sub-meters OR **b.** Install water monitoring equipment integral to the plant or area. **3.** For each meter (main and sub): **a.** Install a pulsed or other open protocol communication output AND **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. **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. **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. **Additionally for those pursuing a post-occupancy stage certification:** **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.				
Wat 03: Water leak detection > 1. Leak detection system	**One credit - Leak detection system** **1.** Install a leak detection system capable of detecting a major water leak: **a.** On the utilities water supply within the buildings, to detect any major leaks within the	1	0.88%	1	0.88%

	buildings. AND **b.** Between the buildings and the utilities water supply, to detect any major leaks between the utilities supply and the buildings under assessment. **2.** The leak detection system is: **a.** A permanent automated water leak detection system that alerts the building occupants to the leak OR an inbuilt automated diagnostic procedure for detecting leaks. **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. **c.** 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. **d.** Programmable to suit the owner's or occupier's water consumption criteria. **e.** Where applicable, designed to avoid false alarms caused by normal operation of large water consuming plant such as chillers. 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.				
Wat 03: Water leak detection > 2. Flow control devices	**One credit - Flow control devices**	1	0.88%	1	0.88%

	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	**Up to six credits – Superstructure (all building types)** **Comparison with the BREEAM LCA benchmark during Concept Design (offices, industrial and retail buildings only)** Superstructure (offices, industrial and retail buildings (except for Simple Buildings and where Notes 1.1 and 1.2 apply)) **1.** During the Concept Design, demonstrate the environmental performance of the building as follows: **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). **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). **Comparison with the BREEAM LCA benchmark during Technical Design (offices, industrial and retail buildings only)** **2.** During Technical Design, demonstrate the environmental performance of the building as follows: **a.** As criterion 1.a **b.** Submit the Mat 01/02 Results Submission Tool to BRE at the end of Technical Design. Where a project has not achieved criterion 1, criterion 2 may still be achieved. **Option appraisal during Concept Design (all building types)** **3.** For offices, industrial and retail building types, achieve criterion 1 (except where Notes 1.0, 1.1 and 1.2 apply). **4.** During Concept Design,	6	6.43%	3	3.21%

	identify opportunities for reducing environmental impacts as follows: **a.** Carry out building LCA options appraisal of 2 to 4 significantly different superstructure design options (applicable to the Concept Design stage, see Methodology). **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). **c.** For each design option, fulfil the same functional requirements specified by the client and all statutory requirements (to ensure functional equivalency). **d.** Integrate the LCA options appraisal activity within the wider design decision-making process. Record this in an options appraisal summary document. **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. **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). 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. **Options appraisal during Technical Design (all building types)** **5.** During Technical Design identify opportunities for reducing environmental impacts as follows: **a.** Carry out building LCA options appraisal of 2 to 3				

	significantly different superstructure design options (based on the selected Concept Design option and as applicable to the Technical Design stage). **b.** Use a building LCA tool that is recognised by BREEAM (as suitable for assessing superstructure during Technical Design) according to the methodology. **c.** As criteria 4.c to 4.e above. Where an options appraisal summary document was produced during Concept Design, update it to include the Technical Design options. **d.** Submit the Mat 01/02 Results Submission Tool to BRE at the end of Technical Design. Where a project has not achieved criteria 3 and 4, criterion 5 may still be achieved. **Exemplary level criteria** To achieve exemplary performance credits **One credit – Core building services options appraisal during Concept Design (all building types)** **8.** Criteria 3 to 4 are achieved. **9.** During Concept Design identify opportunities for reducing environmental impacts as follows: **a.** Carry out building LCA options appraisal of at least 3 significantly different core building services design options. **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. **c.** As criteria 4.c to 4.f. **One credit – LCA and LCC alignment (all building types)** **10.** Achieve criteria 3 to 5. **11.** Achieve Elemental LCC plan and Component Level LCC options appraisal credits (Man 02 Life cycle cost and service life planning). **12.** 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. **13.** Include the design options appraised for criterion 5 during				

	Concept Design in the 'Component level LCC option appraisal' (in Man 02 Life cycle cost and service life planning). **14.** 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'. **One credit – Third party verification (all building types)** **15.** Criteria 1 to 7 (as applicable to the building type) are achieved. **16.** A suitably qualified third party (see Definitions) either carries out the building LCA workor verifies the building LCA work (if by others), and produces a report describing howthey 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). **17.** 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. **18.** 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.				
Mat 01: Environmental impacts from construction products - Building life cycle assessment (LCA) > 2. Substructure	**One credit – Substructure and hard landscaping options appraisal during Concept Design (all building types)** **6.** Criteria 3 and 4 are achieved. **7.** During Concept Design identify opportunities for reducing environmental impacts as follows: **a.** 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). **b.** Using a building LCA	1	1.07%	1	1.07%

	tool that is recognized by BREEAM (as suitable for assessing substructure and hard landscaping during Concept Design) according to the methodology. **c.** As criteria 4.c to 4.f				
Mat 02: Environmental impacts from construction products - Environmental Product Declarations (EPD)	**One credit - Specification of products with a recognised environmental product declaration (EPD)** **1.** Specify construction products with EPD that achieve a total EPD points score of at least 20, according to the Methodology. **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.	1	1.07%	1	1.07%
Mat 03: Responsible sourcing of construction products > 1. Pre-requisite - Legally harvested and traded timber	**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). Compliance with criterion 1 is a minimum requirement for achieving any BREEAM rating. There are no pre-requisite requirements for other materials.	0	0%	0	0%
Mat 03: Responsible sourcing of construction products > 2. Enabling sustainable procurement	**One credit - Enabling sustainable procurement** **2.** A sustainable procurement plan must be used by the design team to guide specification towards sustainable construction products. The plan must: **a.** Be in place before Concept Design. **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. **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. **d.** Include details of procedures in place to check and verify the effective implementation of the sustainable procurement plan. In addition, if the plan is applied	1	1.07%	1	1.07%

	to several sites or adopted at an organisational level it must: **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.				
Mat 03: Responsible sourcing of construction products > 3. Measuring responsible sourcing	**Up to 3 credits - Measuring responsible sourcing** **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.	3	3.21%	0	0%
Mat 05: Designing for durability and resilience	**One credit** **Protecting vulnerable parts of the building from damage** **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: **a.** Negative impacts of high user numbers in relevant areas of the building (e.g. corridors, lifts, stairs, doors etc.). **b.** Damage from any vehicle or trolley movements within 1m of the internal building fabric in storage, delivery, corridor and kitchen areas. **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. **d.** Potential malicious damage to building materials and finishes, in public and common areas where appropriate. **Protecting exposed parts of the building from material degradation** **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: **a.** The element or product achieving an appropriate	1	1.07%	1	1.07%

	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 **b.** A detailed assessment of the element's resilience when exposed to the applicable material degradation and environmental factors. **3.** Include convenient access to the roof and façade for cost-effective cleaning, replacement and repair in the building's design. **4.** 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 than can be used to achieve compliance.				
Mat 06: Material efficiency	**One credit** **1.** 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 **a.** Preparation and Brief **b.** Concept Design **c.** Developed Design **d.** Technical Design **e.** Construction **2.** Develop and record the implementation of material efficiency, see Table 9.15 below, during **a.** Developed Design **b.** Technical Design **c.** Construction **3.** Report the targets and actual material efficiencies achieved.	1	1.07%	1	1.07%
Materials Totals		14	15.00%	8	8.57%

Waste	Compliance Requirements	Available		Targeted	
		Credits	Percent	Credits	Percent
Wst 01: Construction waste management > 1. Pre-demolition audit	**One credit - Pre-demolition audit** **1.** 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: **a.** Be carried out at Concept Design stage	1	0.6%	1	0.6%

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

	402:2013 compliant company (see Definitions).				
Wst 01: Construction waste management > 4. Diversion of resources from landfill	**One credit - Diversion of resources from landfill** **6.** Meet, where applicable, the diversion from landfill benchmarks in Table 10.2 for non-hazardous construction waste and demolition and excavation waste generated. **7.** Sort waste materials into separate key waste groups as per Table 10.3, either on-site or through a licensed contractor for recovery.	1	0.6%	1	0.6%
Wst 02: Use of recycled and sustainably sourced aggregates	**Pre-requisite** **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. **One credit - Project Sustainable Aggregate points** **2.** Identify all aggregates uses and type on the project Table 10.5 and Table 10.6. **3.** Determine the quantity in tonnes for each identified use and aggregate type. **4.** Identify the region in which the aggregate source is located. **5.** Identify the distance in kilometres travelled by all aggregates by transport type. **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 **Exemplary level criteria** To achieve an exemplary performance credit: **7.** The Project Sustainable Aggregate Points score meets or exceeds the exemplary level performance benchmark in Table 10.4.	1	0.6%	0	0%
Wst 03: Operational waste	**One credit - Operational waste** **1.** Provide a dedicated space for the segregation and storage of operational recyclable waste generated. The space is: **a.** Clearly labelled, to assist with segregation, storage and collection of the recyclable waste streams **b.** Accessible to building occupants or facilities operators for the deposit of materials and collections by waste	1	0.6%	1	0.6%

	management contractors **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. **2.** For consistent and large amounts of operational waste generated, provide: **a.** Static waste compactors or balers; situated in a service area or dedicated waste management space **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 **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. **Additionally for healthcare buildings only** **3.** The specified or installed operational waste facilities are compliant with the relevant NHS guidelines for that part of the UK. **Additionally for multi-residential buildings with self-contained dwellings or bedsits only** **4.** Provide three internal storage containers for each dwelling or bedsit with: **a.** A minimum total capacity of 30 litres **b.** No individual container smaller than 7 litres **c.** All containers in a dedicated non-obstructive position **d.** Storage containers for recycling in addition to non-recyclable waste storage. **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. **Additionally for multi-residential buildings with individual bedrooms and communal facilities only** **6.** Meet criteria 4.a and 4.b for self-contained dwellings or bedsits for every six bedrooms.				

	7. Locate recyclable storage in a dedicated, unobstructive position in communal kitchens or other appropriate communal space. **8.** Provide home composting facilities and a home composting information leaflet within the kitchen area or communal space. **9.** Provide a minimum of 10 litres of internal storage for compostable waste.				
Wst 05: Adaptation to climate change	**One credit - Resilience of structure, fabric, building services and renewables installation** **1.** Conduct a climate change adaptation strategy appraisal by the end of Concept Design using: **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): **i.** Hazard identification **ii.** Hazard assessment **iii.** Risk estimation **iv.** Risk evaluation **v.** Risk management. **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. **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. **Exemplary level criteria – Responding to climate change** 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:	1	0.6%	1	0.6%

	4. Meet criteria 1 to 3 above. **5.** Meet the criteria or achieve credits of the assessment issues given in Table 10.11				
Wst 06: Design for disassembly and adaptability > 1. Recommendations	**One credit - Design for disassembly and functional adaptability - Recommendations** **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. **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.	1	0.6%	1	0.6%
Wst 06: Design for disassembly and adaptability > 2. Implementation	**One credit - Disassembly and functional adaptability – Implementation** **3.** Achieve criteria 1 and 2 **4.** Provide an update, during Technical Design, on: **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. **b.** Changes to the recommendations and solutions during the development of the Technical Design. **5.** Produce a building adaptability and disassembly guide to communicate the characteristics allowing functional adaptability and disassembly to prospective tenants.	1	0.6%	1	0.6%
Waste Totals		10	6.00%	7	4.20%

Land Use and Ecology	Compliance Requirements	Available		Targeted	
		Credits	Percent	Credits	Percent
LE 01: Site selection > 1. Previously occupied land	**One credit - Previously occupied land** **1.** At least 75% of the proposed development's footprint is on an area of land which has previously been occupied (see Definitions).	1	1%	1	1%
LE 01: Site selection > 2. Contaminated land	**One credit - Contaminated land** **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	1	1%	0	0%

	assessment and appraisal have identified: **a.** The degree of contamination **b.** The contaminant sources or types **c.** The options for remediating sources of contamination which present an unacceptable risk. **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).				
LE 02: Identifying and understanding the risks and opportunities for the project > 1. Assessment route selection	**Pre-requisite - Assessment route selection** **1.** An assessment route (see Definitions) for the project has been determined using BREEAM Guidance Note GN34 BREEAM Ecological Risk Evaluation Checklist. **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.	0	0%	0	0%
LE 02: Identifying and understanding the risks and opportunities for the project > 2. Survey and evaluation	**Survey and evaluation (Route 1)** **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. **Survey and evaluation (Route 2)** **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. **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: **a.** Current and potential ecological value and condition of the site, and	1	1%	1	1%

	related areas within the zone of influence. **b.** Direct and indirect risks to current ecological value **c.** Capacity and feasibility for enhancement of the ecological value of the site and, where relevant, areas within the zone of influence. **6.** Data are collected and shared with project team to inform the site preparation, design and construction works.				
LE 02: Identifying and understanding the risks and opportunities for the project > 3. Determining the ecological outcomes for the site	**Determining the ecological outcomes for the site (Routes 1 and 2)** **7.** Survey and evaluation criteria relevant to the chosen route (criterion 3 or criteria 4-6) have been achieved. **8.** 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). **9.** 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 **Route 1** 1. Avoidance 2. Protection **Route 2** 1. Avoidance 2. Protection 3. Reduction or limitation of negative impacts 4. On site compensation and 5. Enhancement, considering the capacity and feasibility within the site, or where viable, offsite **10.** The optimal ecological outcome for the site isselected after liaising with representative stakeholders and the project team. 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. **Exemplary Level criteria** To achieve one exemplary	1	1%	0	0%

	performance credit: **11.** Achieve criteria 8 to 10. **12.** 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. **13.** Achieve the credits of the assessment issues outlined below: **a.** Hea 07 - Both credits **b.** Pol 03 - Achieve credits for 'Surface water run-off' and 'Minimising watercourse pollution' **c.** Pol 05				
LE 03: Managing negative impacts on ecology > 1. Pre-requisite	**Pre-requisite – Identification and understanding the risks and opportunities for the site** **1.** LE 02 has been achieved.	0	0%	0	0%
LE 03: Managing negative impacts on ecology > 2. Planning, liaison, implementation and data	**One credit – Planning, liaison and implementation** **2.** 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. **3.** The potential impact of site preparation and construction works on ecology are identified at an early project stage to optimise benefits and outputs. **4.** 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.	1	1%	1	1%
LE 03: Managing negative impacts on ecology > 3. Managing negative impacts of the project	**One credit - Managing negative impacts of the project (Route 1)** **5.** Criteria 2 and 3 have been achieved. **6.** 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. 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. **Up to two credits – Managing negative impacts of the**	2	2%	1	1%

	project (Route 2) **7.** Criteria 2-4 have been achieved. **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: **a.** No overall loss of ecological value has occurred (2 credits) OR **b.** The loss of ecological value has been minimised (Minimising Loss) (1 credit)				
LE 04: Change and enhancement of ecological value > 1. Pre-requisite - Managing negative impacts on ecology	**1.** Criteria 2-3 in LE03 have been achieved. **2.** The client or contractor confirms compliance is monitored against all relevant UK, EU or international legislation relating to the ecology of the site.	0	0%	0	0%
LE 04: Change and enhancement of ecological value > 2. Change and enhancement of ecology	**One credit - Change and enhancement of ecology (Route 1)** **3.** The project team, liaising and collaborating with representative stakeholders and taking into consideration data collated and shared, have implemented locally relevant ecologicalsolutions 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. 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. **Up to three credits - Enhancement of ecology (Route 2)** **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 processset out in GN36 - BREEAM, CEEQUAL and HQM Ecology Calculation Methodology – Route 2. Credits are awarded as follows: **a.** Minimising loss of ecological value (one credit - percentage score of 75-94) **b.** No net loss of ecological value (two credits- percentage score of 95-	3	3%	1	1%

	104) **c.** Net gain of ecological value (three credits- percentage score of 105-109) **Exemplary Level criteria** To achieve one exemplary performance credit: **7.** The change in ecological value occurring is calculated in accordance with the processset 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)				
LE 04: Change and enhancement of ecological value > 3. Liaison, implementation and data collation	**One credit - Liaison, implementation and data collation (Route 2)** **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 stateholders" 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	1	1%	0	0%
LE 05: Long term ecology management and maintenance > 1. Pre-requisite - Roles and responsibilities, implementation, statutory obligations	**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.	0	0%	0	0%
LE 05: Long term ecology management and maintenance > 2. Planning, liaison, data, monitoring and review management and maintenance	**One credit - Planning, liaison, data, monitoring and review management and maintenance** **3.** The project team liaise and collaborate with representative	1	1%	0.5	0.5%

	stakeholders (for relevant stakeholders see - "Determining the ecological outcomes for the site - project team liaison and collaboration with relevant stateholders" in the LE 02 Methodology), taking into consideration data collated and shared, on solutions and measures implemented to: **a.** Monitor and reviewthe effectiveness withwhich the plansfor LE03 & LE04 are implemented. **b.** develop and review management and maintenance solutions, actions or measures. **4.** In support of the above and to help ensure their continued relevance over the period of the project the following should be considered: **a.** Monitoring and reporting of the ecological outcomes for site implemented at the design and construction stage **b.** Monitoring and reporting of outcomes and successes from the project **c.** Arrangements for the ongoing management of landscape and habitat connected to the project (on and, where relevant, off site) **d.** Maintaining the ecological value of the site and its relationship or connection to its zone of influence **e.** Maintaining the site in line with the any sustainability linked activities, e.g. ecosystems benefits (LE 02). **f.** Remedial or other management actions are carried out which relate to those identified in LE 02, LE 03 and LE 04. **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. 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.				
LE 05: Long term ecology management and maintenance > 3. Landscape and ecology management plan (or similar) development	**One credit - Landscape and ecology management plan (or similar) development** **6.** Landscape and ecology management plan, or	1	1%	0.5	0.5%

	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: **a.** Actions and responsibilities, prior to handover, to give to relevant individuals **b.** The ecological value and condition of the site over the development life. **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 **d.** Identification and guidance s to trigger appropriate remedial actions to address previously unforeseen impacts **e.** Clearly defined and allocated roles and responsibilities. **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.				
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	**Three credits - No refrigerant use** **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	3	2%	3	2%
Pol 02: Local air quality	**Up to two credits** **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	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	**Two credits - Low flood risk** **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). **One credit - Medium or high flood risk** **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. **4.** To increase the resilience and resistance of the development to flooding, one of the following must be achieved: **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). **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.	2	1.33%	2	1.33%
Pol 03: Flood and surface water management > 3. Surface water run-off : Pre-requisite	**Pre-requisite for surface water run-off credits** **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	0	0%	0	0%

	appropriate consultant where water is allowed to leave the site. Note: For Simple Buildings, achieving criteria 5-15 will also achieve an Exemplary credit.				
Pol 03: Flood and surface water management > 3. Surface water run-off : Rate	**One credit - Surface Water Run-Off - Rate** **6.** 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. **7.** 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 wasfor the pre-development site. This should comply at the 1-year and 100-year return period events. **8.** Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified Sustainable Drainage Systems (SuDS) are in place. **9.** Calculations include an allowance for climate change. This should be made in accordance with current best practice planning guidance (see definitions). Note: For Simple Buildings, achieving criteria 5-16 will also achieve an Exemplary credit.	1	0.67%	1	0.67%
Pol 03: Flood and surface water management > 3. Surface water run-off : Volume	**One credit - Surface Water Run-Off - Volume** **10.** 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 **11.** 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). **12.** Any additional predicted volume of run-off for this event is prevented from leaving the site by using infiltration or other SuDS techniques. OR (only where criteria 11 and 12 cannot be achieved): **13.** Justification from the	1	0.67%	1	0.67%

	appropriate consultant indicating why the above criteria cannot be achieved, i.e. where infiltration or other SuDS techniques are not technically viable options. **14.** 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: **a.** The pre-development one-year peak flow rate **b.** The mean annual flow rate (Qbar) **c.** 2L/s/ha. For the one-year peak flow rate, the one-year return period event criterion applies. **15.** Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified SuDS are in place. **16.** 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.				
Pol 03: Flood and surface water management > 5. Minimising watercourse pollution	**One credit - Minimising watercourse pollution** **17.** There is no discharge from the developed site for rainfall up to 5mm (confirmed by the appropriate consultant). **18.** Areas with a low risk source of watercourse pollution have an appropriate level of pollution prevention treatment is provided, using appropriate SuDS techniques. **19.** 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. **20.** 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. **21.** 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	1	0.67%	0	0%

	practice. They must be bespoke solutions taking account of the specific site requirements and natural or man-made environment of and surrounding the site. **22.** A comprehensive and up to date drainage plan of the site will be made available for the building or site occupiers. **23.** Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified SuDS must be in place. **24.** All external storage and delivery areas are designed and detailed in accordance with the current best practice planning guidance.				
Pol 04: Reduction of night time light pollution	**One credit** **1.** 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: **2.** 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 **3.** All external lighting (except for safety and security lighting) can be automatically switched off between 23:00 and 07:00. **4.** 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. **5.** Illuminated advertisements are designed in compliance with ILP PLG05 The Brightness of Illuminated Advertisements.	1	0.67%	1	0.67%
Pol 05: Reduction of noise pollution	**One credit** **1.** There are no noise-sensitive areas within the assessed building or within 800m radius of the assessed site. OR **2.** 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	1	0.67%	1	0.67%

	must be measured or determined for: **a.** Existing background noise levels: **i.** at the nearest or most exposed noise-sensitive development to the proposed assessed site **ii.** including existing plant on a building, where the assessed development is an extension to the building **b.** Noise rating level from the assessed building. **3.** The noise impact assessment must be carried out by a suitably qualified acoustic consultant. **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. **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.				
Polution Totals		12	8.00%	10	6.67%

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

	consumption **h.** Mat 01 Environmental impacts from construction products - Building life cycle assessment (LCA) **i.** Mat 03 Responsible sourcing of construction products **j.** Wst 01 Construction waste management **k.** Wst 02 Use of recycled and sustainably sourced aggregates **l.** Wst 05 Adaptation to climate change **m.** LE 02 Identifying and understanding the risks and opportunities for the site **n.** Pol 03 Flood and surface water management (Simple buildings only). Please refer to the relevant BREEAM issue within this scheme document for details of the exemplary level performance assessment criteria. **Approved innovations** **2.** 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.				
Man 03: Responsible construction practices > 1. Responsible construction management	**Assessment criteria** See compliance requirements for Man 03	1	1%	0	0%
Hea 01: Visual comfort > 1. Daylighting	**Assessment criteria** See compliance requirements for Hea 01	1	1%	0	0%
Hea 01: Visual comfort > 2. Internal and external lighting	**Assessment criteria** See compliance requirements for Hea 01	1	1%	0	0%
Hea 02: Indoor air quality	**Assessment criteria** See compliance requirements for Hea 02	1	1%	0	0%
Hea 06: Security	**Assessment criteria** See compliance requirements for Wat 01	1	1%	0	0%
Ene 01: Reduction of energy use and carbon emissions > 1. Energy performance	**Exemplary level criteria** **Up to two credits - Beyond zero net regulated carbon** **6.** The building achieves an EPR NC≥ 0.9 and zero net regulated CO_2-eq emissions (see Definitions). **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. **8.** Award the exemplary credits based on the percentage of additional emissions from	3	3%	0	0%

	unregulated energy that are offset by LZC sources (see Table 6.2). **Three credits - Carbon negative** **9.** The building is deemed carbon negative where > 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).				
Ene 01: Reduction of energy use and carbon emissions > 2. Prediction of operational energy consumption : Post-occupancy stage	**Exemplary level criteria** **Two credits – Post-occupancy stage** **10.** 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. **11.** 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. **12.** The energy model (criterion 3 above) is: **a.** Submitted to BRE and **b.** Retained by the building owner.	2	2%	0	0%
Wat 01: Water consumption	**Assessment criteria** See compliance requirements for Wat 01	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	**Assessment criteria** See compliance requirements for Mat 01	1	1%	0	0%
Mat 01: Environmental impacts from construction products - Building life cycle assessment (LCA) > 2. LCA and LCC alignment	**Assessment criteria** See compliance requirements for Mat 01	1	1%	0	0%
Mat 01: Environmental impacts from construction products - Building life cycle assessment (LCA) > 3. Third party verification	**Assessment criteria** See compliance requirements for Mat 01	1	1%	0	0%
Mat 03: Responsible sourcing of construction products	**Assessment criteria** See compliance requirements for Mat 03	1	1%	0	0%
Wst 01: Construction waste management > 1. Construction resource efficiency	**Assessment criteria** See compliance requirements for Wst 01	1	1%	0	0%
Wst 02: Use of recycled and sustainably sourced aggregates	**Assessment criteria** See compliance requirements for Wst 02	1	1%	0	0%
Wst 05: Adaptation to climate change	**Assessment criteria** See compliance requirements	1	1%	0	0%

	for Wst 05				
LE 02: Identifying and understanding the risks and opportunities for the site	**Assessment criteria** See compliance requirements for LE 02	1	1%	0	0%
LE 04: Change and enhancement of ecological value	**Assessment criteria** 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%
Overall Totals		**139**	**110.00%**	**95**	**71.27%**