



**ELEMENT
SUSTAINABILITY**

FIRST STREET SOUTH, BLOCK C, PLOT 11, MANCHESTER ENVIRONMENTAL STANDARDS STATEMENT

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1. INTRODUCTION

Element Sustainability has been commissioned by Downing Living (Manchester South) Limited Partnership Incorporated to review the sustainability and energy performance of the proposed student accommodation block to be constructed at Block C, Plot 11, First Street South, Manchester.

The purpose of this statement is to summarise the relevant policy background and requirements of Manchester City Council and to demonstrate the ways in which the developer has addressed these aims through their proposals, ensuring all practicable measures have been taken to deliver a sustainable development at this site.

Details of the design attributes, specifications and characteristics of the scheme are appraised in order to demonstrate how the proposals contribute to sustainable development in Manchester and seek to mitigate the environmental impacts of the scheme, providing a sustainability appraisal in support of the planning application.

This report is intended to support the planning application for this development and therefore, establish an approach to the delivery of this scheme which meet the criteria outlined by the Council that the developer commits to implement at the site.



2. DEVELOPMENT PROPOSALS

2.1 Development Site Description

The application site is currently a vacant brownfield plot of land, located in a highly urbanised area of Manchester City Centre, adjacent to Medlock Street and the Mancunian Way. The Site forms part of the wider First Street Development Framework Area.

The Mancunian Way and Medlock Street encompass the site to the south and west respectively. Bordering the site to the east lies Newcastle Street, which separates the site from the Unite Students Parkway Gate student accommodation building, and another vacant plot of land also within with the First Street Masterplan. Beyond the northern perimeter lies Blocks A/B and D Plot 11, currently under construction to deliver a co-living development.

The site is not in a designated conservation area.

The pre-development site is presented in Figure 2.1 below.

Figure 2.1 – Site Location Plan



Figure 2.2 – Pre-developed Site



2.2 Development Proposals

Planning approval is sought to erect a five hundred and fifty-five room purpose-built student accommodation facility.

Figure 2.3 to 2.7 presents the proposed floor plans and elevations for the proposed First Street development.



Figure 2.3 – Proposed Central North Elevation



Figure 2.4 – Proposed Central East Elevation



Figure 2.5 – Proposed Level 00 General Arrangement Plan



Figure 2.6 – Proposed Level 01 General Arrangement Plan



Figure 2.7 – Proposed Level Typical General Arrangement Plan



3. POLICY REVIEW

3.1 National Planning Policy

The National Planning Policy Framework was updated on 5th September 2023 and sets out the government's planning policies for England and how these are expected to be applied. The purpose of the planning system is to contribute to the achievement of sustainable development. The planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways, as set out below:

An economic role – to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure;

A social role – to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering well-designed, beautiful and safe places, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and

An environmental role – to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

These objectives should be delivered through the preparation and implementation of plans and the application of the policies in this Framework. Planning policies and decisions should play an active role in guiding development towards sustainable solutions, but in doing so should take local circumstances into account, to reflect the character, needs and opportunities of each area.

3.2 Local Planning Policy

3.2.1 Manchester Core Strategy

Manchester's Core Strategy was adopted on the 11th July 2012 and remains the key document in the adopted Manchester Local Plan. It sets out the long-term strategic policies for Manchester's future development and will form the framework that planning applications will be assessed against.

Policy EN 4 - Reducing CO₂ Emissions by Enabling Low and Zero Carbon Development: The Council will seek to reduce fuel poverty and decouple growth in the economy, growth in CO₂ emissions, and rising fossil fuel prices, through the following actions:

All development must follow the principle of the Energy Hierarchy, being designed:

- To reduce the need for energy through design features that provide passive heating, natural-lighting and cooling;
- To reduce the need for energy through energy efficient features such as improved insulation and glazing; and,



- To meet residual energy requirements using low or zero carbon energy generating technologies.

Where possible new development and retrofit projects will be used as a mechanism to help improve energy efficiency and provide low and zero carbon energy supplies to existing buildings.

Where appropriate new development and retrofit projects will be required to connect to and / or make contributions to low or zero carbon energy schemes and / or to incorporate provision to enable future connection to any existing / potential decentralised energy schemes.

The use of building materials with low embodied carbon in new development and refurbishment schemes

Policy EN 5 - Strategic Areas for Low and Zero Carbon Decentralised Energy Infrastructure: Within Manchester it is considered that the following strategic areas, will have a major role to play in achieving an increase in the level of decentralised, low and zero carbon energy supplies available:

- The Regional Centre, which also includes the Oxford Road Corridor and Eastlands;
- District Centres and associated major development sites;
- Airport Strategic site;
- Strategic housing location; and,
- Strategic employment locations.

Within these areas new development, regeneration and retrofit projects will be expected to take place in the context of more detailed proposals for decentralised low and zero carbon energy infrastructure in the form of energy proposals plans.

Policy EN 6 - Target Framework for CO₂ Reductions from Low or Zero Carbon Energy Supplies: The Council requires applications for residential development of ten or more units and all other development over one thousand square metres to meet, as a minimum, the targets shown in the tables below, unless unviable.

Table 3.1 – Policy EN6 Non-Domestic CO₂ Emissions Reduction Targets

Target	% Minimum Requirements
Target One: Network development area	CHP/District heating anchor or connection or where not feasible a 15% increase on Part L 2010
Target Two: Electricity intense buildings	+10% increase on Part L 2010
Target Three: Micro generation area	+15% increase on Part L 2010

The scheme will be specified and constructed to comply with Building Regulations Part L, Approved Document Volume 2 (2021). Therefore, the scheme will significantly improve upon the minimum requirements stipulated in Policy EN6 which requests a 15% improvement upon 2010 regulations.



Policy EN 8 – Adaption to Climate Change requires all new development to be adaptable to climate change in terms of the design, layout, siting and function of both buildings and associated external spaces. In achieving developments which are adaptable to climate change developers should have regard to the following, although this is not an exhaustive list:

- Minimisation of flood risk by appropriate siting, drainage, and treatment of surface areas to ensure rainwater permeability;
- Reduction in urban heat island effect using green infrastructure such as green roofs, green walls, increased tree cover and waterways;
- The need to control overheating of buildings through passive design; and
- The opportunity to provide linked and diverse green space to enhance natural habitats which will assist species adaptation.

Developers will be permitted to use green infrastructure elements such as green roofs, green walls, street trees and waterways to contribute to compliance with CO₂ mitigation under Policy EN6, subject to sufficient evidence to quantify their contribution to compliance.

Policy EN9 - Green Infrastructure: New development will be expected to maintain existing green infrastructure in terms of its quantity, quality and multiple function. Where the opportunity arises, and in accordance with current green infrastructure strategies, the Council will encourage developers to enhance the quality and quantity of green infrastructure, improve the performance of its functions and create and improve linkages to and between areas of green infrastructure. Where the benefits of a proposed development are considered to outweigh the loss of an existing element of green infrastructure, the developer will be required to demonstrate how this loss will be mitigated in terms of quantity, quality, function and future management.

Policy EN14 – Flood Risk: The Council requires developments to:

- Be directed away from sites at the greatest risk of flooding, and towards sites with little or no risk of flooding; this should take account of all sources of flooding identified in the Manchester-Salford-Trafford Strategic Flood Risk Assessment (SFRA); and
- All new development should minimise surface water run-off, including through Sustainable Drainage Systems (SUDS) and the appropriate use of green infrastructure. Developers should have regard to the surface water run-off rates in the SFRA User Guide. In critical drainage areas, evidence to justify the surface water run-off approach / rates will be required.

Policy EN15 – Biodiversity and Geological Conservation: The Council will seek to maintain or enhance sites of biodiversity and geological value throughout the city.

Developers will be expected to identify and implement reasonable opportunities to enhance, restore or create new biodiversity, either on-site or adjacent to the site, contributing to linkages between valuable or potentially valuable habitat areas where appropriate, with reference to:

- The Manchester Biodiversity Strategy, which provides further details of priority habitats within Manchester and opportunities for biodiversity enhancement including corridors such as the Mersey, Medlock and Irk River valleys, the canals and disused railway lines, and areas of managed greenspace particularly in parks;



- The Green Infrastructure Framework for Greater Manchester, which encompasses an ecological framework that seeks to guide and inform habitat creation and repair, including identifying large 'biodiversity opportunity areas' including the Moston Brook Corridor and Nutsford Vale;
 - Manchester's Climate Change Action Plan;
 - The Strategic Flood Risk Assessment (SFRA) for Manchester;
 - The River Basin Management Plan for the North West; and,
 - The Manchester Tree Strategy.

Any adverse impacts on biodiversity will need to be justified against the wider benefits of the proposal, assessed against other Local Development Framework policies. Where adverse impacts are unavoidable, developers will be required to provide appropriate mitigation and / or compensation. Development should, wherever possible, seek to maintain, enhance or restore existing geology.

Policy EN16 – Air Quality: The Council will seek to improve the air quality within Manchester, and particularly within Air Quality Management Areas. Developers will be expected to take measures to minimise and mitigate the local impact of emissions from traffic generated by the development, as well as emissions created by the use of the development itself.

Policy EN17 – Water Quality: The Council require:

- New developments to avoid any adverse impact on water quality, including during the construction phase, and wherever possible should seek to enhance water quality, both chemical and ecological; and,
- Development should minimise surface water run-off from development and associated roads, and maximise the use of appropriate sustainable drainage systems, to minimise groundwater contamination, and to avoid pollutants reaching watercourses.

Policy EN19 – Waste: The Council will:

- Require all developers, including those of new waste management facilities within the district, to demonstrate the proposal's consistency with the principles of the waste hierarchy (prevention, reduction, re-use, recycling/composting, energy recovery, final disposal);
- Require all developers to submit a waste management plan to demonstrate how both construction and demolition waste will be minimised, and recycled on site wherever possible, and how the sustainable waste management needs of the end user will be met; and,
- Encourage communities to take responsibility for the waste they create through the provision of accessible facilities.

Policy DM1 – Development Management: All development should have regard to the following specific issues, for which more detailed guidance may be given within a supplementary planning document:

- Accessibility: buildings and neighbourhoods fully accessible to disabled people, access to new development by sustainable transport modes;



- Community safety and crime prevention;
- Design for health;
- Adequacy of internal accommodation and external amenity space;
- Refuse storage and collection;
- Effects relating to biodiversity, landscape, archaeological or built heritage;
- Green infrastructure including open space, both public and private;
- The use of alternatives to peat-based products in landscaping/gardens within development schemes;
- Flood risk and drainage and,
- Subject to scheme viability, developers will be required to demonstrate that new development incorporates sustainable construction techniques (In terms of energy targets this policy should be read alongside policy EN6 and the higher target will apply).

Policy T1 – Sustainable Transport: To deliver a sustainable, high quality, integrated transport system to encourage modal shift away from car travel to public transport, cycling and walking, to support the needs of residents and businesses and to prepare for carbon free modes of transport, the Council will support proposals that:

- Improve choice by developing alternatives to the car;
- Facilitate modes of transport that reduce carbon emissions e.g by incorporating charging points for electric vehicles, subject to their appropriate design and location;
- Would reduce the negative impacts of road traffic, for example, congestion, air pollution and road accident casualties; and,
- Take account of the needs of road users according to a broad hierarchy consisting of, in order of priority:
 1. pedestrians and disabled people
 2. cyclists, public transport,
 3. commercial access,
 4. general off peak traffic,
 5. general peak time traffic.

3.3 Guide to Development in Manchester, Supplementary Planning Document

Manchester's Core Strategy requires that all new residential developments should accord with the design guidance set out in the Supplementary Planning Documents (SPD). The Guide to Development in Manchester SPD was adopted on 11th April 2007 and supports and enhances the ongoing shaping of the city by providing a set of reasoned principles which will guide developers, designers and residents. These principles include a number of environmental standards, and includes the following categories which are identified in the SPD:

- | | |
|--|----------------------------|
| • Energy efficiency; | • Waste management; |
| • Renewable energy; | • Construction management; |
| • Environmental design; | • Biodiversity; and, |
| • Water management and weather resilience; | • Waterways. |



3.4 Manchester's Great Outdoors

The **Green and Blue Infrastructure Strategy for Manchester** aims to invest in the city's green and blue infrastructure over the next ten years (by 2025). Four objectives have been established to enable the vision to be achieved:

1. Improve the quality and function of existing green and blue Infrastructure, to maximise the benefits it delivers.
2. Use appropriate green and blue infrastructure as a key component of new developments to help create successful neighbourhoods and support the city's growth.
3. Improve connectivity and accessibility to green and blue infrastructure within the city and beyond.
4. Improve and promote a wider understanding and awareness of the benefits that green and blue infrastructure provides to residents, the economy and the local environment.

3.5 Climate Emergency

On 10th July 2019, a motion asking Manchester City Council (MCC) to formally declare a **climate emergency** was unanimously agreed. The motion declares that climate change is a serious risk to Manchester's future. Manchester is committed to embedding the issue as an integral part of council decision-making – making sure that all key decisions are taken with the city's target of becoming zero-carbon by 2038 in mind. The council has agreed the following:

- To deliver the 2038 zero carbon target and determine if an earlier target can be possible;
- Make climate breakdown and the environment an integral part of activity throughout the council, including all decision making, ensuring key decisions take into account the impact on achieving the zero-carbon target;
- Investigate and introduce measures to help reach domestic zero carbon levels, including addressing fuel poverty and retrofitting existing homes; and
- Investigate ways to ensure that future local plans place a mandatory requirement for all new development to be net zero carbon by the earliest possible date.

In March 2020 the Executive adopted the Manchester Climate Change Framework 2020-2025. The five-year framework sets out measures that MCC will take in order to reduce carbon emissions from its buildings, energy use and transport. Measures include retrofitting buildings to improve energy efficiency, increasing the use of electric vehicles, and seeking 100% renewable energy. Whilst this has also not been formally adopted into planning policy, it is a key consideration for future development proposals.

3.6 Emerging Policies

The Draft 'Places for Everyone' (PfE) Plan is a new long-term plan of nine Greater Manchester districts (Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Tameside, Trafford and Wigan) for jobs, new



homes, and sustainable growth. It has been prepared by the Greater Manchester Combined Authority on behalf of the nine districts.

The Draft Plan will determine the kind of development that takes place across the city-region, maximising the use of brownfield land and urban spaces while protecting green belt land from the risk of unplanned development. It will also ensure all new developments are sustainably integrated into Greater Manchester's transport network or supported by new infrastructure.

The nine Places for Everyone local planning authorities are now inviting views on the Modifications Consultation 2023 from 11th October 2023 and ending on 6th December 2023. The Plan is therefore considered to be in an advanced state of preparation.

3.7 Regulatory Framework

Building Regulations, Part L - Conservation of Fuel and Power sets the compliance standards for energy demand and carbon dioxide emissions from buildings. Guidance on how to meet the requirements of this regulation is provided within a number of approved documents. The relevant document is referenced below:

Approved Document Volume 2: In new buildings other than dwellings: Gives guidance on how to comply with Part L of Schedule 1 to the Building Regulations and the energy efficiency requirements for buildings other than dwellings. Part L 2021 standards are expected to achieve a 27% reduction in carbon emissions over the Part L2a 2013 regulations¹.

The minimum energy performance requirements shall be approved and expressed in accordance with the methodology for:

- New buildings, in the form of target CO₂ emission rates;
- New buildings, in the form of target fabric efficiency rates; and,
- New buildings in the form of target primary energy rates.

3.8 Applicable Targets

Based upon a review of relevant planning policy requirements, legislative drivers, and client priorities, the following list provides a brief precis of the key criteria that should be targeted for this development:

Manchester Core Strategy

- | | |
|--|---|
| <ul style="list-style-type: none"> • Policy EN 4 - Reducing CO₂ Emissions by Enabling Low and Zero Carbon Development • Policy EN 5 - Strategic Areas for low and zero carbon decentralised energy infrastructure • Policy EN 6 - Target Framework for CO₂ Reductions from Low or Zero | <ul style="list-style-type: none"> • Policy EN 8 – Adaption to Climate Change • Policy EN9 - Green Infrastructure • Policy EN14 – Flood Risk • Policy EN15 – Biodiversity and Geological Conservation • Policy EN16 – Air Quality |
|--|---|

¹ By virtue of complying with the current Part L requirements, this will significantly improve upon the Part L 2010 requirements stipulated within Policy EN6. To demonstrate, Part L 2013 required a 6% carbon emissions reduction over 2010. Whereas now the latest 2021 regulations require a 27% reduction over the previous 2013 regulations. Thereby cumulatively by complying with 2021 Part L regulations this will achieve a 33% emissions reduction over Building Regulations, Part L 2010.



- **Policy EN19** – Waste
- **Policy DM1** – Development Management
- **Policy T1** - Sustainable Transport

Guide to Development in Manchester, Supplementary Planning Document

The Green and Blue Infrastructure Strategy for Manchester

Manchester City Council Climate Emergency Declaration

Building Regulations, Part L - Approved Document Volume 2: Buildings other than Dwellings (2021 edition)



4. SUSTAINABILITY STATEMENT

This section provides an appraisal of the proposals and details the specific approach, design features and specifications which will contribute to reducing the environmental impact of the scheme.

4.1 Energy Performance

In order to limit energy demand and carbon dioxide (CO₂) emissions from the operation of the building, a number of design features will be integrated that will collectively contribute towards the emissions reduction target for the scheme.

Detailed measures are presented in Section 5 of this report, but in essence, the energy strategy proposed is an enhanced 'fabric led' solution coupled with the inclusion of an energy efficient servicing provision to maximise the buildings' performance.

The reduction in energy demand to meet the carbon reduction targets will be achieved through the following design measures and low carbon technology options:

- Improved thermal insulation;
- A low air permeability;
- Efficient air source heat pumps; and,
- Low energy lighting.

These measures will secure the carbon reduction targets sought by the local planning authority and **Building Regulations Part L: Approved Document Volume 2 (2021 edition)**.

4.2 Flood Risk and Surface Water Management

Data obtained from the Environment Agency was used to determine which flood zone the site is located within and the potential flood risk to the proposed development.

Figure 4.1 below presents the latest Environment Agency (EA) Flood Zone Map data which demonstrates that the site is located wholly within Flood Zone 1, demonstrating a low probability of flooding from rivers.

The nearest watercourse is the River Medlock, which is located approximately two hundred and thirty metres north of the site. As such, the risk of flooding to the new development from rivers is considered to be low.



Figure 4.1 – Environment Agency Flood Risk Zone Map



Figure 4.2 demonstrates that the area is at low risk from surface water flooding as well, with a chance of flooding of less than 0.1% each year.

Figure 4.2 – Extent of Flooding: Flood Risk from Surface Water



In accordance with **Policy EN14** the proposed development is not considered to be in an area at high risk of flooding.



4.2.1 Drainage Strategy

A drainage strategy has been produced by Alan Johnston Partnership Limited which outlines the following possible drainage solutions which will be utilised to manage any flood risk on site:

- Surface water will be discharged into the local sewage network;
- The new trees being planted as part of the landscaping proposal will increase infiltration rates and assist in reducing the risk associated with flooding caused by surface water runoff;
- Permeable surfaces have been proposed for public walkways on the east side of the development; and,
- Suitable systems of below ground drainage will be required to contain as a minimum requirement, the 1 in 30-year event. Additionally, any surface water run-off from events that exceed the design capacity of the new drainage system, up to and including the 1 in 100-year (+45%) event, will be retained on-site in safe storage areas.

These design solutions will assist in **minimising surface water run-off** on site in accordance with **Core Strategy Policy EN14**.

4.3 Materials

The proposals will contribute towards making more efficient use of non-renewable materials resources, and to reducing the lifecycle impact of materials used in construction. This is demonstrated by²:

- The Ramboll Group has conducted a whole life cycle assessment, in order to quantify the carbon impact associated with the proposed construction methods and materials, in line with the BREEAM MAT01 credit criteria;
- The key principals of a circular economy will be embedded throughout the design process, in order to maximise the longevity, flexibility and recoverability of the development and to reduce waste and energy consumption throughout both construction and occupation,
- Materials with a low environmental impact throughout their life cycle will be prioritised. Plus, materials with associated Environmental Performance Declarations (EPDs) will be favoured;
- Materials will be sourced in accordance with a Sustainable Procurement Plan (SPP). A SPP includes sustainability aims, objectives and strategic targets to guide procurement activities;
- Responsibly sourced materials from suppliers operating an Environmental Management System and procuring timber verified by either the Forest Stewardship Council (FSC) or Programme for the Endorsement of Forest Certification standard (PEFC) will be prioritised;
- Material selection will be carefully considered to avoid the use of toxic materials, such as Volatile Organic Compounds (VOCs) and contribute towards creating a healthy indoor environment;

² Further details are provided within the circular economy statement which supports this application.



- Excavated material (such as soil and substructural elements) from construction works will be used, where practical, for landscaping purposes.

Local sourcing of construction materials where feasible and viable will minimise the impact of carbon dioxide emissions associated with the transportation of materials. In addition to this, **materials with low levels of embodied carbon will be prioritised in accordance with Policy EN4.**

4.4 Water Efficiency

The proposed development will be designed to reduce mains / potable water consumption and will include the following water efficient designs and equipment:

- A water efficiency strategy will be determined for the site and will include for the provision of 'A' rated appliances as a minimum;
- In order to reduce water demand, the sanitary fixtures will be specified to achieve a calculated daily consumption of <110 litres/person/day;
- The scheme is targeting a 40% improvement over the BREEAM baseline specification. The baseline component specification is equivalent to the water efficiency of industry standard components, steered by the minimum levels required by the Water Supply (Water Fittings) Regulations(157) and Part G of the Building Regulations;
- A water meter on the mains water supply to the building will be specified to monitor and manage consumption.

Efficient water fixtures will be specified throughout the building such as low flow taps and dual flush WCs in order to reduce water consumption.

4.5 Ecology and Biodiversity

An Extended Phase One Habitat Survey and Biodiversity Net Gain Assessment has been carried out by Penny Anderson Associates limited. This provides an assessment of the ecological features on site and, provides recommendations to enhance the ecological status of the proposed scheme. In addition to this landscape proposals have been provided by Optimised Environments Limited and from both of these the following conclusions can be drawn:

- The existing mature Norway Maple tree, located at the southern end of Newcastle Street, is to be retained and its setting enhanced with new planting;
- New trees will be planted within the public realm and the inclusion of native species will be prioritised. The new trees will also provide seasonal interest and habitat opportunities for urban wildlife. This will further help to visually extend the established corridor of trees along Princess Road northwards, connecting First Street Block C to its surrounding green infrastructure context and enhancing this green link towards Manchester City Centre.
- A green roof will be installed as shown within Figure 4.3;



- The roof terrace will incorporate additional planting in the form of raised planters;
- If the design allows, then the inclusion of suitably designed bat roosting boxes/structures and bird nest boxes would support additional biodiversity across the site.

In accordance with Policy **EN15**, the BNG assessment carried out by Penny Anderson Associates Ltd states that the scheme is expected to provide a **+143.43% increase in biodiversity**.

Figures 4.3 and 4.4 present the proposed landscape plans for the scheme.

Figure 4.3 – Landscape Plan – Roof Terrace



Figure 4.3 – General Arrangement Landscape Plan

4.6 Waste Management

4.6.1 Construction Waste

Best practice techniques to prevent and minimise waste during the design and construction phase of the development will be adopted, as follows:

- Prior to commencement of the above ground construction phase, a site waste management plan (SWMP) will be produced by the developer to limit the on and off-site environmental impacts of construction:
- The SWMP will detail:
 - Recycled and secondary materials;
 - Waste reduction;
 - Waste segregation;
 - Waste recovery; and,
 - Waste disposal.
- This development will promote the minimisation of waste arising and seek to maximise the use of recycled materials in construction.

The **principal contractor** will implement sound environmental management practices and consideration for neighbouring sites during their activities on-site.



4.6.2 Operational Waste

The operational waste strategy for the scheme focuses on the segregation of waste at source, in order to maximise the potential for the residents to recycle. All residents will be informed on collection frequency, as well as guidance on local recycling facilities to assist with the management and storage of waste.

The proposed waste management strategy has been developed in compliance with the policies of Manchester City Council to optimise recycling rates:

- Waste will be segregated at source with the help of split bins to receive multiple streams of waste – general, recyclables and compost; and,
- Residents will have their waste collected by the building management company and transferred to the designated refuse area, to be collected by refuse operators on the designated collection day.

The proposed development will seek to **minimise waste and promote recycling**, during both construction and occupation.

4.7 Pollution

To reduce the schemes impact on the surrounding communities and environments, the proposals will include the following:

- The external lighting strategy will be designed to reduce unnecessary light pollution through effective design, energy consumption and nuisance to neighbouring properties;
- Pollution Prevention Guidance will be adhered to in respects of air (dust) and water (ground and surface) pollution during the demolition and construction phase;
- Dust suppression measures will also be put in place as part of the Main Contractor's Environmental Management Plan, such that any potential risks to watercourses or the neighbouring properties are minimised; and,

The principal contractor will put measures in place to ensure that the surrounding area will not be **polluted** as a direct result of the activities on site during the construction phase.

4.8 Health and Wellbeing

To enable the occupants of the proposed development to lead lower impact lifestyles and enhance their quality of life, the following measures will be delivered:

- The landscaped area will also facilitate natural surveillance and create busy, overlooked routes at the site to reduce the opportunity for crime, creating a safer and more secure environment;
- The proposed design will create a close community allowing residents to socialise;



- The client will also be submitting a Human Health Chapter as part of the ES, as well as a standalone Student Management Plan and Wellbeing Strategy.

Good levels of natural day lighting will be achieved within each unit. This will provide a good quality of life for the occupants and reduce the need for energy to light proposed development.

4.9 Transport

A transport Statement and Travel Plan has been produced by Sanderson Associates Consulting Engineers Limited and a review of the most appropriate and sustainable modes of transport has been conducted, in order to assess the feasibility of each transport option available to the future occupiers of the proposed car free development. The conclusions that can be drawn from this appraisal are as follows:

4.9.1 Public transport

- The closest bus is located north of the site, along Medlock Street (City Road East stop) approximately three hundred metres away.
- Deansgate – Castlefield tram stop is the closest Metrolink stop to the site, which can be accessed via a nine-minute walk.
- The nearest railway stations to the proposed development are Manchester Oxford Road and Deansgate, which can both be accessed within a six-to-eight-minute walk.

4.9.2 Cycling and Walking

- The proposed development will incorporate eighty-six cycle spaces as part of the free to hire bike scheme.
- A further twelve short stay visitor spaces will be provided within the public realm, within six Sheffield stands as part of the free to hire bike scheme.
- In addition to this, Downing will provide and promote a free to hire bike scheme at the site, providing eighty-three bikes.
- The site benefits from an excellent pedestrian infrastructure within the vicinity of the site. There are lit footways and crossing points linking the site to the surrounding area and the wider public realm.
- The general topography of area is reasonably flat, which should assist in encouraging visitors of the proposed development to travel by bike.
- There are also a range of local amenities within both suitable walking and cycling distances.

Due to the site's proximity to local amenities and the presence of public transport services within easy walking distance, **the site is considered to be well located to encourage trips to be made on foot, bicycle or via public transport.**



5. ENERGY STRATEGY

An energy strategy has been prepared by Abacus Consult Limited which outlines the approach to achieving compliance with both Building Regulations, Part L and Manchester City Councils carbon reduction targets stipulated within Policy EN6.

The strategy focuses on an enhanced building fabric specification allied to efficient servicing and controls, plus renewable energy technology in order to achieve compliance with latest new build carbon dioxide emission reduction and fabric energy efficiency targets stipulated by Building Regulation, Part L Approved Document Volume 2 and Manchester City Council.

Details of the proposed energy strategy are presented below and the Approved Document Part L report can be viewed in the appendix of this report:

5.1 Build Fabric and Thermal Performance

The standard measurement of heat transfer through a given building material or construction type is the U-value ($\text{W/m}^2\text{K}$). The lower the U-value, the more slowly heat transfers and is lost out of a building. In buildings, heat loss generally occurs through the following main areas and elements of the construction:

- Ground floor;
- External walls;
- Roofs;
- Doors and windows;
- Thermal bridging; and,
- Uncontrolled ventilation.

The proposed material specification that will be incorporated throughout the scheme to limit heat loss and ensure efficient operation of the building is presented in Table 5.1.

Table 5.1 – Proposed Fabric Specification

Item	Specification
Unitised Façade – Vision and Non-Vision panels	$U=0.90 \text{ W/m}^2\text{K}$
Solid Floor	$U=0.18 \text{ W/m}^2\text{K}$
Roof	$U=0.18 \text{ W/m}^2\text{K}$
Windows	G Value = 0.40
Design Air Permeability	$5.00 \text{ m}^3/\text{hm}^2 \text{ (@}50\text{Pa.)}$

This enhanced material specification and design will provide the following benefits:

- **High performance thermal insulation** will ensure low U-values for all heat loss elements and will minimise heat loss through the building's thermal envelope;



- **Thermally efficient, 'A' rated, double glazed windows** will be specified with argon gas fill and low emissivity coatings to limit heat loss through the pane. Thermal breaks will be incorporated within the frames of the vision panels to further limit heat loss. The glazing g value will be specified to optimise beneficial solar gains but limit the propensity for the building to overheat;
- **Low air tightness** (design air permeability targeting 5.00m³/hm²) will minimise uncontrolled ventilation. This will reduce heat losses and provide high levels of occupant comfort;

This enhanced fabric specification will **deliver a Building Regulation, Part L Approved Document Volume 2 (2021) compliant scheme for all aspects of the proposed development**. It ensures an inherently energy efficient development, focussing upon limiting demand side reductions in accordance with the energy hierarchy.

5.2 Building Services

The proposed mechanical and electrical specification that will be incorporated to ensure efficient servicing of the scheme is presented in Table 5.2.

Table 5.2 – Proposed Mechanical and Electrical Specification

Item	Specification
Lighting	100% 'Low E' / LED
Ventilation	MEV with trickle vents (assigned to – Cluster bedrooms, Studios and Cluster kitchen/lounges)
	MVHR (assigned to – Reception, Office/Management Suite)
	Mechanical extract (assigned to – WC's)
Space Heating	VRF heat pump systems (assigned to - management suites, amenity areas, clusters and studios).
Water Heating	Mitsubishi QAHV high temperature CO ₂ air source heat pumps serving hot water storage vessels.

The mechanical and electrical specification will provide the following benefits:

- **Low energy and LED lighting** - will be specified in order to maximise operational efficiencies and lifespan of the fittings. LEDs operate with an estimated energy efficiency of up to 90% when compared to traditional lighting and conventional light bulbs. This means that about c.90% of the electrical energy is converted to light, rather than wasted heat as in conventional bulbs.
- **VRF heat pumps** - Air Source Heat Pumps (space heating) are a low carbon solution that are ideal for non-residential spaces. They are a highly efficient method of producing heat as ASHPs collect low-grade heat from the air to supply useful heat for space heating requirements by applying additional energy input (in the form of electricity).
- **Mechanical Verification Heat Recovery (MVHR)** - systems will be specified to maintain a healthy living environment and further reduce the heat losses and the energy demand of each zone. The proposed MVHR system can recover heat from the extracted stale air from the rooms by



using a counter flow heat exchanger which 'pre-heats' cool incoming, fresh air. The outgoing and incoming air pass next to each other, but do not mix.

- **Intermittent Extract Ventilation** will be specified in the units, which will draw moisture laden, stale air out of the rooms and maintain a healthy living environment.

This mechanical and electrical specification **will deliver a Building Regulation Part L Approved Document Volume 2 (2021) compliant scheme** for all aspects of the proposed development.



6. PROPOSED RENEWABLE ENERGY SOLUTION

An analysis of the most appropriate renewable energy options has been undertaken to ensure compliance with Building Regulation Part L.

A number of renewable energy technologies have been considered for this site, including:

- Solar hot water;
- Photovoltaics (PV);
- Wind;
- Air source heat pumps;
- Ground source heat pumps; and,
- Biomass heating.

A review of the development proposals and site location concludes that the Photovoltaic Panels (PV) are feasible for this scheme, as detailed below in Table 6.1:

Table 6.1 – Renewable Technologies Review

Technology	Description	Advantages & Limitations	Feasibility
Solar Hot Water	Solar Hot Water utilises the energy in sunlight and diffuse daylight to heat water for use in buildings. The main component of any solar water heating system is the collector, which absorbs the radiant energy of the sun and converts it to heat energy.	<ul style="list-style-type: none"> ✓ Low maintenance. ✓ Feasible for small scale developments. 	<p>No - This technology is not considered to be a feasible option for this site as these solar thermal technologies make only a relatively limited contribution to reducing the building's energy demand and carbon dioxide emissions. Furthermore, there are potential problems associated with routing the pipework through the building.</p>
		<ul style="list-style-type: none"> ✗ Panels ideally facing south at 30° tilt for optimum efficiency. 	
Photovoltaics (PV)	Photovoltaic (PV) panels harness solar thermal energy and convert it into electricity which can then be used within a building. The panels may be roof or floor mounted and orientated in a southerly direction to enable this technology to operate efficiently.	<ul style="list-style-type: none"> ✓ Low maintenance. ✓ Easy to integrate into buildings design. ✓ Cost of PV is constantly dropping. 	<p>No – The incorporation of PV is technically a feasible option for this development; however, it is the design team's preference to achieve compliance using alternative technologies.</p>
		<ul style="list-style-type: none"> ✗ Panels ideally facing south at 30° tilt for optimum efficiency. ✗ Overshadowing will reduce performance. ✗ Can require significant roof space. 	



Technology	Description	Advantages & Limitations	Feasibility
Wind Turbines	Wind generation equipment harness the wind to turn a propeller and in doing so, drive an alternator to generate electricity. The turbines may be pole or roof mounted.	<ul style="list-style-type: none"> ✓ Low maintenance. ✓ Excess electricity can be exported to the grid. ✓ Vertical Axis Turbines can operate at wind speeds as low as 2m/s. ✗ A wind speed of at least 6m/s is typically required for traditional turbines to operate efficiently. ✗ Visual and noise impact risk. 	No – Wind turbines are considered unsuitable for this site due to a poor wind resource and lack of space to locate the turbines. Integrating these systems at height on the roof is not considered feasible due to the associated noise, vibration, and structural stresses upon the buildings. Furthermore, there are planning issues and perceived safety concerns with this technology.
Ground Source Heat Pumps	Ground Source Heat Pumps collect low-grade heat from the ground to supply useful heat for space and water heating requirements. By applying additional energy input (in the form of electricity), it is possible to raise the temperature of the source heat to the temperature required.	<ul style="list-style-type: none"> ✓ Highly tested and efficient technology ✓ Can be used for space and water heating. ✓ Lifespan of 20-25 years. ✗ Excavation works required for buried piping to be installed. ✗ Planning permission potentially required for installation. 	No – This technology is considered unsuitable for this site due to an insufficient area (based upon the proposed densities) to install a horizontal ground collector and the prohibitive costs and technical constraint of installing vertical boreholes.
Air Source Heat Pump	Air Source Heat Pumps collect low-grade heat from the air to supply useful heat for space and/or water heating requirements. They operate in the same way as a ground source heat pump, by applying additional energy input (in the form of electricity), it is possible to raise the temperature of the source heat to the temperature required.	<ul style="list-style-type: none"> ✓ Can be used for space and water heating. ✓ Highly tested and efficient technology ✓ Low maintenance. ✓ Lifespan of 20-25 years. ✗ Visual and noise impact risk. ✗ Reduced efficiency in cold conditions. ✗ Large outdoor space required for the heat pump unit. 	Yes – The incorporation of an air source heat pump is a technically feasible option for this development.
Biomass Heating	Biomass boilers typically burn wood chips or pellets as fuel to provide space heating and hot water.	<ul style="list-style-type: none"> ✓ Almost a carbon neutral technology. ✗ Frequent and large fuel deliveries. ✗ Large fuel store required. ✗ Regular maintenance. 	No – This technology is considered inappropriate for this type of development due to the need for a large fuel storage facility.



7. CARBON DIOXIDE EMISSIONS CALCULATIONS

In order to demonstrate the environmental benefits associated with the energy strategy for the proposed development, Abacus Limited have carried out a Simplified Building Energy Models (SBEM) Assessment using IES Virtual Environment software in order to demonstrate compliance with Building Regulations, Part L 2021 and 2010.

7.1 Regulated Energy Performance Calculations

Table 7.1 below presents a summary of the results, which show the Building Emission Rate (BER) and (regulated) energy demand performance associated with the proposed energy strategy for the building.

Table 7.1 – Calculated Regulated Building Emission Rates

	First Street
Building Emission Rate - BER (kgCO ₂ /m ² /yr.)	9.68
Building Target Emission Rate - TER (kgCO ₂ /m ² /yr.)	10.44
% DER Reduction over AD: Volume 2 (2021)	7.28
Building Primary Energy Rate - BPER (kWh/m ² /yr.)	105.02
Building Target Primary Energy Rate TPER (kWh/m ² /yr.)	113.93
% DPER Reduction over AD: Volume 2 (2021)	7.82

The student accommodation block will incorporate an enhanced material specification along with high quality design and construction standards, in order to improve the energy efficiency of the proposed development through a 'fabric led' energy strategy, allied to efficient renewable and low carbon technologies.

The proposed development **has the potential to secure a minimum carbon dioxide reduction rate of 7.28%**, thereby improving upon current Part L Volume 2 (2021) requirements.

7.1.1 Policy EN6 Domestic Carbon Dioxide (CO₂) Emissions Reduction Targets

Abacus Limited have also assessed compliance against Building Regulations Part L 2010, in order to demonstrate the requirements of Policy EN6 have been met as demonstrated below and further details are available in appendix A:

Policy EN 6 - Target Framework for CO₂ Reductions from Low or Zero Carbon Energy Supplies: The Council requires applications for developments over one thousand square metres to meet, as a minimum, the targets shown in the tables below, unless unviable.



Table 7.2 – Policy EN6 Domestic CO2 Emissions Reduction Targets

Target	% Minimum Requirements
Target One: Network development area	CHP/District heating anchor or connection or where not feasible a 15% increase on Part L 2010
Target Two: Electricity intense buildings	+15% increase on Part L 2010
Target Three: Micro generation area	+15% increase on Part L 2010

Table 7.3 below presents a summary of the results, which show the Building Emission Rate (BER) and (regulated) energy demand performance associated with the proposed energy strategy for the proposed scheme.

Table 7.3 – Calculated Regulated Building Emission Rates

	First Street
Building Emission Rate - BER (kgCO ₂ /m ² /yr.)	35
Building Target Emission Rate - TER (kgCO ₂ /m ² /yr.)	58.4
% DER Reduction over AD: Volume 2 (2021)	40.07

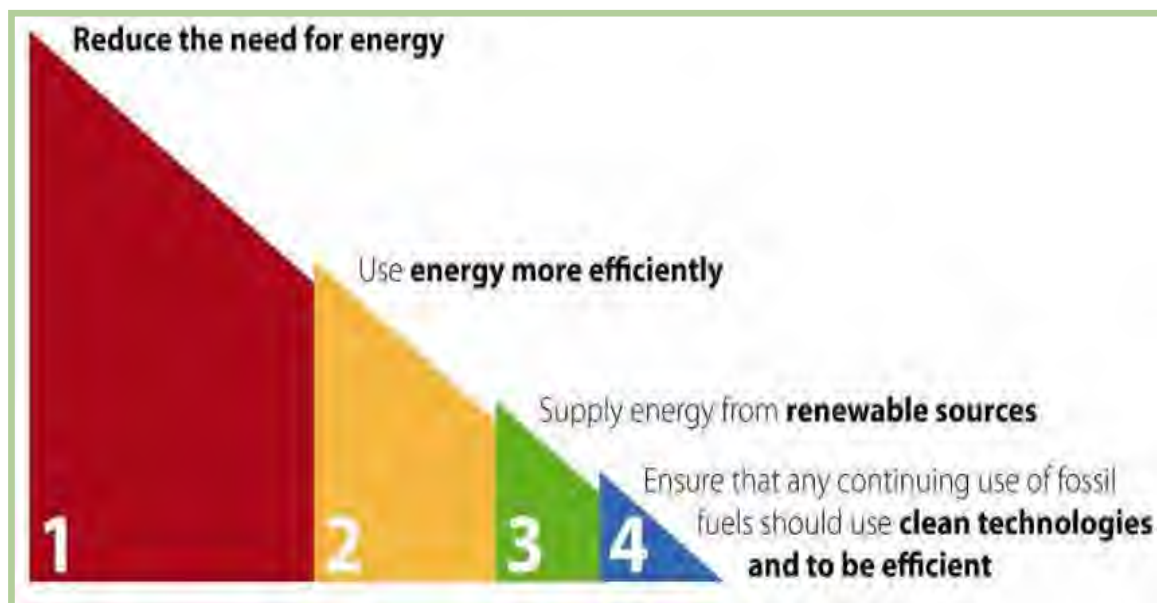
The proposed development **has the potential to secure a minimum carbon dioxide reduction rate of 40.07% relative to the current Part L (2021) compliance criteria**, thereby significantly improving upon the 2010 Part L requirements and Core Strategy EN6.

7.2 Energy Hierarchy

The Energy Hierarchy has been used as a framework to guide this energy strategy to achieve practical and cost-effective carbon emission reductions. It is intended that the construction, design and specification proposed for this scheme will deliver a building that is inherently efficient and cost-effective during occupation. The hierarchy prioritises such demand-side activities to reduce wastage and improve efficiency (see Figure 7.1).



Figure 7.1 – The Energy Hierarchy



First Principle

The student accommodation block will benefit from a material and design specification that is aligned with Building Regulation standards and includes numerous efficiency measures designed to reduce heat losses and minimise energy demand, including:

- ✓ High performance u - values;
- ✓ Efficient form of construction, limiting heat loss areas; and,
- ✓ Low design air permeability target.

This 'fabric led' approach to minimising energy demand and associated carbon dioxide emissions through the performance of the thermal envelope is aligned with the first principle of the energy hierarchy, which states that reduction in energy demand should be achieved initially by energy efficiency.

Second Principle

100% low energy and LED lighting provision and sophisticated control systems for the space and water heating will boost the operational efficiency of the development as per the second principle of the Energy Hierarchy.

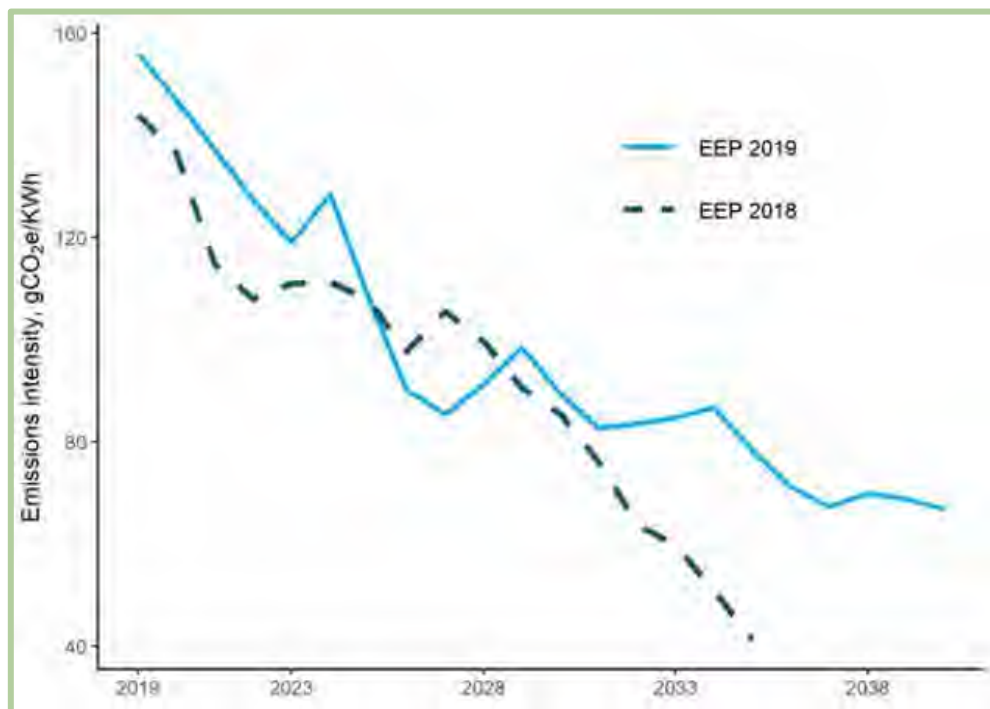
Third Principle

Variable Refrigerant Flow air source heat pumps will be installed to provide a low carbon heating solution as per the third principle of the Energy Hierarchy.

Fourth Principle

In support of this, as the UK electricity grids' CO₂ footprint continues to improve, so too would the carbon dioxide emissions associated with the operational phase of the proposed scheme which benefits from a 'full electric' energy strategy, see Figure 7,2 below.



Figure 7.2 – Energy and Emissions Projections 2020 (BEIS)

8. BREEAM PRE ASSESSMENT

BREEAM UK New Construction 2018 scheme is a performance-based assessment method and certification scheme for new non-domestic buildings. The primary aim of BREEAM UK New Construction is to mitigate the life cycle impact of new buildings on the environment in a robust and cost-effective manner. This is achieved through integration and the use of the scheme by clients and their project team at key stages in the design and construction process.

The building's performance is assessed under a number of categories, including:

- Energy;
- Water;
- Transport;
- Materials;
- Land Use;
- Pollution;
- Health and wellbeing; and
- Management.

The BREEAM rating benchmarks for BREEAM UK new construction projects assessed using the 2018 version 6.1 of BREEAM are presented in Table 8.1 below.

Table 8.1 – BREEAM Rating Benchmarks

BREEAM Rating	% Score Required
Outstanding	≥ 85
Excellent	≥ 70
Very Good	≥ 55
Good	≥ 45
Pass	≥ 30

There are minimum standards associated with the BREEAM 'Very Good' standard in terms of the building's energy and emission performance. However, to ensure that performance against fundamental environmental issues is not over-looked in pursuit of a particular rating, BREEAM sets minimum standards of performance in key areas e.g. energy, water, materials etc.

A BREEAM 'Very Good' rating requires the following minimum performance standards, see Table 8.2.

Table 8.2 – Mandatory 'Very Good' Standards

BREEAM NC 2018 Issues	Minimum Standards for BREEAM for 'Very Good' rating
MAN 4: Commissioning and Handover	One credit (commissioning-test schedule and responsibilities)
MAN 4: Commissioning and Handover	Criterion 11 (Building User Guide)



<i>ENE 2: Energy Monitoring</i>	<i>One credit (First sub metering credit)</i>
<i>WAT 1: Water Consumption</i>	<i>One credit</i>
<i>WAT 2: Water Monitoring</i>	<i>Criterion 1 only</i>
<i>MAT 3: Responsible Sourcing of Materials</i>	<i>Criterion 1 only</i>

8.1 Potential BREEAM Rating

A BREEAM UK 2018 Non-Domestic New Construction (multi residential) BREEAM Pre-assessment has been prepared by a qualified, licensed BREEAM Accredited Professional. This determines the feasible credits and potential BREEAM rating for the First Street scheme and demonstrates a commitment to the principles of good construction, design and sustainability.

Indicative BREEAM Score and Rating = 'Very Good'

Working alongside the qualified Accredited Professional, the technical design team has reviewed the individual credit criteria and award of credits within the Pre-assessment in order to optimise the building's BREEAM performance. All credits allocated within this BREEAM Pre-assessment will require further technical verification and additional feasibility assessment during the formal Design Stage and Post Construction BREEAM assessment.

The BREEAM Pre-assessment (presented in the Appendix of this Statement) shows that the buildings are expected to perform as follows:

- Indicative building BREEAM score = **59.31%** (*minimum required for BREEAM 'Very Good' = 55%*)
- Indicative BREEAM rating = Potential for **BREEAM 'Very Good' rating**.

Following an initial review of the proposals the BREEAM New Construction Pre-assessment report demonstrates that the proposed development is able, in principle, to meet all mandatory credit requirements and achieve an overall BREEAM 'Very Good' rating for the proposed scheme.

Note that a number of assumptions have been made within this initial appraisal which will require confirmation by means of further technical input during the formal assessment, once the design and specifications are finalised. The approach to achieving the target BREEAM rating may, therefore, be subject to change further into the development cycle.



9. CLIMATE CHANGE EMERGENCY

On 10th July 2019, a motion asking Manchester City Council (MCC) to formally declare a **climate emergency** was unanimously agreed. In support of this, the developer wishes to highlight the following measures that will form part of the specification of this development:

- An energy strategy that exceeds Building Regulations, Part L Approved Document Volume 2 (2021), in relation to reducing carbon emissions and minimising energy consumption;
- The proposed strategy will also improve upon standards targeted within Core Strategy Policy EN6 which relates to Building Regulations Part L 2010.
- A site waste management plan (SWMP) will be produced by the developer to limit the on and off-site environmental impacts of construction waste.
- The student accommodation block will be designed to incorporate features that will serve to reduce energy demand, and in turn, carbon emissions arising from access to the building:
 - Variable refrigerant flow air source heat pumps;
 - MVHR; and,
 - LED lighting.
- The site is well located to encourage trips to be made on foot, by bike or via public transport. This is facilitated by:
 - Bus stop being accessible along Medlock Street;
 - The nearest tram stop is Deansgate Castlefield, which can be accessed via a nine-minute walk;
 - Manchester Oxford Road and Deansgate Station can be accessed via a short cycle or within a six-to-eight-minute walk;
 - The incorporation of eighty-six cycle spaces;
 - A further twelve short stay visitor spaces will be provided within the public realm in the form of six Sheffield stands; and,
 - Downing will provide and promote a free to hire bike scheme at the site, providing eighty-three bikes.

These commitments, in combination, seek to work towards the carbon reduction target of no more than 1.5°C global temperature increase and assist the council in meeting their Climate Change Emergency objectives.



10. CONCLUSION

This Statement has reviewed the sustainability performance of the proposed First Street, Plot 11, Block C development against national and local planning policies. The conclusions that may be drawn from the review are as per the following:

Sustainability Performance –

- The scheme is expected to achieve a BREEAM rating of ‘Very Good’ with an expected score of 59.31%. This represents the top 25% of UK new non-domestic buildings (advanced good practice)
- The scheme will be specified with **efficient water fixtures and controls**. This will achieve a calculated daily consumption of <110 litres/person/day.
- This scheme promotes access to sustainable modes of transport which will contribute towards creating a highly connected and sustainable development in accordance with **Policy T1**.
- Downing will provide and **promote a free to hire bike scheme at the site, providing eighty-three bikes**. The proposed development will incorporate **eighty-six cycle spaces**, with the addition of six Sheffield stands within the wider public realm, as part of the free to hire bike scheme.
- The site is in an area at low risk from flooding, with it being **located within a Flood Risk Zone 1** in accordance with **Policy EN14**.
- Waste arising during construction will be minimised through the **implementation of a Site Waste Management Plan (SWMP) in accordance with Policy EN19**. The SWMP will be used to ensure that there is adequate management, and that storage of construction waste takes place in line with the Council’s policies. Opportunities for the possible recycling of construction from excavation works will also be considered.
- **A Refuse Management Strategy** has been developed to manage waste and recyclables from the operational phase of the development. Source segregation will encourage the individuals to recycle and **divert waste away from landfills**.
- **Materials with low environmental impact** will be selected and local suppliers will be prioritised where possible in accordance with **Policy EN4**.
- **A whole life cycle assessment has been conducted** to assess the environmental impact associated with the construction of the proposed development in line with the **BREEAM MAT01 credit requirements**.
- **Permeable surfaces will be included** within public walkways on the east side of the development to assist with the management of surface water drainage.

Energy Strategy –

The scheme will be designed and specified in accordance with **the principles of the energy hierarchy** and improves upon the **carbon dioxide (CO₂) reduction targets and guidance set by Manchester City Council**:



- The proposed scheme has the **potential to secure a minimum carbon dioxide reduction rate of 7.28%**, thereby improving upon current Part L Volume 2 (2021).
- In response to **Manchester City Councils Core Strategy Policy EN6**, the development is expected to achieve a **40.07% reduction in carbon emissions when assessed against Part L 2010**, thereby significantly exceeding the policy requirement of 15% target.
- The proposed material and mechanical specification will **provide various benefits** including; **upgraded thermal insulation**, efficient mechanical servicing, and low energy lighting.
- The scheme will integrate **efficient air source heat pumps** and MVHR system in order to limit the carbon emissions arising from the scheme.

Furthermore, the proposals accord with the aims of the National Planning Policy Framework, as follows:

- The **re-use of the piece of land** will provide a development that inherently supports **sustainable accommodation space with access to local amenities and sustainable modes of transport**. The reuse of the site is also an efficient use of land and resources;
- **Construction practices that minimise adverse impacts on the environment** will be adhered to including a waste management strategy to reduce the quantity of waste generated, and to increase re-use and recycling, a commitment will be made to minimise waste and pollution; and,
- **Improving upon the regulatory Part L compliance criteria** will assist in lessening the impact of this development on the environment by way of reducing carbon emissions.

In conclusion, the proposed development will deliver a quality development that accords with the guidance provided within Manchester Core Strategy as well as national planning and regulatory standards.



Appendix A – Abacus Part L Report



First Street South, Block C

Mechanical & Electrical Services

AD Part L Report



Project Number:	L1513
Document Ref:	L1513-ABA-ZC-ZZ-RP-M-57001
Engineer:	P.Abel/ S. Boswarva
Revision:	P02
Issue Date:	24-10-2023

Abacus Consult Limited

First Street South, Block C, AD Part L Report

Project: **First Street South, Block C, Student Accommodation, Manchester**

Subject: Stage 2 M&E Concept Design – AD Part L Report

Prepared for: Downing Living (Manchester South) Limited Partnership Incorporated

Revision	Issue/Revision Description	Prepared By	Approved By	Issue Date
P01	Issued for Planning Approval	P. Abel	P. Abel S. Boswarva	13/10/2023
P02	2010 BRUKL Results Included	P. Abel	P. Abel S. Boswarva	24/10/2023

CONTENTS

- 1.0 Introduction & Input Data
- 2.0 Results
- 3.0 Block C As Designed BRUKL

1.0 Introduction & Input Data

This report forms part of the full planning application for First Street Block C Student Accommodation development in Manchester City Centre. The report is intended to set out the principles of the building services systems in accordance with Building Regulations and Manchester City Council Plan Policy EN6.

Downing intend to submit planning for the erection of 1no. student accommodation block 28 storeys with associated amenity areas. The total number of beds will be 555, 56% of which will be studios with the remaining 44% cluster bedrooms.

This executive summary details the input data used and the results of the dynamic simulation and Part L2 calculations. The key points are highlighted in the summary below: -

- The following U-Values have been used in the simulation/calculations: -

Unitised Façade (non-vision)	=	0.9 W/m ² K
Unitised Façade (vision)	=	0.9 W/m ² K
Solid Floor	=	0.18 W/m ² K
Roof	=	0.18 W/m ² K

Window Frames assumed 50mm

- Windows

G Value	=	0.4
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- Weather data file used for calculations is CIBSE DSY1 2020s, high emissions 50th percentile for Manchester.
- Lighting Gains are based on previous similar projects and will be finalised upon completion of calculations.
- Air Permeability is based on maximum 5.0 m³/m².Hr at 50Pa.
- Ventilation is via MVHR and MEV systems as detailed in Abacus Consult Ventilation Strategy. Fan SFP's are currently based on worst case and will be finalised at as-built stage.
- Mechanical heating and cooling via VRF heat pump systems to management suites, amenity areas, clusters and studios.
- Domestic hot water production via Mitsubishi QAHV high temperature CO₂ air source heat pumps serving hot water storage vessels.

2.0 Results

The development meets the Manchester City Council's Plan (MCCP) requirement for at least 15% reduction in Part L 2010 carbon emissions from renewable and or low carbon technologies, as demonstrated below.

- Part L2 2021 CO₂ target emissions (TER) and predicted building emissions (BER) are as follows: -

Block C 19,212 m²

Target Emissions Rate	=	10.44 kgCO ₂ /m ² /yr
Building Emissions Rate	=	9.68 kgCO ₂ /m ² /yr
Project Carbon Reduction	=	7 % (40% over Part L 2010)

AD Part L 2010 Result

BRUKL Output Document

Compliance with England and Wales Building Regulations Part L 2010

 HM Government

Project name

First Street Block C
As designed

Date: Tue Oct 24 11:34:00 2023

Administrative information

Building Details

Address: Manchester,

Certification tool

Calculation engine: Apache

Calculation engine version: 6.4.0.16

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 6.4.0.16

BRUKL compliance check version: v4.1.h.0

Certifier details

Name:

Telephone number:

Address: , ,

Criterion 1: The calculated CO₂ emission rate for the building should not exceed the target

1.1	CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	58.4
1.2	Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	58.4
1.3	Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	35
1.4	Are emissions from the building less than or equal to the target?	BER ≤ TER
1.5	Are as built details the same as used in the BER calculations?	Separate submission

3.0 Block C 'As Designed' 2021 BRUKL

Project name

First Street Block C

As designed

Date: Wed Sep 13 09:21:36 2023

Administrative information

Building Details

Address: Manchester,

Certifier details

Name:

Telephone number:

Address:

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.22

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.22

BRUKL compliance module version: v6.1.e.1

Foundation area [m²]: 404.02The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	10.44
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	9.68
Target primary energy rate (TPER), kWh _{pe} /m ² annum	113.93
Building primary energy rate (BPER), kWh _{pe} /m ² annum	105.02
Do the building's emission and primary energy rates exceed the targets?	BER ≤ TER BPER ≤ TPER

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

Fabric element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	-	-	UNKNOWN
Floors	0.18	0.18	0.18	ST000000:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.18	0.18	ST000195:Surf[0]
Windows** and roof windows	1.6	0.9	0.9	ST000000:Surf[3]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.6	1.6	CY000000:Surf[1]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

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

* 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. *** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

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

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	5

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

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- VRF – MEV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	5.7	11.3	0	2	-
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

2- VRF – MVHR

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	5.7	11.3	0	2	0.8
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

1- DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	3.33	0.002
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
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 balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1			
Studio 3	-	-	0.1	-	-	-	-	-	-	-	-	N/A
Studio 4	-	-	0.1	-	-	-	-	-	-	-	-	N/A
Studio 5	-	-	0.1	-	-	-	-	-	-	-	-	N/A
Studio 6	-	-	0.1	-	-	-	-	-	-	-	-	N/A
Studio 7	-	-	0.1	-	-	-	-	-	-	-	-	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	2.3	2	0.5	0.5	0.4	1	Zone	Standard
Studio 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 9		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Studio		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 10		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 11		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 6		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Cluster Bedroom		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 6		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 9		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Studio		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 10		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 11		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 6		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Cluster Bedroom		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 4		-	-	0.1	-	-	-	-	-	-	-	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	2.3	2	0.5	0.5	0.4	1	Zone	Standard
Studio 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 6		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 9		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Studio		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 10		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 11		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 6		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Cluster Bedroom		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 6		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 9		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Studio		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 10		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 11		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 6		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Cluster Bedroom		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 1		-	-	0.1	-	-	-	-	-	-	-	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	2.3	2	0.5	0.5	0.4	1	Zone	Standard	
Cluster Bedroom 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 3	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 4	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 5	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 6	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 7	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 8	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 9	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Acc. Studio	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 10	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 11	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 8	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 7	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 6	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 5	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Kitchen 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 4	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 3	-	-	0.1	-	-	-	-	-	-	-	N/A	
Acc. Cluster Bedroom	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Kitchen 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 3	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 4	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 5	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 6	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 7	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 8	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 9	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Acc. Studio	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 10	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 11	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 8	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 7	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 6	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 5	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Kitchen 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 4	-	-	0.1	-	-	-	-	-	-	-	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	2.3	2	0.5	0.5	0.4	1	Zone	Standard	
Cluster Bedroom 3	-	-	0.1	-	-	-	-	-	-	-	N/A	
Acc. Cluster Bedroom	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Kitchen 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 3	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 4	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 5	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 6	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 7	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 8	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 9	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Acc. Studio	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 10	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 11	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 8	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 7	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 6	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 5	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Kitchen 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 4	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 3	-	-	0.1	-	-	-	-	-	-	-	N/A	
Acc. Cluster Bedroom	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Kitchen 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 3	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 4	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 5	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 6	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 7	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 8	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 9	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Acc. Studio	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 10	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 11	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 8	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 7	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 6	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 5	-	-	0.1	-	-	-	-	-	-	-	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	2.3	2	0.5	0.5	0.4	1	Zone	Standard	
Cluster Bedroom 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Kitchen 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 4	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 3	-	-	0.1	-	-	-	-	-	-	-	N/A	
Acc. Cluster Bedroom	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Kitchen 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 3	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 4	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 5	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 6	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 7	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 8	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 9	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Acc. Studio	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 10	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 11	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 8	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 7	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 6	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 5	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Kitchen 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 4	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 3	-	-	0.1	-	-	-	-	-	-	-	N/A	
Acc. Cluster Bedroom	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Kitchen 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 3	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 4	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 5	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 6	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 7	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 8	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 9	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Acc. Studio	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 10	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 11	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 8	-	-	0.1	-	-	-	-	-	-	-	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	2.3	2	0.5	0.5	0.4	1	Zone	Standard	
Cluster Bedroom 7	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 6	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 5	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Kitchen 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 4	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 3	-	-	0.1	-	-	-	-	-	-	-	N/A	
Acc. Cluster Bedroom	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Kitchen 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 3	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 4	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 5	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 6	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 7	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 8	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 9	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Acc. Studio	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 10	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 11	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 8	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 7	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 6	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 5	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Kitchen 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 4	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 3	-	-	0.1	-	-	-	-	-	-	-	N/A	
Acc. Cluster Bedroom	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Kitchen 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 3	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 4	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 5	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 6	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 7	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 8	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 9	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Acc. Studio	-	-	0.1	-	-	-	-	-	-	-	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	2.3	2	0.5	0.5	0.4	1	Zone	Standard
Studio 10		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 11		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 6		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Cluster Bedroom		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 6		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 9		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Studio		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 10		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 11		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 6		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Cluster Bedroom		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 6		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 9		-	-	0.1	-	-	-	-	-	-	-	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	2.3	2	0.5	0.5	0.4	1	Zone	Standard
Studio 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Studio		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 10		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 11		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 6		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Cluster Bedroom		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 6		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 9		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Studio		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 10		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 11		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 6		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Cluster Bedroom		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 6		-	-	0.1	-	-	-	-	-	-	-	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	2.3	2	0.5	0.5	0.4	1	Zone	Standard
Studio 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 9		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Studio		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 10		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 11		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 6		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Cluster Bedroom		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 6		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 9		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Studio		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 10		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 11		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 6		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Cluster Bedroom		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 3		-	-	0.1	-	-	-	-	-	-	-	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	2.3	2	0.5	0.5	0.4	1	Zone	Standard
Studio 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 6		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 9		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Studio		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 10		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 11		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 6		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Cluster Bedroom		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 6		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 9		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Studio		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 10		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 11		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 6		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Cluster Bedroom		-	-	0.1	-	-	-	-	-	-	-	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	2.3	2	0.5	0.5	0.4	1	Zone	Standard	
Cluster Kitchen 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 3	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 4	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 5	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 6	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 7	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 8	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 9	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Acc. Studio	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 10	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 11	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 8	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 7	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 6	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 5	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Kitchen 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 4	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 3	-	-	0.1	-	-	-	-	-	-	-	N/A	
Acc. Cluster Bedroom	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Kitchen 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 3	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 4	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 5	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 6	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 7	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 8	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 9	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Acc. Studio	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 10	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 11	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 8	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 7	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 6	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 5	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Kitchen 2	-	-	0.1	-	-	-	-	-	-	-	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	2.3	2	0.5	0.5	0.4	1	Zone	Standard	
Cluster Bedroom 4	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 3	-	-	0.1	-	-	-	-	-	-	-	N/A	
Acc. Cluster Bedroom	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Kitchen 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 3	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 4	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 5	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 6	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 7	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 8	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 9	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Acc. Studio	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 10	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 11	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 8	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 7	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 6	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 5	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Kitchen 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 4	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 3	-	-	0.1	-	-	-	-	-	-	-	N/A	
Acc. Cluster Bedroom	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Kitchen 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 3	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 4	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 5	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 6	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 7	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 8	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 9	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 2	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 1	-	-	0.1	-	-	-	-	-	-	-	N/A	
Acc. Studio	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 10	-	-	0.1	-	-	-	-	-	-	-	N/A	
Studio 11	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 8	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 7	-	-	0.1	-	-	-	-	-	-	-	N/A	
Cluster Bedroom 6	-	-	0.1	-	-	-	-	-	-	-	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	2.3	2	0.5	0.5	0.4	1	Zone	Standard
Cluster Bedroom 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Cluster Bedroom		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 6		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 9		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Studio		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 10		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 11		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 6		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Cluster Bedroom		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 6		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 9		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Studio		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 12		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 11		-	-	0.1	-	-	-	-	-	-	-	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	2.3	2	0.5	0.5	0.4	1	Zone	Standard
Cluster Bedroom 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 6		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Cluster Bedroom		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 6		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 9		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Studio		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 10		-	-	0.1	-	-	-	-	-	-	-	N/A
Studio 11		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 8		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 7		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 6		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 5		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 2		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 4		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 3		-	-	0.1	-	-	-	-	-	-	-	N/A
Acc. Cluster Bedroom		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Kitchen 1		-	-	0.1	-	-	-	-	-	-	-	N/A
Cluster Bedroom 1		-	-	0.1	-	-	-	-	-	-	-	N/A

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Studio 3		95	95	1.579
Studio 4		95	95	1.579
Studio 5		95	95	1.579
Studio 6		95	95	1.579
Studio 7		95	95	1.579

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Studio 8		95	95	1.579
Studio 9		95	95	1.579
Store		95	-	-
Riser		95	-	-
Riser		95	-	-
Corridor		95	-	-
Lift		95	-	-
Lift		95	-	-
Riser		95	-	-
Riser		95	-	-
Stair		95	-	-
Studio 2		95	95	1.579
Studio 1		95	95	1.579
Acc. Studio		95	95	1.579
Studio 10		95	95	1.579
Studio 11		95	95	1.579
Cluster Bedroom 8		95	-	-
Cluster Bedroom 7		95	-	-
Cluster Bedroom 6		95	-	-
Cluster Bedroom 5		95	-	-
WC S1		95	-	-
WC S2		95	-	-
WC S3		95	-	-
WC S4		95	-	-
WC S5		95	-	-
WC S6		95	-	-
WC S7		95	-	-
WC S8		95	-	-
WC S9		95	-	-
WC AS		95	-	-
WC S10		95	-	-
WC S11		95	-	-
WC C8		95	-	-
WC C7		95	-	-
WC C6		95	-	-
WC C5		95	-	-
Store		95	-	-
Store		95	-	-
Lift		95	-	-
Stairs		95	-	-
Corridor		95	-	-
Cluster Bedroom 2		95	-	-
Cluster Kitchen 2		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Cluster Bedroom 4		95	-	-
Cluster Bedroom 3		95	-	-
Acc. Cluster Bedroom		95	-	-
Cluster Kitchen 1		95	-	-
Cluster Bedroom 1		95	-	-
WC C1		95	-	-
WC C2		95	-	-
WC C3		95	-	-
WC C4		95	-	-
WC ACB		95	-	-
Corridor		95	-	-
Corridor		95	-	-
Studio 3		95	95	1.579
Studio 4		95	95	1.579
Studio 5		95	95	1.579
Studio 6		95	95	1.579
Studio 7		95	95	1.579
Studio 8		95	95	1.579
Studio 9		95	95	1.579
Store		95	-	-
Riser		95	-	-
Riser		95	-	-
Corridor		95	-	-
Lift		95	-	-
Lift		95	-	-
Riser		95	-	-
Riser		95	-	-
Stair		95	-	-
Studio 2		95	95	1.579
Studio 1		95	95	1.579
Acc. Studio		95	95	1.579
Studio 10		95	95	1.579
Studio 11		95	95	1.579
Cluster Bedroom 8		95	-	-
Cluster Bedroom 7		95	-	-
Cluster Bedroom 6		95	-	-
Cluster Bedroom 5		95	-	-
WC S1		95	-	-
WC S2		95	-	-
WC S3		95	-	-
WC S4		95	-	-
WC S5		95	-	-
WC S6		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
WC S7		95	-	-
WC S8		95	-	-
WC S9		95	-	-
WC AS		95	-	-
WC S10		95	-	-
WC S11		95	-	-
WC C8		95	-	-
WC C7		95	-	-
WC C6		95	-	-
WC C5		95	-	-
Store		95	-	-
Store		95	-	-
Lift		95	-	-
Stairs		95	-	-
Corridor		95	-	-
Cluster Bedroom 2		95	-	-
Cluster Kitchen 2		95	-	-
Cluster Bedroom 4		95	-	-
Cluster Bedroom 3		95	-	-
Acc. Cluster Bedroom		95	-	-
Cluster Kitchen 1		95	-	-
Cluster Bedroom 1		95	-	-
WC C1		95	-	-
WC C2		95	-	-
WC C3		95	-	-
WC C4		95	-	-
WC ACB		95	-	-
Corridor		95	-	-
Corridor		95	-	-
Studio 3		95	95	1.579
Studio 4		95	95	1.579
Studio 5		95	95	1.579
Studio 6		95	95	1.579
Studio 7		95	95	1.579
Studio 8		95	95	1.579
Studio 9		95	95	1.579
Store		95	-	-
Riser		95	-	-
Riser		95	-	-
Corridor		95	-	-
Lift		95	-	-
Lift		95	-	-
Riser		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Riser		95	-	-
Stair		95	-	-
Studio 2		95	95	1.579
Studio 1		95	95	1.579
Acc. Studio		95	95	1.579
Studio 10		95	95	1.579
Studio 11		95	95	1.579
Cluster Bedroom 8		95	-	-
Cluster Bedroom 7		95	-	-
Cluster Bedroom 6		95	-	-
Cluster Bedroom 5		95	-	-
WC S1		95	-	-
WC S2		95	-	-
WC S3		95	-	-
WC S4		95	-	-
WC S5		95	-	-
WC S6		95	-	-
WC S7		95	-	-
WC S8		95	-	-
WC S9		95	-	-
WC AS		95	-	-
WC S10		95	-	-
WC S11		95	-	-
WC C8		95	-	-
WC C7		95	-	-
WC C6		95	-	-
WC C5		95	-	-
Store		95	-	-
Store		95	-	-
Lift		95	-	-
Stairs		95	-	-
Corridor		95	-	-
Cluster Bedroom 2		95	-	-
Cluster Kitchen 2		95	-	-
Cluster Bedroom 4		95	-	-
Cluster Bedroom 3		95	-	-
Acc. Cluster Bedroom		95	-	-
Cluster Kitchen 1		95	-	-
Cluster Bedroom 1		95	-	-
WC C1		95	-	-
WC C2		95	-	-
WC C3		95	-	-
WC C4		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
WC ACB		95	-	-
Corridor		95	-	-
Corridor		95	-	-
Studio 3		95	95	1.579
Studio 4		95	95	1.579
Studio 5		95	95	1.579
Studio 6		95	95	1.579
Studio 7		95	95	1.579
Studio 8		95	95	1.579
Studio 9		95	95	1.579
Store		95	-	-
Riser		95	-	-
Riser		95	-	-
Corridor		95	-	-
Lift		95	-	-
Lift		95	-	-
Riser		95	-	-
Riser		95	-	-
Stair		95	-	-
Studio 2		95	95	1.579
Studio 1		95	95	1.579
Acc. Studio		95	95	1.579
Studio 10		95	95	1.579
Studio 11		95	95	1.579
Cluster Bedroom 8		95	-	-
Cluster Bedroom 7		95	-	-
Cluster Bedroom 6		95	-	-
Cluster Bedroom 5		95	-	-
WC S1		95	-	-
WC S2		95	-	-
WC S3		95	-	-
WC S4		95	-	-
WC S5		95	-	-
WC S6		95	-	-
WC S7		95	-	-
WC S8		95	-	-
WC S9		95	-	-
WC AS		95	-	-
WC S10		95	-	-
WC S11		95	-	-
WC C8		95	-	-
WC C7		95	-	-
WC C6		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
WC C5		95	-	-
Store		95	-	-
Store		95	-	-
Lift		95	-	-
Stairs		95	-	-
Corridor		95	-	-
Cluster Bedroom 2		95	-	-
Cluster Kitchen 2		95	-	-
Cluster Bedroom 4		95	-	-
Cluster Bedroom 3		95	-	-
Acc. Cluster Bedroom		95	-	-
Cluster Kitchen 1		95	-	-
Cluster Bedroom 1		95	-	-
WC C1		95	-	-
WC C2		95	-	-
WC C3		95	-	-
WC C4		95	-	-
WC ACB		95	-	-
Corridor		95	-	-
Corridor		95	-	-
Studio 3		95	95	1.579
Studio 4		95	95	1.579
Studio 5		95	95	1.579
Studio 6		95	95	1.579
Studio 7		95	95	1.579
Studio 8		95	95	1.579
Studio 9		95	95	1.579
Store		95	-	-
Riser		95	-	-
Riser		95	-	-
Corridor		95	-	-
Lift		95	-	-
Lift		95	-	-
Riser		95	-	-
Riser		95	-	-
Stair		95	-	-
Studio 2		95	95	1.579
Studio 1		95	95	1.579
Acc. Studio		95	95	1.579
Studio 10		95	95	1.579
Studio 11		95	95	1.579
Cluster Bedroom 8		95	-	-
Cluster Bedroom 7		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Cluster Bedroom 6		95	-	-
Cluster Bedroom 5		95	-	-
WC S1		95	-	-
WC S2		95	-	-
WC S3		95	-	-
WC S4		95	-	-
WC S5		95	-	-
WC S6		95	-	-
WC S7		95	-	-
WC S8		95	-	-
WC S9		95	-	-
WC AS		95	-	-
WC S10		95	-	-
WC S11		95	-	-
WC C8		95	-	-
WC C7		95	-	-
WC C6		95	-	-
WC C5		95	-	-
Store		95	-	-
Store		95	-	-
Lift		95	-	-
Stairs		95	-	-
Corridor		95	-	-
Cluster Bedroom 2		95	-	-
Cluster Kitchen 2		95	-	-
Cluster Bedroom 4		95	-	-
Cluster Bedroom 3		95	-	-
Acc. Cluster Bedroom		95	-	-
Cluster Kitchen 1		95	-	-
Cluster Bedroom 1		95	-	-
WC C1		95	-	-
WC C2		95	-	-
WC C3		95	-	-
WC C4		95	-	-
WC ACB		95	-	-
Corridor		95	-	-
Corridor		95	-	-
Studio 3		95	95	1.579
Studio 4		95	95	1.579
Studio 5		95	95	1.579
Studio 6		95	95	1.579
Studio 7		95	95	1.579
Studio 8		95	95	1.579

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Studio 9		95	95	1.579
Store		95	-	-
Riser		95	-	-
Riser		95	-	-
Corridor		95	-	-
Lift		95	-	-
Lift		95	-	-
Riser		95	-	-
Riser		95	-	-
Stair		95	-	-
Studio 2		95	95	1.579
Studio 1		95	95	1.579
Acc. Studio		95	95	1.579
Studio 10		95	95	1.579
Studio 11		95	95	1.579
Cluster Bedroom 8		95	-	-
Cluster Bedroom 7		95	-	-
Cluster Bedroom 6		95	-	-
Cluster Bedroom 5		95	-	-
WC S1		95	-	-
WC S2		95	-	-
WC S3		95	-	-
WC S4		95	-	-
WC S5		95	-	-
WC S6		95	-	-
WC S7		95	-	-
WC S8		95	-	-
WC S9		95	-	-
WC AS		95	-	-
WC S10		95	-	-
WC S11		95	-	-
WC C8		95	-	-
WC C7		95	-	-
WC C6		95	-	-
WC C5		95	-	-
Store		95	-	-
Store		95	-	-
Lift		95	-	-
Stairs		95	-	-
Corridor		95	-	-
Cluster Bedroom 2		95	-	-
Cluster Kitchen 2		95	-	-
Cluster Bedroom 4		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Cluster Bedroom 3		95	-	-
Acc. Cluster Bedroom		95	-	-
Cluster Kitchen 1		95	-	-
Cluster Bedroom 1		95	-	-
WC C1		95	-	-
WC C2		95	-	-
WC C3		95	-	-
WC C4		95	-	-
WC ACB		95	-	-
Corridor		95	-	-
Corridor		95	-	-
Studio 3		95	95	1.579
Studio 4		95	95	1.579
Studio 5		95	95	1.579
Studio 6		95	95	1.579
Studio 7		95	95	1.579
Studio 8		95	95	1.579
Studio 9		95	95	1.579
Store		95	-	-
Riser		95	-	-
Riser		95	-	-
Corridor		95	-	-
Lift		95	-	-
Lift		95	-	-
Riser		95	-	-
Riser		95	-	-
Stair		95	-	-
Studio 2		95	95	1.579
Studio 1		95	95	1.579
Acc. Studio		95	95	1.579
Studio 10		95	95	1.579
Studio 11		95	95	1.579
Cluster Bedroom 8		95	-	-
Cluster Bedroom 7		95	-	-
Cluster Bedroom 6		95	-	-
Cluster Bedroom 5		95	-	-
WC S1		95	-	-
WC S2		95	-	-
WC S3		95	-	-
WC S4		95	-	-
WC S5		95	-	-
WC S6		95	-	-
WC S7		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
WC S8		95	-	-
WC S9		95	-	-
WC AS		95	-	-
WC S10		95	-	-
WC S11		95	-	-
WC C8		95	-	-
WC C7		95	-	-
WC C6		95	-	-
WC C5		95	-	-
Store		95	-	-
Store		95	-	-
Lift		95	-	-
Stairs		95	-	-
Corridor		95	-	-
Cluster Bedroom 2		95	-	-
Cluster Kitchen 2		95	-	-
Cluster Bedroom 4		95	-	-
Cluster Bedroom 3		95	-	-
Acc. Cluster Bedroom		95	-	-
Cluster Kitchen 1		95	-	-
Cluster Bedroom 1		95	-	-
WC C1		95	-	-
WC C2		95	-	-
WC C3		95	-	-
WC C4		95	-	-
WC ACB		95	-	-
Corridor		95	-	-
Corridor		95	-	-
Studio 3		95	95	1.579
Studio 4		95	95	1.579
Studio 5		95	95	1.579
Studio 6		95	95	1.579
Studio 7		95	95	1.579
Studio 8		95	95	1.579
Studio 9		95	95	1.579
Store		95	-	-
Riser		95	-	-
Riser		95	-	-
Corridor		95	-	-
Lift		95	-	-
Lift		95	-	-
Riser		95	-	-
Riser		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Stair		95	-	-
Studio 2		95	95	1.579
Studio 1		95	95	1.579
Acc. Studio		95	95	1.579
Studio 10		95	95	1.579
Studio 11		95	95	1.579
Cluster Bedroom 8		95	-	-
Cluster Bedroom 7		95	-	-
Cluster Bedroom 6		95	-	-
Cluster Bedroom 5		95	-	-
WC S1		95	-	-
WC S2		95	-	-
WC S3		95	-	-
WC S4		95	-	-
WC S5		95	-	-
WC S6		95	-	-
WC S7		95	-	-
WC S8		95	-	-
WC S9		95	-	-
WC AS		95	-	-
WC S10		95	-	-
WC S11		95	-	-
WC C8		95	-	-
WC C7		95	-	-
WC C6		95	-	-
WC C5		95	-	-
Store		95	-	-
Store		95	-	-
Lift		95	-	-
Stairs		95	-	-
Corridor		95	-	-
Cluster Bedroom 2		95	-	-
Cluster Kitchen 2		95	-	-
Cluster Bedroom 4		95	-	-
Cluster Bedroom 3		95	-	-
Acc. Cluster Bedroom		95	-	-
Cluster Kitchen 1		95	-	-
Cluster Bedroom 1		95	-	-
WC C1		95	-	-
WC C2		95	-	-
WC C3		95	-	-
WC C4		95	-	-
WC ACB		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Corridor		95	-	-
Corridor		95	-	-
Studio 3		95	95	1.579
Studio 4		95	95	1.579
Studio 5		95	95	1.579
Studio 6		95	95	1.579
Studio 7		95	95	1.579
Studio 8		95	95	1.579
Studio 9		95	95	1.579
Store		95	-	-
Riser		95	-	-
Riser		95	-	-
Corridor		95	-	-
Lift		95	-	-
Lift		95	-	-
Riser		95	-	-
Riser		95	-	-
Stair		95	-	-
Studio 2		95	95	1.579
Studio 1		95	95	1.579
Acc. Studio		95	95	1.579
Studio 10		95	95	1.579
Studio 11		95	95	1.579
Cluster Bedroom 8		95	-	-
Cluster Bedroom 7		95	-	-
Cluster Bedroom 6		95	-	-
Cluster Bedroom 5		95	-	-
WC S1		95	-	-
WC S2		95	-	-
WC S3		95	-	-
WC S4		95	-	-
WC S5		95	-	-
WC S6		95	-	-
WC S7		95	-	-
WC S8		95	-	-
WC S9		95	-	-
WC AS		95	-	-
WC S10		95	-	-
WC S11		95	-	-
WC C8		95	-	-
WC C7		95	-	-
WC C6		95	-	-
WC C5		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Store		95	-	-
Store		95	-	-
Lift		95	-	-
Stairs		95	-	-
Corridor		95	-	-
Cluster Bedroom 2		95	-	-
Cluster Kitchen 2		95	-	-
Cluster Bedroom 4		95	-	-
Cluster Bedroom 3		95	-	-
Acc. Cluster Bedroom		95	-	-
Cluster Kitchen 1		95	-	-
Cluster Bedroom 1		95	-	-
WC C1		95	-	-
WC C2		95	-	-
WC C3		95	-	-
WC C4		95	-	-
WC ACB		95	-	-
Corridor		95	-	-
Corridor		95	-	-
Studio 3		95	95	1.579
Studio 4		95	95	1.579
Studio 5		95	95	1.579
Studio 6		95	95	1.579
Studio 7		95	95	1.579
Studio 8		95	95	1.579
Studio 9		95	95	1.579
Store		95	-	-
Riser		95	-	-
Riser		95	-	-
Corridor		95	-	-
Lift		95	-	-
Lift		95	-	-
Riser		95	-	-
Riser		95	-	-
Stair		95	-	-
Studio 2		95	95	1.579
Studio 1		95	95	1.579
Acc. Studio		95	95	1.579
Studio 10		95	95	1.579
Studio 11		95	95	1.579
Cluster Bedroom 8		95	-	-
Cluster Bedroom 7		95	-	-
Cluster Bedroom 6		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Cluster Bedroom 5		95	-	-
WC S1		95	-	-
WC S2		95	-	-
WC S3		95	-	-
WC S4		95	-	-
WC S5		95	-	-
WC S6		95	-	-
WC S7		95	-	-
WC S8		95	-	-
WC S9		95	-	-
WC AS		95	-	-
WC S10		95	-	-
WC S11		95	-	-
WC C8		95	-	-
WC C7		95	-	-
WC C6		95	-	-
WC C5		95	-	-
Store		95	-	-
Store		95	-	-
Lift		95	-	-
Stairs		95	-	-
Corridor		95	-	-
Cluster Bedroom 2		95	-	-
Cluster Kitchen 2		95	-	-
Cluster Bedroom 4		95	-	-
Cluster Bedroom 3		95	-	-
Acc. Cluster Bedroom		95	-	-
Cluster Kitchen 1		95	-	-
Cluster Bedroom 1		95	-	-
WC C1		95	-	-
WC C2		95	-	-
WC C3		95	-	-
WC C4		95	-	-
WC ACB		95	-	-
Corridor		95	-	-
Corridor		95	-	-
Studio 3		95	95	1.579
Studio 4		95	95	1.579
Studio 5		95	95	1.579
Studio 6		95	95	1.579
Studio 7		95	95	1.579
Studio 8		95	95	1.579
Studio 9		95	95	1.579

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Store		95	-	-
Riser		95	-	-
Riser		95	-	-
Corridor		95	-	-
Lift		95	-	-
Lift		95	-	-
Riser		95	-	-
Riser		95	-	-
Stair		95	-	-
Studio 2		95	95	1.579
Studio 1		95	95	1.579
Acc. Studio		95	95	1.579
Studio 10		95	95	1.579
Studio 11		95	95	1.579
Cluster Bedroom 8		95	-	-
Cluster Bedroom 7		95	-	-
Cluster Bedroom 6		95	-	-
Cluster Bedroom 5		95	-	-
WC S1		95	-	-
WC S2		95	-	-
WC S3		95	-	-
WC S4		95	-	-
WC S5		95	-	-
WC S6		95	-	-
WC S7		95	-	-
WC S8		95	-	-
WC S9		95	-	-
WC AS		95	-	-
WC S10		95	-	-
WC S11		95	-	-
WC C8		95	-	-
WC C7		95	-	-
WC C6		95	-	-
WC C5		95	-	-
Store		95	-	-
Store		95	-	-
Lift		95	-	-
Stairs		95	-	-
Corridor		95	-	-
Cluster Bedroom 2		95	-	-
Cluster Kitchen 2		95	-	-
Cluster Bedroom 4		95	-	-
Cluster Bedroom 3		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Acc. Cluster Bedroom		95	-	-
Cluster Kitchen 1		95	-	-
Cluster Bedroom 1		95	-	-
WC C1		95	-	-
WC C2		95	-	-
WC C3		95	-	-
WC C4		95	-	-
WC ACB		95	-	-
Corridor		95	-	-
Corridor		95	-	-
Studio 3		95	95	1.579
Studio 4		95	95	1.579
Studio 5		95	95	1.579
Studio 6		95	95	1.579
Studio 7		95	95	1.579
Studio 8		95	95	1.579
Studio 9		95	95	1.579
Store		95	-	-
Riser		95	-	-
Riser		95	-	-
Corridor		95	-	-
Lift		95	-	-
Lift		95	-	-
Riser		95	-	-
Riser		95	-	-
Stair		95	-	-
Studio 2		95	95	1.579
Studio 1		95	95	1.579
Acc. Studio		95	95	1.579
Studio 10		95	95	1.579
Studio 11		95	95	1.579
Cluster Bedroom 8		95	-	-
Cluster Bedroom 7		95	-	-
Cluster Bedroom 6		95	-	-
Cluster Bedroom 5		95	-	-
WC S1		95	-	-
WC S2		95	-	-
WC S3		95	-	-
WC S4		95	-	-
WC S5		95	-	-
WC S6		95	-	-
WC S7		95	-	-
WC S8		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
WC S9		95	-	-
WC AS		95	-	-
WC S10		95	-	-
WC S11		95	-	-
WC C8		95	-	-
WC C7		95	-	-
WC C6		95	-	-
WC C5		95	-	-
Store		95	-	-
Store		95	-	-
Lift		95	-	-
Stairs		95	-	-
Corridor		95	-	-
Cluster Bedroom 2		95	-	-
Cluster Kitchen 2		95	-	-
Cluster Bedroom 4		95	-	-
Cluster Bedroom 3		95	-	-
Acc. Cluster Bedroom		95	-	-
Cluster Kitchen 1		95	-	-
Cluster Bedroom 1		95	-	-
WC C1		95	-	-
WC C2		95	-	-
WC C3		95	-	-
WC C4		95	-	-
WC ACB		95	-	-
Corridor		95	-	-
Corridor		95	-	-
Studio 3		95	95	1.579
Studio 4		95	95	1.579
Studio 5		95	95	1.579
Studio 6		95	95	1.579
Studio 7		95	95	1.579
Studio 8		95	95	1.579
Studio 9		95	95	1.579
Store		95	-	-
Riser		95	-	-
Riser		95	-	-
Corridor		95	-	-
Lift		95	-	-
Lift		95	-	-
Riser		95	-	-
Riser		95	-	-
Stair		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Studio 2		95	95	1.579
Studio 1		95	95	1.579
Acc. Studio		95	95	1.579
Studio 10		95	95	1.579
Studio 11		95	95	1.579
Cluster Bedroom 8		95	-	-
Cluster Bedroom 7		95	-	-
Cluster Bedroom 6		95	-	-
Cluster Bedroom 5		95	-	-
WC S1		95	-	-
WC S2		95	-	-
WC S3		95	-	-
WC S4		95	-	-
WC S5		95	-	-
WC S6		95	-	-
WC S7		95	-	-
WC S8		95	-	-
WC S9		95	-	-
WC AS		95	-	-
WC S10		95	-	-
WC S11		95	-	-
WC C8		95	-	-
WC C7		95	-	-
WC C6		95	-	-
WC C5		95	-	-
Store		95	-	-
Store		95	-	-
Lift		95	-	-
Stairs		95	-	-
Corridor		95	-	-
Cluster Bedroom 2		95	-	-
Cluster Kitchen 2		95	-	-
Cluster Bedroom 4		95	-	-
Cluster Bedroom 3		95	-	-
Acc. Cluster Bedroom		95	-	-
Cluster Kitchen 1		95	-	-
Cluster Bedroom 1		95	-	-
WC C1		95	-	-
WC C2		95	-	-
WC C3		95	-	-
WC C4		95	-	-
WC ACE		95	-	-
Corridor		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Corridor		95	-	-
Studio 3		95	95	1.579
Studio 4		95	95	1.579
Studio 5		95	95	1.579
Studio 6		95	95	1.579
Studio 7		95	95	1.579
Studio 8		95	95	1.579
Studio 9		95	95	1.579
Store		95	-	-
Riser		95	-	-
Riser		95	-	-
Corridor		95	-	-
Lift		95	-	-
Lift		95	-	-
Riser		95	-	-
Riser		95	-	-
Stair		95	-	-
Studio 2		95	95	1.579
Studio 1		95	95	1.579
Acc. Studio		95	95	1.579
Studio 10		95	95	1.579
Studio 11		95	95	1.579
Cluster Bedroom 8		95	-	-
Cluster Bedroom 7		95	-	-
Cluster Bedroom 6		95	-	-
Cluster Bedroom 5		95	-	-
WC S1		95	-	-
WC S2		95	-	-
WC S3		95	-	-
WC S4		95	-	-
WC S5		95	-	-
WC S6		95	-	-
WC S7		95	-	-
WC S8		95	-	-
WC S9		95	-	-
WC AS		95	-	-
WC S10		95	-	-
WC S11		95	-	-
WC C8		95	-	-
WC C7		95	-	-
WC C6		95	-	-
WC C5		95	-	-
Store		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Store		95	-	-
Lift		95	-	-
Stairs		95	-	-
Corridor		95	-	-
Cluster Bedroom 2		95	-	-
Cluster Kitchen 2		95	-	-
Cluster Bedroom 4		95	-	-
Cluster Bedroom 3		95	-	-
Acc. Cluster Bedroom		95	-	-
Cluster Kitchen 1		95	-	-
Cluster Bedroom 1		95	-	-
WC C1		95	-	-
WC C2		95	-	-
WC C3		95	-	-
WC C4		95	-	-
WC ACB		95	-	-
Corridor		95	-	-
Corridor		95	-	-
Studio 3		95	95	1.579
Studio 4		95	95	1.579
Studio 5		95	95	1.579
Studio 6		95	95	1.579
Studio 7		95	95	1.579
Studio 8		95	95	1.579
Studio 9		95	95	1.579
Store		95	-	-
Riser		95	-	-
Riser		95	-	-
Corridor		95	-	-
Lift		95	-	-
Lift		95	-	-
Riser		95	-	-
Riser		95	-	-
Stair		95	-	-
Studio 2		95	95	1.579
Studio 1		95	95	1.579
Acc. Studio		95	95	1.579
Studio 10		95	95	1.579
Studio 11		95	95	1.579
Cluster Bedroom 8		95	-	-
Cluster Bedroom 7		95	-	-
Cluster Bedroom 6		95	-	-
Cluster Bedroom 5		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
WC S1		95	-	-
WC S2		95	-	-
WC S3		95	-	-
WC S4		95	-	-
WC S5		95	-	-
WC S6		95	-	-
WC S7		95	-	-
WC S8		95	-	-
WC S9		95	-	-
WC AS		95	-	-
WC S10		95	-	-
WC S11		95	-	-
WC C8		95	-	-
WC C7		95	-	-
WC C6		95	-	-
WC C5		95	-	-
Store		95	-	-
Store		95	-	-
Lift		95	-	-
Stairs		95	-	-
Corridor		95	-	-
Cluster Bedroom 2		95	-	-
Cluster Kitchen 2		95	-	-
Cluster Bedroom 4		95	-	-
Cluster Bedroom 3		95	-	-
Acc. Cluster Bedroom		95	-	-
Cluster Kitchen 1		95	-	-
Cluster Bedroom 1		95	-	-
WC C1		95	-	-
WC C2		95	-	-
WC C3		95	-	-
WC C4		95	-	-
WC ACB		95	-	-
Corridor		95	-	-
Corridor		95	-	-
Studio 3		95	95	1.579
Studio 4		95	95	1.579
Studio 5		95	95	1.579
Studio 6		95	95	1.579
Studio 7		95	95	1.579
Studio 8		95	95	1.579
Studio 9		95	95	1.579
Store		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Riser		95	-	-
Riser		95	-	-
Corridor		95	-	-
Lift		95	-	-
Lift		95	-	-
Riser		95	-	-
Riser		95	-	-
Stair		95	-	-
Studio 2		95	95	1.579
Studio 1		95	95	1.579
Acc. Studio		95	95	1.579
Studio 10		95	95	1.579
Studio 11		95	95	1.579
Cluster Bedroom 8		95	-	-
Cluster Bedroom 7		95	-	-
Cluster Bedroom 6		95	-	-
Cluster Bedroom 5		95	-	-
WC S1		95	-	-
WC S2		95	-	-
WC S3		95	-	-
WC S4		95	-	-
WC S5		95	-	-
WC S6		95	-	-
WC S7		95	-	-
WC S8		95	-	-
WC S9		95	-	-
WC AS		95	-	-
WC S10		95	-	-
WC S11		95	-	-
WC C8		95	-	-
WC C7		95	-	-
WC C6		95	-	-
WC C5		95	-	-
Store		95	-	-
Store		95	-	-
Lift		95	-	-
Stairs		95	-	-
Corridor		95	-	-
Cluster Bedroom 2		95	-	-
Cluster Kitchen 2		95	-	-
Cluster Bedroom 4		95	-	-
Cluster Bedroom 3		95	-	-
Acc. Cluster Bedroom		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Cluster Kitchen 1		95	-	-
Cluster Bedroom 1		95	-	-
WC C1		95	-	-
WC C2		95	-	-
WC C3		95	-	-
WC C4		95	-	-
WC ACB		95	-	-
Corridor		95	-	-
Corridor		95	-	-
Studio 3		95	95	1.579
Studio 4		95	95	1.579
Studio 5		95	95	1.579
Studio 6		95	95	1.579
Studio 7		95	95	1.579
Studio 8		95	95	1.579
Studio 9		95	95	1.579
Store		95	-	-
Riser		95	-	-
Riser		95	-	-
Corridor		95	-	-
Lift		95	-	-
Lift		95	-	-
Riser		95	-	-
Riser		95	-	-
Stair		95	-	-
Studio 2		95	95	1.579
Studio 1		95	95	1.579
Acc. Studio		95	95	1.579
Studio 10		95	95	1.579
Studio 11		95	95	1.579
Cluster Bedroom 8		95	-	-
Cluster Bedroom 7		95	-	-
Cluster Bedroom 6		95	-	-
Cluster Bedroom 5		95	-	-
WC S1		95	-	-
WC S2		95	-	-
WC S3		95	-	-
WC S4		95	-	-
WC S5		95	-	-
WC S6		95	-	-
WC S7		95	-	-
WC S8		95	-	-
WC S9		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
WC AS		95	-	-
WC S10		95	-	-
WC S11		95	-	-
WC C8		95	-	-
WC C7		95	-	-
WC C6		95	-	-
WC C5		95	-	-
Store		95	-	-
Store		95	-	-
Lift		95	-	-
Stairs		95	-	-
Corridor		95	-	-
Cluster Bedroom 2		95	-	-
Cluster Kitchen 2		95	-	-
Cluster Bedroom 4		95	-	-
Cluster Bedroom 3		95	-	-
Acc. Cluster Bedroom		95	-	-
Cluster Kitchen 1		95	-	-
Cluster Bedroom 1		95	-	-
WC C1		95	-	-
WC C2		95	-	-
WC C3		95	-	-
WC C4		95	-	-
WC ACB		95	-	-
Corridor		95	-	-
Corridor		95	-	-
Studio 3		95	95	1.579
Studio 4		95	95	1.579
Studio 5		95	95	1.579
Studio 6		95	95	1.579
Studio 7		95	95	1.579
Studio 8		95	95	1.579
Studio 9		95	95	1.579
Store		95	-	-
Riser		95	-	-
Riser		95	-	-
Corridor		95	-	-
Lift		95	-	-
Lift		95	-	-
Riser		95	-	-
Riser		95	-	-
Stair		95	-	-
Studio 2		95	95	1.579

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Studio 1		95	95	1.579
Acc. Studio		95	95	1.579
Studio 10		95	95	1.579
Studio 11		95	95	1.579
Cluster Bedroom 8		95	-	-
Cluster Bedroom 7		95	-	-
Cluster Bedroom 6		95	-	-
Cluster Bedroom 5		95	-	-
WC S1		95	-	-
WC S2		95	-	-
WC S3		95	-	-
WC S4		95	-	-
WC S5		95	-	-
WC S6		95	-	-
WC S7		95	-	-
WC S8		95	-	-
WC S9		95	-	-
WC AS		95	-	-
WC S10		95	-	-
WC S11		95	-	-
WC C8		95	-	-
WC C7		95	-	-
WC C6		95	-	-
WC C5		95	-	-
Store		95	-	-
Store		95	-	-
Lift		95	-	-
Stairs		95	-	-
Corridor		95	-	-
Cluster Bedroom 2		95	-	-
Cluster Kitchen 2		95	-	-
Cluster Bedroom 4		95	-	-
Cluster Bedroom 3		95	-	-
Acc. Cluster Bedroom		95	-	-
Cluster Kitchen 1		95	-	-
Cluster Bedroom 1		95	-	-
WC C1		95	-	-
WC C2		95	-	-
WC C3		95	-	-
WC C4		95	-	-
WC ACB		95	-	-
Corridor		95	-	-
Corridor		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Studio 3		95	95	1.579
Studio 4		95	95	1.579
Studio 5		95	95	1.579
Studio 6		95	95	1.579
Studio 7		95	95	1.579
Studio 8		95	95	1.579
Studio 9		95	95	1.579
Store		95	-	-
Riser		95	-	-
Riser		95	-	-
Corridor		95	-	-
Lift		95	-	-
Lift		95	-	-
Riser		95	-	-
Riser		95	-	-
Stair		95	-	-
Studio 2		95	95	1.579
Studio 1		95	95	1.579
Acc. Studio		95	95	1.579
Studio 10		95	95	1.579
Studio 11		95	95	1.579
Cluster Bedroom 8		95	-	-
Cluster Bedroom 7		95	-	-
Cluster Bedroom 6		95	-	-
Cluster Bedroom 5		95	-	-
WC S1		95	-	-
WC S2		95	-	-
WC S3		95	-	-
WC S4		95	-	-
WC S5		95	-	-
WC S6		95	-	-
WC S7		95	-	-
WC S8		95	-	-
WC S9		95	-	-
WC AS		95	-	-
WC S10		95	-	-
WC S11		95	-	-
WC C8		95	-	-
WC C7		95	-	-
WC C6		95	-	-
WC C5		95	-	-
Store		95	-	-
Store		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Lift		95	-	-
Stairs		95	-	-
Corridor		95	-	-
Cluster Bedroom 2		95	-	-
Cluster Kitchen 2		95	-	-
Cluster Bedroom 4		95	-	-
Cluster Bedroom 3		95	-	-
Acc. Cluster Bedroom		95	-	-
Cluster Kitchen 1		95	-	-
Cluster Bedroom 1		95	-	-
WC C1		95	-	-
WC C2		95	-	-
WC C3		95	-	-
WC C4		95	-	-
WC ACB		95	-	-
Corridor		95	-	-
Corridor		95	-	-
Studio 3		95	95	1.579
Studio 4		95	95	1.579
Studio 5		95	95	1.579
Studio 6		95	95	1.579
Studio 7		95	95	1.579
Studio 8		95	95	1.579
Studio 9		95	95	1.579
Store		95	-	-
Riser		95	-	-
Riser		95	-	-
Corridor		95	-	-
Lift		95	-	-
Lift		95	-	-
Riser		95	-	-
Riser		95	-	-
Stair		95	-	-
Studio 2		95	95	1.579
Studio 1		95	95	1.579
Acc. Studio		95	95	1.579
Studio 10		95	95	1.579
Studio 11		95	95	1.579
Cluster Bedroom 8		95	-	-
Cluster Bedroom 7		95	-	-
Cluster Bedroom 6		95	-	-
Cluster Bedroom 5		95	-	-
WC S1		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
WC S2		95	-	-
WC S3		95	-	-
WC S4		95	-	-
WC S5		95	-	-
WC S6		95	-	-
WC S7		95	-	-
WC S8		95	-	-
WC S9		95	-	-
WC AS		95	-	-
WC S10		95	-	-
WC S11		95	-	-
WC C8		95	-	-
WC C7		95	-	-
WC C6		95	-	-
WC C5		95	-	-
Store		95	-	-
Store		95	-	-
Lift		95	-	-
Stairs		95	-	-
Corridor		95	-	-
Cluster Bedroom 2		95	-	-
Cluster Kitchen 2		95	-	-
Cluster Bedroom 4		95	-	-
Cluster Bedroom 3		95	-	-
Acc. Cluster Bedroom		95	-	-
Cluster Kitchen 1		95	-	-
Cluster Bedroom 1		95	-	-
WC C1		95	-	-
WC C2		95	-	-
WC C3		95	-	-
WC C4		95	-	-
WC ACB		95	-	-
Corridor		95	-	-
Corridor		95	-	-
Studio 3		95	95	1.579
Studio 4		95	95	1.579
Studio 5		95	95	1.579
Studio 6		95	95	1.579
Studio 7		95	95	1.579
Studio 8		95	95	1.579
Studio 9		95	95	1.579
Store		-	-	-
Riser		-	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Riser		95	-	-
Corridor		95	-	-
Lift		95	-	-
Lift		95	-	-
Riser		95	-	-
Riser		95	-	-
Stair		95	-	-
Studio 2		95	95	1.579
Studio 1		95	95	1.579
Acc. Studio		95	95	1.579
Studio 10		95	95	1.579
Studio 11		95	95	1.579
Cluster Bedroom 8		95	-	-
Cluster Bedroom 7		95	-	-
Cluster Bedroom 6		95	-	-
Cluster Bedroom 5		95	-	-
WC S1		95	-	-
WC S2		95	-	-
WC S3		95	-	-
WC S4		95	-	-
WC S5		95	-	-
WC S6		95	-	-
WC S7		95	-	-
WC S8		95	-	-
WC S9		95	-	-
WC AS		95	-	-
WC S10		95	-	-
WC S11		95	-	-
WC C8		95	-	-
WC C7		95	-	-
WC C6		95	-	-
WC C5		95	-	-
Store		95	-	-
Store		95	-	-
Lift		95	-	-
Stairs		95	-	-
Corridor		95	-	-
Cluster Bedroom 2		95	-	-
Cluster Kitchen 2		95	-	-
Cluster Bedroom 4		95	-	-
Cluster Bedroom 3		95	-	-
Acc. Cluster Bedroom		95	-	-
Cluster Kitchen 1		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Cluster Bedroom 1		95	-	-
WC C1		95	-	-
WC C2		95	-	-
WC C3		95	-	-
WC C4		95	-	-
WC ACB		95	-	-
Corridor		95	-	-
Corridor		95	-	-
Studio 3		95	95	1.579
Studio 4		95	95	1.579
Studio 5		95	95	1.579
Studio 6		95	95	1.579
Studio 7		95	95	1.579
Studio 8		95	95	1.579
Studio 9		95	95	1.579
Store		95	-	-
Riser		95	-	-
Riser		95	-	-
Corridor		95	-	-
Lift		95	-	-
Lift		95	-	-
Riser		95	-	-
Riser		95	-	-
Stair		95	-	-
Studio 2		95	95	1.579
Studio 1		95	95	1.579
Acc. Studio		95	95	1.579
Studio 10		95	95	1.579
Studio 11		95	95	1.579
Cluster Bedroom 8		95	-	-
Cluster Bedroom 7		95	-	-
Cluster Bedroom 6		95	-	-
Cluster Bedroom 5		95	-	-
WC S1		95	-	-
WC S2		95	-	-
WC S3		95	-	-
WC S4		95	-	-
WC S5		95	-	-
WC S6		95	-	-
WC S7		95	-	-
WC S8		95	-	-
WC S9		95	-	-
WC AE		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
WC S10		95	-	-
WC S11		95	-	-
WC C8		95	-	-
WC C7		95	-	-
WC C6		95	-	-
WC C5		95	-	-
Store		95	-	-
Store		95	-	-
Lift		95	-	-
Stairs		95	-	-
Corridor		95	-	-
Cluster Bedroom 2		95	-	-
Cluster Kitchen 2		95	-	-
Cluster Bedroom 4		95	-	-
Cluster Bedroom 3		95	-	-
Acc. Cluster Bedroom		95	-	-
Cluster Kitchen 1		95	-	-
Cluster Bedroom 1		95	-	-
WC C1		95	-	-
WC C2		95	-	-
WC C3		95	-	-
WC C4		95	-	-
WC ACB		95	-	-
Corridor		95	-	-
Corridor		95	-	-
Studio 3		95	95	1.579
Studio 4		95	95	1.579
Studio 5		95	95	1.579
Studio 6		95	95	1.579
Studio 7		95	95	1.579
Studio 8		95	95	1.579
Studio 9		95	95	1.579
Store		95	-	-
Riser		95	-	-
Riser		95	-	-
Corridor		95	-	-
Lift		95	-	-
Lift		95	-	-
Riser		95	-	-
Riser		95	-	-
Stair		95	-	-
Studio 2		95	95	1.579
Studio 1		95	95	1.579

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Acc. Studio		95	95	1.579
Studio 10		95	95	1.579
Studio 11		95	95	1.579
Cluster Bedroom 8		95	-	-
Cluster Bedroom 7		95	-	-
Cluster Bedroom 6		95	-	-
Cluster Bedroom 5		95	-	-
WC S1		95	-	-
WC S2		95	-	-
WC S3		95	-	-
WC S4		95	-	-
WC S5		95	-	-
WC S6		95	-	-
WC S7		95	-	-
WC S8		95	-	-
WC S9		95	-	-
WC AS		95	-	-
WC S10		95	-	-
WC S11		95	-	-
WC C8		95	-	-
WC C7		95	-	-
WC C6		95	-	-
WC C5		95	-	-
Store		95	-	-
Store		95	-	-
Lift		95	-	-
Stairs		95	-	-
Corridor		95	-	-
Cluster Bedroom 2		95	-	-
Cluster Kitchen 2		95	-	-
Cluster Bedroom 4		95	-	-
Cluster Bedroom 3		95	-	-
Acc. Cluster Bedroom		95	-	-
Cluster Kitchen 1		95	-	-
Cluster Bedroom 1		95	-	-
WC C1		95	-	-
WC C2		95	-	-
WC C3		95	-	-
WC C4		95	-	-
WC ACB		95	-	-
Corridor		95	-	-
Corridor		95	-	-
Studio 3		95	95	1.579

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Studio 4		95	95	1.579
Studio 5		95	95	1.579
Studio 6		95	95	1.579
Studio 7		95	95	1.579
Studio 8		95	95	1.579
Studio 9		95	95	1.579
Store		95	-	-
Riser		95	-	-
Riser		95	-	-
Corridor		95	-	-
Lift		95	-	-
Lift		95	-	-
Riser		95	-	-
Riser		95	-	-
Stair		95	-	-
Studio 2		95	95	1.579
Studio 1		95	95	1.579
Acc. Studio		95	95	1.579
Studio 10		95	95	1.579
Studio 11		95	95	1.579
Cluster Bedroom 8		95	-	-
Cluster Bedroom 7		95	-	-
Cluster Bedroom 6		95	-	-
Cluster Bedroom 5		95	-	-
WC S1		95	-	-
WC S2		95	-	-
WC S3		95	-	-
WC S4		95	-	-
WC S5		95	-	-
WC S6		95	-	-
WC S7		95	-	-
WC S8		95	-	-
WC S9		95	-	-
WC AS		95	-	-
WC S10		95	-	-
WC S11		95	-	-
WC C8		95	-	-
WC C7		95	-	-
WC C6		95	-	-
WC C5		95	-	-
Store		95	-	-
Store		95	-	-
Lift		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Stairs		95	-	-
Corridor		95	-	-
Cluster Bedroom 2		95	-	-
Cluster Kitchen 2		95	-	-
Cluster Bedroom 4		95	-	-
Cluster Bedroom 3		95	-	-
Acc. Cluster Bedroom		95	-	-
Cluster Kitchen 1		95	-	-
Cluster Bedroom 1		95	-	-
WC C1		95	-	-
WC C2		95	-	-
WC C3		95	-	-
WC C4		95	-	-
WC ACB		95	-	-
Corridor		95	-	-
Corridor		95	-	-
Studio 3		95	95	1.579
Studio 4		95	95	1.579
Studio 5		95	95	1.579
Studio 6		95	95	1.579
Studio 7		95	95	1.579
Studio 8		95	95	1.579
Studio 9		95	95	1.579
Store		95	-	-
Riser		95	-	-
Riser		95	-	-
Corridor		95	-	-
Lift		95	-	-
Lift		95	-	-
Riser		95	-	-
Riser		95	-	-
Stair		95	-	-
Studio 2		95	95	1.579
Studio 1		95	95	1.579
Acc. Studio		95	95	1.579
Studio 10		95	95	1.579
Studio 11		95	95	1.579
Cluster Bedroom 8		95	-	-
Cluster Bedroom 7		95	-	-
Cluster Bedroom 6		95	-	-
Cluster Bedroom 5		95	-	-
WC S1		95	-	-
WC S2		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
WC S3		95	-	-
WC S4		95	-	-
WC S5		95	-	-
WC S6		95	-	-
WC S7		95	-	-
WC S8		95	-	-
WC S9		95	-	-
WC AS		95	-	-
WC S10		95	-	-
WC S11		95	-	-
WC C8		95	-	-
WC C7		95	-	-
WC C6		95	-	-
WC C5		95	-	-
Store		95	-	-
Store		95	-	-
Lift		95	-	-
Stairs		95	-	-
Corridor		95	-	-
Cluster Bedroom 2		95	-	-
Cluster Kitchen 2		95	-	-
Cluster Bedroom 4		95	-	-
Cluster Bedroom 3		95	-	-
Acc. Cluster Bedroom		95	-	-
Cluster Kitchen 1		95	-	-
Cluster Bedroom 1		95	-	-
WC C1		95	-	-
WC C2		95	-	-
WC C3		95	-	-
WC C4		95	-	-
WC ACB		95	-	-
Corridor		95	-	-
Corridor		95	-	-
Studio 3		95	95	1.579
Studio 4		95	95	1.579
Studio 5		95	95	1.579
Studio 6		95	95	1.579
Studio 7		95	95	1.579
Studio 8		95	95	1.579
Studio 9		95	95	1.579
Store		95	-	-
Riser		95	-	-
Riser		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Corridor		95	-	-
Lift		95	-	-
Lift		95	-	-
Riser		95	-	-
Riser		95	-	-
Stair		95	-	-
Studio 2		95	95	1.579
Studio 1		95	95	1.579
Acc. Studio		95	95	1.579
Studio 10		95	95	1.579
Studio 11		95	95	1.579
Cluster Bedroom 8		95	-	-
Cluster Bedroom 7		95	-	-
Cluster Bedroom 6		95	-	-
Cluster Bedroom 5		95	-	-
WC S1		95	-	-
WC S2		95	-	-
WC S3		95	-	-
WC S4		95	-	-
WC S5		95	-	-
WC S6		95	-	-
WC S7		95	-	-
WC S8		95	-	-
WC S9		95	-	-
WC AS		95	-	-
WC S10		95	-	-
WC S11		95	-	-
WC C8		95	-	-
WC C7		95	-	-
WC C6		95	-	-
WC C5		95	-	-
Store		95	-	-
Store		95	-	-
Lift		95	-	-
Stairs		95	-	-
Corridor		95	-	-
Cluster Bedroom 2		95	-	-
Cluster Kitchen 2		95	-	-
Cluster Bedroom 4		95	-	-
Cluster Bedroom 3		95	-	-
Acc. Cluster Bedroom		95	-	-
Cluster Kitchen 1		95	-	-
Cluster Bedroom 1		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
WC C1		95	-	-
WC C2		95	-	-
WC C3		95	-	-
WC C4		95	-	-
WC ACB		95	-	-
Corridor		95	-	-
Corridor		95	-	-
00 Amenity		95	95	1.421
00 Acc WC		95	-	-
00 Riser		95	-	-
00 Lift Lobby		95	-	-
00 Entrance / Reception		95	95	1.421
00 Parcel Room		95	-	-
00 Office		95	-	-
00 Staff Kitchen		95	-	-
00 Cycle Lift Lobby		95	-	-
00 Cycle Lift		95	-	-
00 Staff WC		95	-	-
00 Sub Station		95	-	-
00 LV		95	-	-
00 Stair / Escape Corridor		95	-	-
00 Lift		95	-	-
00 Plant Lobby		95	-	-
00 Plant		95	-	-
00 Plant		95	-	-
00 Refuse		95	-	-
00 Generator		95	-	-
00 Amenity		95	95	1.421
00 Escape Corridor / Stairs		95	-	-
00 Lobby		95	-	-
00 Lift		95	-	-
00 Lift		95	-	-
00 Lobby		95	-	-
00 Storage		95	-	-
00 Riser		95	-	-
01 Study		95	-	-
01 Study		95	-	-
01 Riser		95	-	-
01 Lift Lobby		95	-	-
01 Lift Lobby		95	-	-
01 Lift		95	-	-
01 Lift		95	-	-
01 Corridor		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
01 Riser		95	-	-
01 Store		95	-	-
01 Riser		95	-	-
01 Lift 3		95	-	-
01 Stairs		95	-	-
01 Store		95	-	-
01 Corridor		95	-	-
01 Cycle Store		95	-	-
01 Cycle Store		95	-	-
01 Fine Dining		95	95	1.579
01 Fine Dining		95	95	1.579
01 Cycle Store		95	-	-
01 Cycle Lift		95	-	-
01 Cycle Lift Lobby		95	-	-
01 Gym		95	-	-
01 Lounge		95	95	1.421
01 Laundry		95	-	-
01 Laundry		95	-	-
Stairs		95	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Studio 3	NO (-65.1%)	NO
Studio 4	YES (+18.1%)	NO
Studio 5	YES (+19.7%)	NO
Studio 6	YES (+20.2%)	NO
Studio 7	YES (+20.7%)	NO
Studio 8	YES (+23.3%)	NO
Studio 9	NO (-63.5%)	NO
Studio 2	YES (+12.3%)	NO
Studio 1	NO (-23.2%)	NO
Acc. Studio	YES (+17.4%)	NO
Studio 10	YES (+15.4%)	NO
Studio 11	YES (+40.8%)	NO
Cluster Bedroom 8	YES (+35.7%)	NO
Cluster Bedroom 7	YES (+31.2%)	NO
Cluster Bedroom 6	YES (+38%)	NO
Cluster Bedroom 5	YES (+28.8%)	NO
Cluster Bedroom 2	NO (-10.1%)	NO
Cluster Kitchen 2	NO (-9.5%)	NO
Cluster Bedroom 4	NO (-11.6%)	NO
Cluster Bedroom 3	NO (-10.1%)	NO
Acc. Cluster Bedroom	NO (-6.1%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Cluster Kitchen 1	NO (-22.2%)	NO
Cluster Bedroom 1	NO (-7.5%)	NO
Studio 3	NO (-65.1%)	NO
Studio 4	YES (+18.1%)	NO
Studio 5	YES (+19.7%)	NO
Studio 6	YES (+20.2%)	NO
Studio 7	YES (+20.7%)	NO
Studio 8	YES (+23.3%)	NO
Studio 9	NO (-63.5%)	NO
Studio 2	YES (+12.3%)	NO
Studio 1	NO (-23.2%)	NO
Acc. Studio	YES (+17.4%)	NO
Studio 10	YES (+15.4%)	NO
Studio 11	YES (+40.8%)	NO
Cluster Bedroom 8	YES (+35.7%)	NO
Cluster Bedroom 7	YES (+31.2%)	NO
Cluster Bedroom 6	YES (+38%)	NO
Cluster Bedroom 5	YES (+28.8%)	NO
Cluster Bedroom 2	NO (-10.1%)	NO
Cluster Kitchen 2	NO (-9.5%)	NO
Cluster Bedroom 4	NO (-11.6%)	NO
Cluster Bedroom 3	NO (-10.1%)	NO
Acc. Cluster Bedroom	NO (-6.1%)	NO
Cluster Kitchen 1	NO (-22.2%)	NO
Cluster Bedroom 1	NO (-7.5%)	NO
Studio 3	NO (-65.1%)	NO
Studio 4	YES (+18.1%)	NO
Studio 5	YES (+19.7%)	NO
Studio 6	YES (+20.2%)	NO
Studio 7	YES (+20.7%)	NO
Studio 8	YES (+23.3%)	NO
Studio 9	NO (-63.5%)	NO
Studio 2	YES (+12.3%)	NO
Studio 1	NO (-23.2%)	NO
Acc. Studio	YES (+17.4%)	NO
Studio 10	YES (+15.4%)	NO
Studio 11	YES (+40.8%)	NO
Cluster Bedroom 8	YES (+35.7%)	NO
Cluster Bedroom 7	YES (+31.2%)	NO
Cluster Bedroom 6	YES (+38%)	NO
Cluster Bedroom 5	YES (+28.8%)	NO
Cluster Bedroom 2	NO (-10.1%)	NO
Cluster Kitchen 2	NO (-9.5%)	NO
Cluster Bedroom 4	NO (-11.6%)	NO
Cluster Bedroom 3	NO (-10.1%)	NO
Acc. Cluster Bedroom	NO (-6.1%)	NO
Cluster Kitchen 1	NO (-22.2%)	NO
Cluster Bedroom 1	NO (-7.5%)	NO
Studio 3	NO (-65.1%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Studio 4	YES (+18.1%)	NO
Studio 5	YES (+19.7%)	NO
Studio 6	YES (+20.2%)	NO
Studio 7	YES (+20.7%)	NO
Studio 8	YES (+23.3%)	NO
Studio 9	NO (-63.5%)	NO
Studio 2	YES (+12.3%)	NO
Studio 1	NO (-23.2%)	NO
Acc. Studio	YES (+17.4%)	NO
Studio 10	YES (+15.4%)	NO
Studio 11	YES (+40.8%)	NO
Cluster Bedroom 8	YES (+35.7%)	NO
Cluster Bedroom 7	YES (+31.2%)	NO
Cluster Bedroom 6	YES (+38%)	NO
Cluster Bedroom 5	YES (+28.8%)	NO
Cluster Bedroom 2	NO (-10.1%)	NO
Cluster Kitchen 2	NO (-9.5%)	NO
Cluster Bedroom 4	NO (-11.6%)	NO
Cluster Bedroom 3	NO (-10.1%)	NO
Acc. Cluster Bedroom	NO (-6.1%)	NO
Cluster Kitchen 1	NO (-22.2%)	NO
Cluster Bedroom 1	NO (-7.5%)	NO
Studio 3	NO (-65.1%)	NO
Studio 4	YES (+18.1%)	NO
Studio 5	YES (+19.7%)	NO
Studio 6	YES (+20.2%)	NO
Studio 7	YES (+20.7%)	NO
Studio 8	YES (+23.3%)	NO
Studio 9	NO (-63.5%)	NO
Studio 2	YES (+12.3%)	NO
Studio 1	NO (-23.2%)	NO
Acc. Studio	YES (+17.4%)	NO
Studio 10	YES (+15.4%)	NO
Studio 11	YES (+40.8%)	NO
Cluster Bedroom 8	YES (+35.7%)	NO
Cluster Bedroom 7	YES (+31.2%)	NO
Cluster Bedroom 6	YES (+38%)	NO
Cluster Bedroom 5	YES (+28.8%)	NO
Cluster Bedroom 2	NO (-10.1%)	NO
Cluster Kitchen 2	NO (-9.5%)	NO
Cluster Bedroom 4	NO (-11.6%)	NO
Cluster Bedroom 3	NO (-10.1%)	NO
Acc. Cluster Bedroom	NO (-6.1%)	NO
Cluster Kitchen 1	NO (-22.2%)	NO
Cluster Bedroom 1	NO (-7.5%)	NO
Studio 3	NO (-65.1%)	NO
Studio 4	YES (+18.1%)	NO
Studio 5	YES (+19.7%)	NO
Studio 6	YES (+20.2%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Studio 7	YES (+20.7%)	NO
Studio 8	YES (+23.3%)	NO
Studio 9	NO (-63.5%)	NO
Studio 2	YES (+12.3%)	NO
Studio 1	NO (-23.2%)	NO
Acc. Studio	YES (+17.4%)	NO
Studio 10	YES (+15.4%)	NO
Studio 11	YES (+40.8%)	NO
Cluster Bedroom 8	YES (+35.7%)	NO
Cluster Bedroom 7	YES (+31.2%)	NO
Cluster Bedroom 6	YES (+38%)	NO
Cluster Bedroom 5	YES (+28.8%)	NO
Cluster Bedroom 2	NO (-10.1%)	NO
Cluster Kitchen 2	NO (-9.5%)	NO
Cluster Bedroom 4	NO (-11.6%)	NO
Cluster Bedroom 3	NO (-10.1%)	NO
Acc. Cluster Bedroom	NO (-6.1%)	NO
Cluster Kitchen 1	NO (-22.2%)	NO
Cluster Bedroom 1	NO (-7.5%)	NO
Studio 3	NO (-65.1%)	NO
Studio 4	YES (+18.1%)	NO
Studio 5	YES (+19.7%)	NO
Studio 6	YES (+20.2%)	NO
Studio 7	YES (+20.7%)	NO
Studio 8	YES (+23.3%)	NO
Studio 9	NO (-63.5%)	NO
Studio 2	YES (+12.3%)	NO
Studio 1	NO (-23.2%)	NO
Acc. Studio	YES (+17.4%)	NO
Studio 10	YES (+15.4%)	NO
Studio 11	YES (+40.8%)	NO
Cluster Bedroom 8	YES (+35.7%)	NO
Cluster Bedroom 7	YES (+31.2%)	NO
Cluster Bedroom 6	YES (+38%)	NO
Cluster Bedroom 5	YES (+28.8%)	NO
Cluster Bedroom 2	NO (-10.1%)	NO
Cluster Kitchen 2	NO (-9.5%)	NO
Cluster Bedroom 4	NO (-11.6%)	NO
Cluster Bedroom 3	NO (-10.1%)	NO
Acc. Cluster Bedroom	NO (-6.1%)	NO
Cluster Kitchen 1	NO (-22.2%)	NO
Cluster Bedroom 1	NO (-7.5%)	NO
Studio 3	NO (-65.1%)	NO
Studio 4	YES (+18.1%)	NO
Studio 5	YES (+19.7%)	NO
Studio 6	YES (+20.2%)	NO
Studio 7	YES (+20.7%)	NO
Studio 8	YES (+23.3%)	NO
Studio 9	NO (-63.5%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Studio 2	YES (+12.3%)	NO
Studio 1	NO (-23.2%)	NO
Acc. Studio	YES (+17.4%)	NO
Studio 10	YES (+15.4%)	NO
Studio 11	YES (+40.8%)	NO
Cluster Bedroom 8	YES (+35.7%)	NO
Cluster Bedroom 7	YES (+31.2%)	NO
Cluster Bedroom 6	YES (+38%)	NO
Cluster Bedroom 5	YES (+28.8%)	NO
Cluster Bedroom 2	NO (-10.1%)	NO
Cluster Kitchen 2	NO (-9.5%)	NO
Cluster Bedroom 4	NO (-11.6%)	NO
Cluster Bedroom 3	NO (-10.1%)	NO
Acc. Cluster Bedroom	NO (-6.1%)	NO
Cluster Kitchen 1	NO (-22.2%)	NO
Cluster Bedroom 1	NO (-7.5%)	NO
Studio 3	NO (-65.1%)	NO
Studio 4	YES (+18.1%)	NO
Studio 5	YES (+19.7%)	NO
Studio 6	YES (+20.2%)	NO
Studio 7	YES (+20.7%)	NO
Studio 8	YES (+23.3%)	NO
Studio 9	NO (-63.5%)	NO
Studio 2	YES (+12.3%)	NO
Studio 1	NO (-23.2%)	NO
Acc. Studio	YES (+17.4%)	NO
Studio 10	YES (+15.4%)	NO
Studio 11	YES (+40.8%)	NO
Cluster Bedroom 8	YES (+35.7%)	NO
Cluster Bedroom 7	YES (+31.2%)	NO
Cluster Bedroom 6	YES (+38%)	NO
Cluster Bedroom 5	YES (+28.8%)	NO
Cluster Bedroom 2	NO (-10.1%)	NO
Cluster Kitchen 2	NO (-9.5%)	NO
Cluster Bedroom 4	NO (-11.6%)	NO
Cluster Bedroom 3	NO (-10.1%)	NO
Acc. Cluster Bedroom	NO (-6.1%)	NO
Cluster Kitchen 1	NO (-22.2%)	NO
Cluster Bedroom 1	NO (-7.5%)	NO
Studio 3	NO (-65.1%)	NO
Studio 4	YES (+18.1%)	NO
Studio 5	YES (+19.7%)	NO
Studio 6	YES (+20.2%)	NO
Studio 7	YES (+20.7%)	NO
Studio 8	YES (+23.3%)	NO
Studio 9	NO (-63.5%)	NO
Studio 2	YES (+12.3%)	NO
Studio 1	NO (-23.2%)	NO
Acc. Studio	YES (+17.4%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Studio 10	YES (+15.4%)	NO
Studio 11	YES (+40.8%)	NO
Cluster Bedroom 8	YES (+35.7%)	NO
Cluster Bedroom 7	YES (+31.2%)	NO
Cluster Bedroom 6	YES (+38%)	NO
Cluster Bedroom 5	YES (+28.8%)	NO
Cluster Bedroom 2	NO (-10.1%)	NO
Cluster Kitchen 2	NO (-9.5%)	NO
Cluster Bedroom 4	NO (-11.6%)	NO
Cluster Bedroom 3	NO (-10.1%)	NO
Acc. Cluster Bedroom	NO (-6.1%)	NO
Cluster Kitchen 1	NO (-22.2%)	NO
Cluster Bedroom 1	NO (-7.5%)	NO
Studio 3	NO (-65.1%)	NO
Studio 4	YES (+18.1%)	NO
Studio 5	YES (+19.7%)	NO
Studio 6	YES (+20.2%)	NO
Studio 7	YES (+20.7%)	NO
Studio 8	YES (+23.3%)	NO
Studio 9	NO (-63.5%)	NO
Studio 2	YES (+12.3%)	NO
Studio 1	NO (-23.2%)	NO
Acc. Studio	YES (+17.4%)	NO
Studio 10	YES (+15.4%)	NO
Studio 11	YES (+40.8%)	NO
Cluster Bedroom 8	YES (+35.7%)	NO
Cluster Bedroom 7	YES (+31.2%)	NO
Cluster Bedroom 6	YES (+38%)	NO
Cluster Bedroom 5	YES (+28.8%)	NO
Cluster Bedroom 2	NO (-10.1%)	NO
Cluster Kitchen 2	NO (-9.5%)	NO
Cluster Bedroom 4	NO (-11.6%)	NO
Cluster Bedroom 3	NO (-10.1%)	NO
Acc. Cluster Bedroom	NO (-6.1%)	NO
Cluster Kitchen 1	NO (-22.2%)	NO
Cluster Bedroom 1	NO (-7.5%)	NO
Studio 3	NO (-65.1%)	NO
Studio 4	YES (+18.1%)	NO
Studio 5	YES (+19.7%)	NO
Studio 6	YES (+20.2%)	NO
Studio 7	YES (+20.7%)	NO
Studio 8	YES (+23.3%)	NO
Studio 9	NO (-63.5%)	NO
Studio 2	YES (+12.3%)	NO
Studio 1	NO (-23.2%)	NO
Acc. Studio	YES (+17.4%)	NO
Studio 10	YES (+15.4%)	NO
Studio 11	YES (+40.8%)	NO
Cluster Bedroom 8	YES (+35.7%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Cluster Bedroom 7	YES (+31.2%)	NO
Cluster Bedroom 6	YES (+38%)	NO
Cluster Bedroom 5	YES (+28.8%)	NO
Cluster Bedroom 2	NO (-10.1%)	NO
Cluster Kitchen 2	NO (-9.5%)	NO
Cluster Bedroom 4	NO (-11.6%)	NO
Cluster Bedroom 3	NO (-10.1%)	NO
Acc. Cluster Bedroom	NO (-6.1%)	NO
Cluster Kitchen 1	NO (-22.2%)	NO
Cluster Bedroom 1	NO (-7.5%)	NO
Studio 3	NO (-65.1%)	NO
Studio 4	YES (+18.1%)	NO
Studio 5	YES (+19.7%)	NO
Studio 6	YES (+20.2%)	NO
Studio 7	YES (+20.7%)	NO
Studio 8	YES (+23.3%)	NO
Studio 9	NO (-63.5%)	NO
Studio 2	YES (+12.3%)	NO
Studio 1	NO (-23.2%)	NO
Acc. Studio	YES (+17.4%)	NO
Studio 10	YES (+15.4%)	NO
Studio 11	YES (+40.8%)	NO
Cluster Bedroom 8	YES (+35.7%)	NO
Cluster Bedroom 7	YES (+31.2%)	NO
Cluster Bedroom 6	YES (+38%)	NO
Cluster Bedroom 5	YES (+28.8%)	NO
Cluster Bedroom 2	NO (-10.1%)	NO
Cluster Kitchen 2	NO (-9.5%)	NO
Cluster Bedroom 4	NO (-11.6%)	NO
Cluster Bedroom 3	NO (-10.1%)	NO
Acc. Cluster Bedroom	NO (-6.1%)	NO
Cluster Kitchen 1	NO (-22.2%)	NO
Cluster Bedroom 1	NO (-7.5%)	NO
Studio 3	NO (-65.1%)	NO
Studio 4	YES (+18.1%)	NO
Studio 5	YES (+19.7%)	NO
Studio 6	YES (+20.2%)	NO
Studio 7	YES (+20.7%)	NO
Studio 8	YES (+23.3%)	NO
Studio 9	NO (-63.5%)	NO
Studio 2	YES (+12.3%)	NO
Studio 1	NO (-23.2%)	NO
Acc. Studio	YES (+17.4%)	NO
Studio 10	YES (+15.4%)	NO
Studio 11	YES (+40.8%)	NO
Cluster Bedroom 8	YES (+35.7%)	NO
Cluster Bedroom 7	YES (+31.2%)	NO
Cluster Bedroom 6	YES (+38%)	NO
Cluster Bedroom 5	YES (+28.8%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Cluster Bedroom 2	NO (-10.1%)	NO
Cluster Kitchen 2	NO (-9.5%)	NO
Cluster Bedroom 4	NO (-11.6%)	NO
Cluster Bedroom 3	NO (-10.1%)	NO
Acc. Cluster Bedroom	NO (-6.1%)	NO
Cluster Kitchen 1	NO (-22.2%)	NO
Cluster Bedroom 1	NO (-7.5%)	NO
Studio 3	NO (-65.1%)	NO
Studio 4	YES (+18.1%)	NO
Studio 5	YES (+19.7%)	NO
Studio 6	YES (+20.2%)	NO
Studio 7	YES (+20.7%)	NO
Studio 8	YES (+23.3%)	NO
Studio 9	NO (-63.5%)	NO
Studio 2	YES (+12.3%)	NO
Studio 1	NO (-23.2%)	NO
Acc. Studio	YES (+17.4%)	NO
Studio 10	YES (+15.4%)	NO
Studio 11	YES (+40.8%)	NO
Cluster Bedroom 8	YES (+35.7%)	NO
Cluster Bedroom 7	YES (+31.2%)	NO
Cluster Bedroom 6	YES (+38%)	NO
Cluster Bedroom 5	YES (+28.8%)	NO
Cluster Bedroom 2	NO (-10.1%)	NO
Cluster Kitchen 2	NO (-9.5%)	NO
Cluster Bedroom 4	NO (-11.6%)	NO
Cluster Bedroom 3	NO (-10.1%)	NO
Acc. Cluster Bedroom	NO (-6.1%)	NO
Cluster Kitchen 1	NO (-22.2%)	NO
Cluster Bedroom 1	NO (-7.5%)	NO
Studio 3	NO (-65.1%)	NO
Studio 4	YES (+18.1%)	NO
Studio 5	YES (+19.7%)	NO
Studio 6	YES (+20.2%)	NO
Studio 7	YES (+20.7%)	NO
Studio 8	YES (+23.3%)	NO
Studio 9	NO (-63.5%)	NO
Studio 2	YES (+12.3%)	NO
Studio 1	NO (-23.2%)	NO
Acc. Studio	YES (+17.4%)	NO
Studio 10	YES (+15.4%)	NO
Studio 11	YES (+40.8%)	NO
Cluster Bedroom 8	YES (+35.7%)	NO
Cluster Bedroom 7	YES (+31.2%)	NO
Cluster Bedroom 6	YES (+38%)	NO
Cluster Bedroom 5	YES (+28.8%)	NO
Cluster Bedroom 2	NO (-10.1%)	NO
Cluster Kitchen 2	NO (-9.5%)	NO
Cluster Bedroom 4	NO (-11.6%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Cluster Bedroom 3	NO (-10.1%)	NO
Acc. Cluster Bedroom	NO (-6.1%)	NO
Cluster Kitchen 1	NO (-22.2%)	NO
Cluster Bedroom 1	NO (-7.5%)	NO
Studio 3	NO (-65.1%)	NO
Studio 4	YES (+18.1%)	NO
Studio 5	YES (+19.7%)	NO
Studio 6	YES (+20.2%)	NO
Studio 7	YES (+20.7%)	NO
Studio 8	YES (+23.3%)	NO
Studio 9	NO (-63.5%)	NO
Studio 2	YES (+12.3%)	NO
Studio 1	NO (-23.2%)	NO
Acc. Studio	YES (+17.4%)	NO
Studio 10	YES (+15.4%)	NO
Studio 11	YES (+40.8%)	NO
Cluster Bedroom 8	YES (+35.7%)	NO
Cluster Bedroom 7	YES (+31.2%)	NO
Cluster Bedroom 6	YES (+38%)	NO
Cluster Bedroom 5	YES (+28.8%)	NO
Cluster Bedroom 2	NO (-10.1%)	NO
Cluster Kitchen 2	NO (-9.5%)	NO
Cluster Bedroom 4	NO (-11.6%)	NO
Cluster Bedroom 3	NO (-10.1%)	NO
Acc. Cluster Bedroom	NO (-6.1%)	NO
Cluster Kitchen 1	NO (-22.2%)	NO
Cluster Bedroom 1	NO (-7.5%)	NO
Studio 3	NO (-65.1%)	NO
Studio 4	YES (+18.1%)	NO
Studio 5	YES (+19.7%)	NO
Studio 6	YES (+20.2%)	NO
Studio 7	YES (+20.7%)	NO
Studio 8	YES (+23.3%)	NO
Studio 9	NO (-63.5%)	NO
Studio 2	YES (+12.3%)	NO
Studio 1	NO (-23.2%)	NO
Acc. Studio	YES (+17.4%)	NO
Studio 10	YES (+15.4%)	NO
Studio 11	YES (+40.8%)	NO
Cluster Bedroom 8	YES (+35.7%)	NO
Cluster Bedroom 7	YES (+31.2%)	NO
Cluster Bedroom 6	YES (+38%)	NO
Cluster Bedroom 5	YES (+28.8%)	NO
Cluster Bedroom 2	NO (-10.1%)	NO
Cluster Kitchen 2	NO (-9.5%)	NO
Cluster Bedroom 4	NO (-11.6%)	NO
Cluster Bedroom 3	NO (-10.1%)	NO
Acc. Cluster Bedroom	NO (-6.1%)	NO
Cluster Kitchen 1	NO (-22.2%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Cluster Bedroom 1	NO (-7.5%)	NO
Studio 3	NO (-65.1%)	NO
Studio 4	YES (+18.1%)	NO
Studio 5	YES (+19.7%)	NO
Studio 6	YES (+20.2%)	NO
Studio 7	YES (+20.7%)	NO
Studio 8	YES (+23.3%)	NO
Studio 9	NO (-63.5%)	NO
Studio 2	YES (+12.3%)	NO
Studio 1	NO (-23.2%)	NO
Acc. Studio	YES (+17.4%)	NO
Studio 10	YES (+15.4%)	NO
Studio 11	YES (+40.8%)	NO
Cluster Bedroom 8	YES (+35.7%)	NO
Cluster Bedroom 7	YES (+31.2%)	NO
Cluster Bedroom 6	YES (+38%)	NO
Cluster Bedroom 5	YES (+28.8%)	NO
Cluster Bedroom 2	NO (-10.1%)	NO
Cluster Kitchen 2	NO (-9.5%)	NO
Cluster Bedroom 4	NO (-11.6%)	NO
Cluster Bedroom 3	NO (-10.1%)	NO
Acc. Cluster Bedroom	NO (-6.1%)	NO
Cluster Kitchen 1	NO (-22.2%)	NO
Cluster Bedroom 1	NO (-7.5%)	NO
Studio 3	NO (-65.1%)	NO
Studio 4	YES (+18.1%)	NO
Studio 5	YES (+19.7%)	NO
Studio 6	YES (+20.2%)	NO
Studio 7	YES (+20.7%)	NO
Studio 8	YES (+23.3%)	NO
Studio 9	NO (-63.5%)	NO
Studio 2	YES (+12.3%)	NO
Studio 1	NO (-23.2%)	NO
Acc. Studio	YES (+17.4%)	NO
Studio 10	YES (+15.4%)	NO
Studio 11	YES (+40.8%)	NO
Cluster Bedroom 8	YES (+35.7%)	NO
Cluster Bedroom 7	YES (+31.2%)	NO
Cluster Bedroom 6	YES (+38%)	NO
Cluster Bedroom 5	YES (+28.8%)	NO
Cluster Bedroom 2	NO (-10.1%)	NO
Cluster Kitchen 2	NO (-9.5%)	NO
Cluster Bedroom 4	NO (-11.6%)	NO
Cluster Bedroom 3	NO (-10.1%)	NO
Acc. Cluster Bedroom	NO (-6.1%)	NO
Cluster Kitchen 1	NO (-22.2%)	NO
Cluster Bedroom 1	NO (-7.5%)	NO
Studio 3	NO (-65.1%)	NO
Studio 4	YES (+18.1%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Studio 5	YES (+19.7%)	NO
Studio 6	YES (+20.2%)	NO
Studio 7	YES (+20.7%)	NO
Studio 8	YES (+23.3%)	NO
Studio 9	NO (-63.5%)	NO
Studio 2	YES (+12.3%)	NO
Studio 1	NO (-23.2%)	NO
Acc. Studio	YES (+17.4%)	NO
Studio 10	YES (+15.4%)	NO
Studio 11	YES (+40.8%)	NO
Cluster Bedroom 8	YES (+35.7%)	NO
Cluster Bedroom 7	YES (+31.2%)	NO
Cluster Bedroom 6	YES (+38%)	NO
Cluster Bedroom 5	YES (+28.8%)	NO
Cluster Bedroom 2	NO (-10.1%)	NO
Cluster Kitchen 2	NO (-9.5%)	NO
Cluster Bedroom 4	NO (-11.6%)	NO
Cluster Bedroom 3	NO (-10.1%)	NO
Acc. Cluster Bedroom	NO (-6.1%)	NO
Cluster Kitchen 1	NO (-22.2%)	NO
Cluster Bedroom 1	NO (-7.5%)	NO
Studio 3	NO (-65.1%)	NO
Studio 4	YES (+18.1%)	NO
Studio 5	YES (+19.7%)	NO
Studio 6	YES (+20.2%)	NO
Studio 7	YES (+20.7%)	NO
Studio 8	YES (+23.3%)	NO
Studio 9	NO (-63.5%)	NO
Studio 2	YES (+12.3%)	NO
Studio 1	NO (-23.2%)	NO
Acc. Studio	YES (+17.4%)	NO
Studio 10	YES (+15.4%)	NO
Studio 11	YES (+40.8%)	NO
Cluster Bedroom 8	YES (+35.7%)	NO
Cluster Bedroom 7	YES (+31.2%)	NO
Cluster Bedroom 6	YES (+38%)	NO
Cluster Bedroom 5	YES (+28.8%)	NO
Cluster Bedroom 2	NO (-10.1%)	NO
Cluster Kitchen 2	NO (-9.5%)	NO
Cluster Bedroom 4	NO (-11.6%)	NO
Cluster Bedroom 3	NO (-10.1%)	NO
Acc. Cluster Bedroom	NO (-6.1%)	NO
Cluster Kitchen 1	NO (-22.2%)	NO
Cluster Bedroom 1	NO (-7.5%)	NO
Studio 3	NO (-65.1%)	NO
Studio 4	YES (+18.1%)	NO
Studio 5	YES (+19.7%)	NO
Studio 6	YES (+20.2%)	NO
Studio 7	YES (+20.7%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Studio 8	YES (+23.3%)	NO
Studio 9	NO (-63.5%)	NO
Studio 2	YES (+12.3%)	NO
Studio 1	NO (-23.2%)	NO
Acc. Studio	YES (+17.4%)	NO
Studio 10	YES (+15.4%)	NO
Studio 11	YES (+40.8%)	NO
Cluster Bedroom 8	YES (+35.7%)	NO
Cluster Bedroom 7	YES (+31.2%)	NO
Cluster Bedroom 6	YES (+38%)	NO
Cluster Bedroom 5	YES (+28.8%)	NO
Cluster Bedroom 2	NO (-10.1%)	NO
Cluster Kitchen 2	NO (-9.5%)	NO
Cluster Bedroom 4	NO (-11.6%)	NO
Cluster Bedroom 3	NO (-10.1%)	NO
Acc. Cluster Bedroom	NO (-5.1%)	NO
Cluster Kitchen 1	NO (-22.2%)	NO
Cluster Bedroom 1	NO (-7.5%)	NO
Studio 3	NO (-65.1%)	NO
Studio 4	YES (+18.1%)	NO
Studio 5	YES (+19.7%)	NO
Studio 6	YES (+20.2%)	NO
Studio 7	YES (+20.7%)	NO
Studio 8	YES (+23.3%)	NO
Studio 9	NO (-63.5%)	NO
Studio 2	YES (+12.3%)	NO
Studio 1	NO (-23.2%)	NO
Acc. Studio	YES (+17.4%)	NO
Studio 10	YES (+15.4%)	NO
Studio 11	YES (+40.8%)	NO
Cluster Bedroom 8	YES (+35.7%)	NO
Cluster Bedroom 7	YES (+31.2%)	NO
Cluster Bedroom 6	YES (+38%)	NO
Cluster Bedroom 5	YES (+28.8%)	NO
Cluster Bedroom 2	NO (-10.1%)	NO
Cluster Kitchen 2	NO (-9.5%)	NO
Cluster Bedroom 4	NO (-11.6%)	NO
Cluster Bedroom 3	NO (-10.1%)	NO
Acc. Cluster Bedroom	NO (-5.1%)	NO
Cluster Kitchen 1	NO (-22.2%)	NO
Cluster Bedroom 1	NO (-7.5%)	NO
Studio 3	NO (-65.1%)	NO
Studio 4	YES (+18.1%)	NO
Studio 5	YES (+19.7%)	NO
Studio 6	YES (+20.2%)	NO
Studio 7	YES (+20.7%)	NO
Studio 8	YES (+23.3%)	NO
Studio 9	NO (-63.5%)	NO
Studio 2	YES (+12.3%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Studio 1	NO (-23.2%)	NO
Acc. Studio	YES (+17.4%)	NO
Studio 10	YES (+15.4%)	NO
Studio 11	YES (+40.8%)	NO
Cluster Bedroom 8	YES (+35.7%)	NO
Cluster Bedroom 7	YES (+31.2%)	NO
Cluster Bedroom 6	YES (+38%)	NO
Cluster Bedroom 5	YES (+28.8%)	NO
Cluster Bedroom 2	NO (-10.1%)	NO
Cluster Kitchen 2	NO (-9.5%)	NO
Cluster Bedroom 4	NO (-11.6%)	NO
Cluster Bedroom 3	NO (-10.1%)	NO
Acc. Cluster Bedroom	NO (-6.1%)	NO
Cluster Kitchen 1	NO (-22.2%)	NO
Cluster Bedroom 1	NO (-7.5%)	NO
Studio 3	NO (-65.1%)	NO
Studio 4	YES (+18.1%)	NO
Studio 5	YES (+19.7%)	NO
Studio 6	YES (+20.2%)	NO
Studio 7	YES (+20.7%)	NO
Studio 8	YES (+23.3%)	NO
Studio 9	NO (-63.5%)	NO
Studio 2	YES (+12.3%)	NO
Studio 1	NO (-23.2%)	NO
Acc. Studio	YES (+17.4%)	NO
Studio 10	YES (+15.4%)	NO
Studio 11	YES (+40.8%)	NO
Cluster Bedroom 8	YES (+35.7%)	NO
Cluster Bedroom 7	YES (+31.2%)	NO
Cluster Bedroom 6	YES (+38%)	NO
Cluster Bedroom 5	YES (+28.8%)	NO
Cluster Bedroom 2	NO (-10.1%)	NO
Cluster Kitchen 2	NO (-9.5%)	NO
Cluster Bedroom 4	NO (-11.6%)	NO
Cluster Bedroom 3	NO (-10.1%)	NO
Acc. Cluster Bedroom	NO (-6.1%)	NO
Cluster Kitchen 1	NO (-22.2%)	NO
Cluster Bedroom 1	NO (-7.5%)	NO
00 Amenity	YES (+170.8%)	NO
00 Acc WC	N/A	N/A
00 Riser	N/A	N/A
00 Lift Lobby	N/A	N/A
00 Entrance / Reception	YES (+132.5%)	NO
00 Parcel Room	YES (+123.6%)	NO
00 Office	YES (+126.4%)	NO
00 Staff Kitchen	YES (+121.4%)	NO
00 Cycle Lift Lobby	YES (+65.7%)	NO
00 Cycle Lift	N/A	N/A
00 Staff WC	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00 Stair / Escape Corridor	YES (+134.6%)	NO
00 Lift	N/A	N/A
00 Plant Lobby	N/A	N/A
00 Refuse	YES (+171.7%)	NO
00 Amenity	YES (+234.7%)	NO
00 Escape Corridor / Stairs	YES (+139.3%)	NO
00 Lobby	N/A	N/A
00 Lift	N/A	N/A
00 Lift	N/A	N/A
00 Lobby	N/A	N/A
00 Storage	N/A	N/A
00 Riser	N/A	N/A
01 Study	YES (+132.1%)	NO
01 Study	YES (+198.2%)	NO
01 Riser	N/A	N/A
01 Lift Lobby	N/A	N/A
01 Lift Lobby	N/A	N/A
01 Lift	N/A	N/A
01 Lift	N/A	N/A
01 Corridor	N/A	N/A
01 Riser	N/A	N/A
01 Store	N/A	N/A
01 Riser	N/A	N/A
01 Lift 3	N/A	N/A
01 Stairs	N/A	N/A
01 Store	N/A	N/A
01 Corridor	N/A	N/A
01 Cycle Store	YES (+182.8%)	NO
01 Cycle Store	YES (+140.5%)	NO
01 Fine Dining	YES (+101%)	NO
01 Fine Dining	YES (+98.4%)	NO
01 Cycle Store	YES (+100.2%)	NO
01 Cycle Lift	N/A	N/A
01 Cycle Lift Lobby	YES (+93.5%)	NO
01 Gym	YES (+194.6%)	NO
01 Lounge	YES (+199.5%)	NO
01 Laundry	YES (+203.6%)	NO
01 Laundry	YES (+204.1%)	NO
Stairs	N/A	N/A

Regulation 25A: Consideration of high efficiency 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
Floor area [m ²]	19212.3	19212.3
External area [m ²]	10174.3	10174.3
Weather	MAN	MAN
Infiltration [m ³ /hm ² @ 50Pa]	5	3
Average conductance [W/K]	8011.59	5863.95
Average U-value [W/m ² K]	0.79	0.58
Alpha value* [%]	12.49	10

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

Building Use

% Area Building Type

Retail/Financial and Professional Services
Restaurants and Cafes/Drinking Establishments/Takeaways
Offices and Workshop Businesses
General Industrial and Special Industrial Groups
Storage or Distribution

99 Hotels

Residential Institutions: Hospitals and Care Homes
Residential Institutions: Residential Schools
Residential Institutions: Universities and Colleges
Secure Residential Institutions
Residential Spaces
Non-residential Institutions: Community/Day Centre
Non-residential Institutions: Libraries, Museums, and Galleries
Non-residential Institutions: Education
Non-residential Institutions: Primary Health Care Building
Non-residential Institutions: Crown and County Courts
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	4.5	2.13
Cooling	1.72	3.58
Auxiliary	6.48	12.85
Lighting	16.23	17.53
Hot water	40.29	41.17
Equipment*	57.46	57.46
TOTAL**	69.21	77.26

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

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

Energy Production by Technology [kWh/m²]

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

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	162.19	81.01
Primary energy [kWh _{PE} /m ²]	105.02	113.93
Total emissions [kg/m ²]	9.68	10.44

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 SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	162.4	109.1	7.9	2.7	10.5	5.7	11.3	5.7	11.3
Notional	37.1	98.4	3.7	5.9	21.6	2.78	4.63	---	---
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	51.1	296.2	2.5	7.3	20.4	5.7	11.3	5.7	11.3
Notional	20	156.6	2	9.4	21.2	2.78	4.63	---	---
[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

Appendix A – BREEAM Pre Assessment





ELEMENT
SUSTAINABILITY

FIRST STREET, MANCHESTER

BREEAM New Construction 2018 PRE-ASSESSMENT REPORT

OCTOBER 2023

REF: 2023.208



Project: First Street, Manchester
Project No: 2023.208
Date: 30th October 2023
Revision: 1.0

BREEAM 2018 New Construction Criteria (NC)

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Executive Summary

Element Sustainability have been appointed by Downing Construction to complete an assessment of the proposed development under the Building Research Establishment Environmental Assessment Methodology (BREEAM). This pre-assessment review report gives an indication of the expected BREEAM score and rating for the development that may be achieved when the final assessment is submitted to the Building Research Establishment (BRE), based on the information provided at this pre-assessment stage.

The proposed scheme comprises the construction of a five hundred and fifty-five room purpose built student accommodation facility.

BREEAM Methodology

The BREEAM UK New Construction 2018 v6.1 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 or use for the first time upon completion of the works.

A BREEAM pre-assessment report has been prepared by a qualified and licensed BREEAM Assessor to demonstrate the feasibility of achieving the desired BREEAM ratings for the new build scheme. The initial pre-assessment report details the possible strategies to be employed.

The BREEAM assessment methodology applicable to this development is as follows:

- BREEAM UK 2018 v6.1 Non-Domestic New Construction (Multi-Residential: Residential Institution Long Term Stay) – fully fitted.

Design Stage Review

Design specifications are assessed for each individual building, before construction begins. A rating is determined, and (subject to quality assurance) a Design Stage or Interim Certificate is awarded for each building. Registered assessors can apply for assessment of a site, compile and submit a design report for assessment and monitor the assessment status online.

Post Construction Stage Review

The Post Construction Stage (PCS) assessment confirms that buildings have either been built to the Design Stage specifications or to (documented) variations from the Design Stage. Variations must be reassessed so that new scores and BREEAM levels can be calculated for each affected building. Where a Design Stage assessment has been undertaken, it is used to inform the PCS assessment.



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BREEAM Rating

A review of the current development proposals has been carried out against the BREEAM UK 2018 New Construction assessment methodology. It is anticipated that the scheme's design has the potential to score **59.31%** (minimum score level for BREEAM 'Very Good' rating is 55%), see Table 1.2 below.

The rating obtained by using this BREEAM Pre-Assessment is for guidance only. The predicted ratings may differ from those obtained through a formal assessment, which will be carried out by an appropriately licensed BREEAM assessor. Advice should be sought from a licensed assessor at an early stage in a project to ensure the estimated rating will be obtained.

Minimum Standards

The minimum standards for the BREEAM 'Very Good' rating are provided within Table 1.1 of this report and highlighted within Table 1.2. To achieve a particular level of performance the majority of BREEAM credits can be traded, i.e. non-compliance in one area can be off set through compliance in another to achieve the target BREEAM rating.

To ensure that performance against fundamental environmental issues is not overlooked in pursuit of a particular rating, BREEAM sets minimum standards of performance in key areas.

Table 1.1 - Minimum Standards

BREEAM NC 2018 Issues	Minimum Standards for BREEAM for 'Very Good' rating
MAN 4: Commissioning and Handover	One credit (commissioning-test schedule and responsibilities)
MAN 4: Commissioning and Handover	Criterion 11 (Building User Guide)
MAN 5: Aftercare	One credit (commissioning-implementation)
ENE 2: Energy Monitoring	One credit (First sub metering credit)
WAT 1: Water Consumption	One credit
WAT 2: Water Monitoring	Criterion 1 only
MAT 3: Responsible Sourcing of Materials	Criterion 1 only

RIBA Sensitive Credits

There are a number of BREEAM credits that need to be addressed at particular RIBA Stage. These credits have been highlighted in **blue** within Table 1.2 below. A full outline of all the RIBA Stage sensitive credits is provided within Appendix A of this report.



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Table 1.2 – Pre-Assessment Review

Issue		Available Credits	Targeted Credits	Credit Weighting (%)	Responsibility	BREEAM Criteria
Management						
Man 1 – Project Brief and Design						
Man 1a	Stakeholder Consultation (Project Delivery)	1	1	0.52%	Design Team	<p>BREEAM Criteria:</p> <p>1) Prior to completion of the Concept Design, the project delivery stakeholders meet to identify and define for each key phase of project delivery:</p> <ul style="list-style-type: none"> 1.a Roles 1.b Responsibilities 1.c Contributions. <p>Consider each one of the following items when defining roles, responsibilities and contributions for each key phase of the project:</p> <ul style="list-style-type: none"> 2.a End user requirements 2.b Aims of the design and design strategy 2.c Particular installation and construction requirements or limitations 2.d Occupiers' budget and technical expertise in maintaining any proposed systems 2.e Maintainability and adaptability of the proposals 2.f Operational energy 2.g Requirements for the production of project and end user documentation 2.h Requirements for commissioning, training and aftercare support. <p>2) The project team demonstrates how the project delivery stakeholders' contributions, and the consultation process outcomes influence the following:</p> <ul style="list-style-type: none"> 3.a Initial Project Brief 3.b Project Execution Plan 3.c Communication Strategy 3.d Concept Design.



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Issue		Available Credits	Targeted Credits	Credit Weighting (%)	Responsibility	BREEAM Criteria
						<p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Copy of the Consultation Plan setting out the scope of the consultation. - Copies of meeting minutes / construction programme / responsibilities schedule, relevant sections/clauses of the building contract. - Evidence demonstrating how the project delivery stakeholder contributions and the outcomes of the consultation process have influenced or changed the Initial Project Brief, Project Execution Plan, Communication Strategy, and Concept Design. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - As per Design Stage.
Man 1b	Stakeholder Consultation (Third Party)	1	1	0.52%	Design Team	<p>BREEAM Criteria:</p> <p>1) Prior to completion of the Concept Design, the design team consult with all interested parties (for example actual or intended building users, representative consultation group from the existing community, existing partnerships and networks that have knowledge of existing buildings of the same type, potential users of shared facilities) on matters that cover the minimum consultation content.</p> <p><u>Minimum Consultation Content:</u></p> <ol style="list-style-type: none"> 1. Functionality, build quality and impact (including aesthetics). 2. Provision of appropriate internal and external facilities (for future building occupants and visitors or users). 3. Management and operational implications. 4. Maintenance resources implications. 5. Impacts on the local community, e.g. local traffic or transportation impact. 6. Opportunities for shared use of facilities and infrastructure with the community or appropriate stakeholders. 7. Compliance with statutory (national or local) consultation requirements. 8. Energy use and sustainability measures. 9. Implementing principles and processes that deliver an inclusive and accessible design.



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Issue		Available Credits	Targeted Credits	Credit Weighting (%)	Responsibility	BREEAM Criteria
						Design Stage Evidence: <ul style="list-style-type: none"> - Consultation plan setting out the process and scope of the consultation. Post Construction Stage Evidence: <ul style="list-style-type: none"> - As per Design Stage.
Man 1c	BREEAM AP (Concept Design)	1	0	0.52%	BREEAM AP	Credit Not Targeted BREEAM Criteria: Involve a BREEAM AP in the project at an appropriate time and level to: <ul style="list-style-type: none"> 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 agreed throughout all stages after their appointment, where decisions critically impact BREEAM performance. c. Proactively identify risks and opportunities related to the achievement of the targets agreed. 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 1d	BREEAM AP (Developed Design)	1	0	0.52%	BREEAM AP	Credit Not Targeted BREEAM Criteria: Involve the BREEAM AP in the project at an appropriate time and level to: <ul style="list-style-type: none"> 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.



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Issue		Available Credits	Targeted Credits	Credit Weighting (%)	Responsibility	BREEAM Criteria
						b. Monitor progress against the performance targets agreed 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. 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 2 - Life Cycle Cost and Service Life Planning						
Man 2a	Elemental LCC	2	0	0.52%	Cost Consultant	<p>Credit Not Targeted</p> <p>BREEAM Criteria:</p> <p>1) A competent person (see Definitions on the facing page) carries out an outline, entire asset LCC plan at Process Stage 2 (equivalent to Concept Design - RIBA Stage 2) together with any design options appraisals in line with 'Standardised method of life cycle costing for construction procurement' PD 156865: 2008. The elemental LCC plan:</p> <p style="padding-left: 40px;">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);</p> <p style="padding-left: 40px;">b. Includes service life, maintenance and operation cost estimates.</p> <p>The study period should ideally be agreed by the client, in line with the design life expectancy of the building.</p> <p>However, where the life expectancy of the building is not yet formally agreed (due to being at very early design stages), the default design life of 60 years should be used for modelling purposes (in line with the UK default).</p> <p>2) Demonstrate, using appropriate examples provided by the design team, how the elemental LCC plan has been used to influence building and systems design and specification to minimise life cycle costs and maximise critical value.</p>



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Issue		Available Credits	Targeted Credits	Credit Weighting (%)	Responsibility	BREEAM Criteria
Man 2b	Component LCC	1	0	0.52%	Cost Consultant	<p>Credit Not Targeted</p> <p>BREEAM Criteria:</p> <p>1) 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.</p> <p>The component level LCC includes (where present):</p> <ul style="list-style-type: none"> 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. <p>The Component level LCC option appraisal should review all of the above component types (where present).</p> <p>However, you do not need to consider every single example cited under each component; only a selection of those most likely to draw valued comparisons. This is to ensure that a wide range of options are considered and help focus the analysis on components which would benefit the most from appraisal.</p> <p>2) 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.</p>
Man 2c	Capital Cost Reporting	1	1	0.52%	Client or Project Manager	<p>BREEAM Criteria:</p> <p>The capital cost to be reported for the refurbishment project £/m².</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Letter of Commitment confirming predicted Capital Costs.



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						Post Construction Stage Evidence: <ul style="list-style-type: none"> - Letter of Confirmation confirming final Capital Costs.
Man 3 - Responsible Construction Practices						
Man 3	Timber Procurement (M)	Pre-Req	Pre-Req	-	Main Contractor	BREEAM Criteria: Main contractor to ensure that all timber is legally harvested and trade timber. Design Stage Evidence: <ul style="list-style-type: none"> - Letter of Commitment confirming all timber will be legally harvested and traded timber. Post Construction Stage Evidence: <ul style="list-style-type: none"> - Copies of all relevant certificates or chain of custody evidence.
Man 3a	Environmental Management	1	1	0.52%	Main Contractor	BREEAM Criteria: 1) 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 be third party certified, to ISO 14001:2015(10) , EMAS (EU Eco-Management and Audit Scheme) or equivalent standard, or be in compliance with BS8555:2016. 2) 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 . Design Stage Evidence: <ul style="list-style-type: none"> - Letter of Commitment.



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						Post Construction Stage Evidence: <ul style="list-style-type: none"> - A copy of the principal contractors EMS/EMAS certificate or for BS 8555, evidence of their status, e.g. a copy of their phase 4 audit.
Man 3b	Sustainability Champion	1	1	0.52%	Sustainability Champion	BREEAM Criteria: Involve a BREEAM AP in the project at an appropriate time and level to: <ul style="list-style-type: none"> 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 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. 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. Design Stage Evidence: <ul style="list-style-type: none"> - Letter of instruction to BREEAM AP. - Formal letter of Commitment. Post Construction Stage Evidence: <ul style="list-style-type: none"> - Meeting minutes / communication records / formal notes of conversations and other statements reporting on discussions related to performance targets and maximising performance. - BREEAM AP Report.



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Man 3c MINIMUM STANDARD	Responsible Construction Management	2	1	0.52%	Main Contractor	<p>BREEAM Criteria: The Main Contractor to register with CCS and achieve a score of 'Compliance'.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Letter of Commitment - Letter of Registration to CCS Scheme <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - Final CCS Report
	Pre-requisite	-	-		Design Team	<p>BREEAM Criteria: Assign responsibility to an individual for monitoring, recording and reporting energy use, water consumption and transportation data (where measured) resulting from all on-site construction processes (and dedicated off-site manufacturing) throughout the build programme.</p> <p>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.</p> <p>Design Stage Evidence: Letter of Commitment</p> <p>Post Construction Stage Evidence: As per Design Stage.</p>
Man 3d	Monitoring of Construction site impacts (Energy and Water)	1	1	0.52%	Main Contractor	<p>BREEAM Criteria: <u>Energy Consumption</u> Main Contractor sets 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.</p>



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						<p>Monitor and record data for the energy consumption described.</p> <p>Report the total carbon dioxide emissions (total kg CO₂/project value) from the construction process via BREEAM Projects.</p> <p><u>Water Consumption</u> Set targets for the potable water consumption (m³) arising from the use of construction plant, equipment (mobile and fixed) and site accommodation.</p> <p>Monitor and record data for the potable water consumption.</p> <p>Use the collated data to report the total net water consumption (m³), i.e. consumption minus any recycled water use from the construction process via BREEAM Projects.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Letter of Commitment <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - Final monitoring and recording data
Man 3e	Monitoring of Construction Site Impacts (Transport)	1	1	0.52%	Main Contractor	<p>BREEAM Criteria: Main Contractor sets 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:</p> <ul style="list-style-type: none"> a. transportation of materials from the point of supply to the building site, including any transport, intermediate storage and point of supply. Monitor as a minimum: <ul style="list-style-type: none"> a.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)). a.i. Ground works and landscaping materials.



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						<p>b. transportation of construction waste from the construction gate to waste disposal processing or recovery centre gate. This monitoring must cover the construction waste groups outlined in the project's resource management plan.</p> <p>Monitor and record data for the transportation movements as described above.</p> <p>Using the collated data, report separately for materials and waste, the total transport-related carbon dioxide emissions (kgCO₂-eq), plus total distance travelled (km) via BREEAM Projects (for the purposes of potential future BREEAM performance benchmarking).</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Letter of Commitment <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - Final monitoring and recording data
Man 4 - Commissioning and Handover						
Man 4a MINIMUM STANDARD	Commissioning and testing schedule and responsibilities	1	1	0.52%	Client/ M&E	<p>BREEAM Criteria:</p> <p>1) Prepare a schedule of commissioning and testing. The schedule identifies and includes a suitable timescale for commissioning and re-commissioning of all complex and non-complex building services and control systems and for testing and inspecting building fabric.</p> <p>The schedule identifies the appropriate standards for all commissioning activities to be conducted, where applicable, in accordance with:</p> <ul style="list-style-type: none"> 2.a Current Building Regulations 2.b BSRIA guidelines (16) 2.c CIBSE guidelines (17) 2.d Other appropriate standards. <p>2) Where a building management system (BMS) is specified:</p>



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						<p>a. Carry out commissioning of air and water systems when all control devices are installed, wired and functional.</p> <p>b. Include physical measurements of room temperatures, off-coil temperatures and other key parameters, as appropriate, in commissioning results.</p> <p>c. The BMS or controls installation should be running in auto with satisfactory internal conditions prior to handover.</p> <p>d. All BMS schematics and graphics (if BMS is present) are fully installed and functional to user interface prior to handover.</p> <p>3) Appoint an appropriate project team member to monitor and programme pre-commissioning, commissioning and testing. Where necessary include re-commissioning activities on behalf of the client.</p> <p>4) The principal contractor accounts for the commissioning and testing programme, responsibilities and criteria within their budget and the main programme of works. Allow the required time to complete all commissioning and testing activities prior to handover.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Letter of Commitment - Copy of Commissioning Schedule - Relevant sections / clauses of the building specification / contract - Copy of Programme of Works confirming commissioning has been accounted for. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - Copies of commissioning records / reports - Formal Letter of Confirmation listing systems commissioned in line with the Commissioning Schedule, along with details of the details of the standards/codes/Building Regulations that each system has been commissioned in accordance with. - Formal letter confirming the BMS commissioning procedures carried out in line with the BREEAM requirements.



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Man 4b	Commissioning – design and preparation	1	1	0.52%	M&E	<p>BREEAM Criteria:</p> <p>1) During the design stage, the client or the principal contractor appoints a specialist commissioning manager with responsibility for:</p> <ul style="list-style-type: none"> a. Undertaking design reviews and giving advice on suitability for ease of commissioning. b. Providing commissioning management input to construction programming and during installation stages. c. Management of commissioning, performance testing and handover or post-handover stages. <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Letter of Commitment - Relevant sections / clauses of the building specification / contract <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - Copies of commissioning records / reports - Formal letter confirming the commissioning responsibilities carried out by the specialist commissioning manager, for all complex systems.
Man 4c	Testing and inspecting building fabric	1	0	0.52%	Main Contractor	<p>Credit Not Targeted</p> <p>BREEAM Criteria:</p> <p>1) Achieve the 'Commissioning – Testing Schedule and responsibilities' credit.</p> <p>2) 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 airtightness testing and a thermographic survey). A suitably qualified professional undertakes the survey and testing in accordance with the appropriate standard.</p> <p>3) 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</p>



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						at the design stage.
Man 4d MINIMUM STANDARD	Handover	1	1	0.52%	Design Team	<p>BREEAM Criteria:</p> <p>1) Prior to handover, develop two building user guides for the following users:</p> <p>a: A non-technical user guide for distribution to the building occupiers.</p> <p>b: A technical user guide for the premises facilities managers.</p> <p>Draft copies will be developed and discussed with users first (where the building occupants are known) to ensure the guide is most appropriate and useful to potential users.</p> <p>2) Prepare two training schedules timed appropriately around handover and proposed occupation plans for the following users:</p> <p>a: A non-technical training schedule for the building occupiers.</p> <p>b: A technical training schedule for the premises facilities managers.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Relevant sections/clauses of the building specification/contract and/or a formal letter of commitment confirming the requirement to develop two compliant Building User Guides. - Relevant sections/clauses of the building specification/contract and/or a formal letter of commitment confirming the requirement to develop two training schedules. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - Copy of the two BREEAM compliant Building User Guides required, covering the minimum BREEAM contents.



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						<ul style="list-style-type: none"> - Formal letter confirming that the Building User Guide has been distributed to all building occupiers and premises managers. - Copy of the two training schedules required, covering the minimum BREEAM contents.
Man 5 – Aftercare						
Man 5a	Aftercare Support	1	1	0.52%	Developer	<p>BREEAM Criteria:</p> <p>1) Provide aftercare support to the building occupiers through having in place operational infrastructure and resources. This includes as a minimum:</p> <ul style="list-style-type: none"> • 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: • Introduce the aftercare support available, including the content of the building user guide (where it exists) and training schedule. • Present key information about features of the building including the design intent and how to use the building to ensure it operates as efficiently and effectively as possible. • On-site facilities management training including: • A walkabout of the building <p>AND</p> <ul style="list-style-type: none"> - introduction to and familiarisation with the building systems, their controls and how to operate them in accordance with the design intent and operational demands. - 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). - 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. <p>2) Establish operational infrastructure and resources to coordinate the</p>



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						<p>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.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Letter of Commitment - Relevant sections / clauses of the building specification / contract <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - Contract to provide compliant aftercare support and training. - Commissioning records, reports and letter of appointment.
Man 5b	Commissioning - Implementation	1	1	0.52%	M&E	<p>BREEAM Criteria:</p> <p>1) Complete the following commissioning activities over a minimum 12-month period, once the building becomes substantially occupied.</p> <p>Complex systems: The specialist commissioning manager will:</p> <ul style="list-style-type: none"> a. Identify changes made by the owner or operator that might have caused impaired or improved performance. b. Test all building services under full load conditions, i.e. heating equipment in mid-winter, cooling and ventilation equipment in mid-summer and under part load conditions (spring and autumn). c. Where applicable, carry out testing during periods of extreme (high or low) occupancy. d. Interview building occupants (where they are affected by the complex services) to identify problems or concerns regarding the effectiveness of the systems. e. Produce monthly reports comparing sub-metered energy performance to the predicted one. f. Identify inefficiencies and areas in need of improvement. g. Re-commission systems (following any work needed to serve revised loads) and incorporate any revisions in operating procedures into the



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						<p>operations and maintenance (O&M) manuals.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Letter of Commitment - Relevant sections / clauses of the building specification / contract <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - As per Design Stage.
Man 5c	Post Occupancy Evaluation	1	0	0.52%	End Occupier	<p>Credit Not Targeted</p> <p>BREEAM Criteria:</p> <p>1) The client or building occupier commits to carry out a POE exercise (see Definitions on the facing page) one year after the building is substantially occupied. This gains comprehensive in-use performance feedback identifies gaps between design intent and in-use performance. The aim is to highlight any improvements or interventions that need to be made and to inform operational processes.</p> <p>An independent party carries out the POE covering:</p> <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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 vi. Other relevant issues, where appropriate



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						<p>2) The independent party provides a report with lessons learned to the client and building occupiers.</p> <p>3) The client or building occupier commits funds to pay for the POE in advance.</p>
Health and Wellbeing						
Hea 1 - Visual Comfort						
Hea 1a	Glare Control	1	1	0.73%	Architect	<p>BREEAM Criteria:</p> <p>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.</p> <p>2) Where risk has been identified within a relevant building area, a glare control strategy issued to design out the potential for glare.</p> <p>The glare control strategy does not increase energy consumption used for lighting. This is achieved by:</p> <ul style="list-style-type: none"> 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. <p>Definition: Glare control - relevant building areas <i>Control of glare from sunlight criteria apply to building areas where lighting and resultant glare could be problematic for users. In residential buildings this would include areas such as study bedrooms or facility management offices, where work or study will be carried out and where glare would hinder such activities. It does not apply to other residential areas.</i></p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Glare control assessment identifying areas at risk of glare and building form, layout and/or design measures implemented in order to design out potential glare in all relevant building areas.



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						Post Construction Stage Evidence: <ul style="list-style-type: none"> - Formal letter confirming that the building has been constructed according to measures identified in the glare control assessment.
Hea 1b	Daylighting	2	2	0.73%	Daylight Consultant	BREEAM Criteria: 1) Daylighting criteria have been met: <ul style="list-style-type: none"> - 80% of relevant building areas achieve a 2% Average Daylight Factor Definition: Daylighting - relevant building areas <ul style="list-style-type: none"> - <i>Kitchens</i> - <i>Living Rooms</i> - <i>Dining Rooms</i> - <i>Studies (including home office)</i> - <i>Non-residential or communal occupied spaces</i> Design Stage Evidence: <ul style="list-style-type: none"> - Daylighting Calculations Post Construction Stage Evidence: <ul style="list-style-type: none"> - Formal letter confirming that the building has been constructed according to measures identified in the Daylighting assessment.
Hea 1c	View Out	1	1	0.73%	Architect	BREEAM Criteria: 1) Multi-Residential Specific Criteria – All areas designed to contain desks or workstations are within 5m of a wall which has a window or permanent opening providing a view out. 2) The window or opening must be >20% of the surrounding wall area. Design Stage Evidence: <ul style="list-style-type: none"> - View Out Calculations



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						Post Construction Stage Evidence: <ul style="list-style-type: none"> - Formal letter confirming that the building has been constructed according to measures identified in the View Out calculations.
Hea 1d	Internal and External Lighting	1	1	0.73%	M&E	BREEAM Criteria: 1) Internal Lighting – 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. 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: <ul style="list-style-type: none"> a. Limits to the luminance of the luminaires to avoid screen reflections. b. Any area where a surface is used to reflect light into a space, such as up-lighting, the 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. 2) Zoning and Controls – Internal lighting is zoned to allow for occupant control. Zoning is in accordance with the criteria below for relevant areas present within the building: <ul style="list-style-type: none"> - In office areas, zones of no more than four workplaces - Workstations adjacent to windows or atria and other building areas separately zoned and controlled



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						<p><u>Spaces less than 40m²</u> Areas which are less than 40m² which do not require any subdivision of lighting zones or control will meet the zoning criteria by default.</p> <p>3) External Lighting – All external lighting located within the refurbishment or fit-out zone is designed in accordance with BS 5489-1:2013 Lighting of roads and public amenity areas³ and BS EN 12464-2:2014 Light and lighting - Lighting of work places - Part 2: Outdoor work places.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Relevant sections/clauses of the building specification/contract and/or a formal letter confirming that all internal lighting has been designed in accordance with the SLL Code for Lighting 2012, LG 7 and LG 5 (where appropriate). - Relevant sections/clauses of the building specification/contract and/or formal letter confirming that all external lighting is 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 workplaces - Part 2: Outdoor workplaces. - Design drawings demonstrating the internal lighting zones and occupant controls. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - Formal letter confirming that there have been no changes to the internal and external lighting design. - 'As built' drawings showing the internal lighting layout, zones and occupant controls as per the design stage. - BREEAM assessor's site inspection.



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Hea 2 Indoor Air Quality						
Hea 2a	Pre-requisite - Indoor Air Quality Plan	Pre-req	Pre-req	-	Design Team/ Indoor Air Quality Specialist	<p>BREEAM Criteria:</p> <p>1) A site-specific indoor air quality plan has been produced and implemented in accordance with the guidance in Guidance Note GN06 during the design stages.</p> <p>The objective of the plan is to facilitate a process that leads to design, specification and installation decisions and actions that minimise indoor air pollution during occupation of the building. The indoor air quality plan must consider the following:</p> <ul style="list-style-type: none"> a. Removal of contaminant sources b. Dilution and control of contaminant sources: c. Where present, consideration is given to the air quality requirements of specialist areas such as laboratories d. Procedures for pre-occupancy flush out e. Third party testing and analysis f. Maintaining good indoor air quality in-use. <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Copy of Indoor Air Quality Plan. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - As per Design Stage.
Hea 2b	Ventilation	1	0	0.73%	M&E	<p>Credit Not Currently Sought</p> <p>BREEAM Criteria:</p> <p>1) The building has been designed to minimise the indoor concentration and recirculation of pollutants in the building as follows:</p> <ul style="list-style-type: none"> a. Provide fresh air into the building in accordance with the criteria of the relevant standard for ventilation.



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						<p>b. Ventilation pathways are designed to minimise the ingress and build-up of air pollutants inside the building.</p> <p>c. Where present, HVAC systems must incorporate suitable filtration to minimise external air pollution, as defined in BS EN16798-3:2017(45). The specified filters should achieve supply air classification of at least SUP 2.</p> <p>d. Areas of the building subject to large and unpredictable or variable occupancy patterns have carbon dioxide (CO₂) or air quality sensors specified and:</p> <p>i. In mechanically ventilated buildings or spaces: sensors are linked to the mechanical ventilation system and provide demand-controlled ventilation to the space.</p> <p>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.</p> <p>2) 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.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Relevant sections/clauses of the building specification/contract and design drawings demonstrating that fresh air into the building is designed in accordance with the criteria of the relevant standard for ventilation. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - Post completion confirmation that there has been no changes to the information provided at design stage. - 'As built' drawings at practical completion.



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Hea 2c	Volatile Organic Compounds (VOCs)	2	1	0.73%	Design Team and Main Contractor	<p>BREEAM Criteria: <u>One credit</u> Three out of the five product types meet the emission limits, testing requirements and any additional requirements listed in Table 5.11 of the BREEAM Technical Manual.</p> <ul style="list-style-type: none"> - Interior Paints and Coatings - Wood Based products - Flooring Materials - Ceiling, wall and acoustic thermal insulation materials - Interior adhesives and sealants <p>Where wood-based products are not one of three selected product types, all wood-based products used for internal fixtures and fittings must be tested and classified as formaldehyde E1 class as a minimum.</p> <p><u>Two Credits</u> All the product types listed meet the emission limits, testing requirements and any additional requirements listed in Table 5.11 of the BREEAM Technical Manual.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Relevant sections/clauses of the building specification/contract and/or a formal letter confirming the requirement for product types to meet the emission limits, testing requirements and any additional requirements listed in Table 5.11 of the BREEAM NC 2018 scheme guidance. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - Manufacturer's literature and/or a formal letter from the product manufacturer confirming compliance with the emission limits, testing requirements and any additional requirements listed in Table 5.11 of the BREEAM NC 2018 scheme guidance.



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Hea 2d	Volatile organic compound (VOC) emission levels (post construction)	1	0	0.73%	Main Contractor/ Indoor Air Quality Specialist	<p>Credit Not Targeted</p> <p>BREEAM Criteria:</p> <p>1) The formaldehyde concentration in indoor air is measured post construction (but pre-occupancy) and does not exceed 100µg/m³ averaged over 30 minutes (World Health Organization guidelines for indoor air quality: Selected pollutants, 2010.</p> <p>2) The formaldehyde sampling and analysis is performed in accordance with ISO 16000-2 and ISO 16000-3.</p> <p>3) The total volatile organic compound (TVOC) concentration in indoor air is measured post construction (but pre-occupancy) and does not exceed 500µg/m³ over 8 hours.</p> <p>4) The TVOC sampling and analysis is performed in accordance with ISO 16000-5 and ISO 16000-6 or ISO 16017-1.</p> <p>5) 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 to within the above limits.</p> <p>6) The measured concentration levels of formaldehyde (µg/m³) and TVOC (µg/m³) are reported, via the BREEAM Scoring and Reporting Tool.</p>
Hea 4 Thermal Comfort						
Hea 4a	Thermal modelling	1	1	0.73%	Thermal Modeller/M&E	<p>BREEAM Criteria:</p> <p>1) Thermal modelling has been carried out using software in accordance with CIBSE AM11 Building Energy and Environmental Modelling during the design stages.</p> <p>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</p>



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						<p>complex means of analysis may be appropriate (such methodologies must still be in accordance with CIBSE AM11).</p> <p>3) The modelling demonstrates that:</p> <p>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 design2, Table 1.5; or other appropriate industry standard (where this sets a higher or more appropriate requirement/level for the building type).</p> <p>b. For naturally ventilated/free running buildings:</p> <p>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/level for the building type).</p> <p>ii. The building is designed to limit the risk of overheating, in accordance with the adaptive comfort methodology outlined in CIBSE TM52: The limits of thermal comfort: avoiding overheating in European buildings.</p> <p>4) For air-conditioned buildings, the PMV (predicted mean vote) and PPD (predicted percentage of dissatisfied) indices based on the above modelling are reported via the BREEAM assessment scoring and reporting tool.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Thermal Modelling Report - PMV (Predicted Mean Vote) and PPD (Predicted Percentage of Dissatisfied) indices based on the thermal modelling. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - Formal letter confirming that there have been no changes to the design since the thermal comfort assessment has been carried out, therefore



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						equipment has been installed as per the design stage specification in order to achieve the design heating and cooling internal temperatures.
Hea 4b	Designing for future thermal comfort	1	1	0.73%	Thermal Modeller/M&E	<p>BREEAM Criteria:</p> <p>1) The 'Thermal Modelling' criteria are achieved.</p> <p>2) The thermal modelling demonstrates that the relevant requirements are achieved for a projected climate change environment.</p> <p>Where this 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.</p> <p>3) For air-conditioned buildings, the PMV and PPD indices based on the above modelling are reported via the BREEAM assessment scoring and reporting tool.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Thermal Modelling Report - PMV (Predicted Mean Vote) and PPD (Predicted Percentage of Dissatisfied) indices based on the thermal modelling. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - Formal letter confirming that there have been no changes to the design since the thermal comfort assessment has been carried out, therefore equipment has been installed as per the design stage specification in order to achieve the design heating and cooling internal temperatures.
Hea 4c	Thermal zoning and controls	1	0	0.73%	Thermal Modeller/M&E	<p>Credit Not Targeted</p> <p>BREEAM Criteria:</p> <p>1) The 'Thermal Modelling' criteria are achieved.</p> <p>2) The thermal modelling analysis has informed the temperature control</p>



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						<p>strategy for the building and its users. The strategy for proposed heating or cooling systems demonstrates that it has addressed the following:</p> <ul style="list-style-type: none"> a. Zones within the building, and how the building services could efficiently and appropriately heat or cool these areas. For example, consider the <ul style="list-style-type: none"> 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 user (or alternatively building type or use specific design guidance, case studies, feedback) and considers: <ul style="list-style-type: none"> 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 5 - Acoustic Performance						
Hea 5a	Performance Standard	4	4	0.73%	Acoustician	<p>BREEAM Criteria:</p> <p>1) During the design stages the building meets the appropriate acoustic performance standards and testing requirements for the acoustic principles</p>



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						<p>of:</p> <ul style="list-style-type: none"> a. Sound insulation b. Indoor ambient noise level, and, c. Room acoustics. <p>RESIDENTIAL INSTITUTIONS SPECIFIC REQUIREMENTS:</p> <p>Sound Insulation – One Credit - Airborne sound insulation values are at least 3 dB higher and impact sound insulation values are at least 3 dB lower than the performance standards in the relevant building regulations or standards.</p> <p>Two Credits - Airborne sound insulation values are at least 5 dB higher and impact sound insulation values are at least 5 dB lower than the performance standards in the relevant building regulations or standards.</p> <p>Indoor ambient noise levels - Achieve indoor ambient noise levels that comply with the design ranges given in Section 7 of BS8233:2014.</p> <p>Room acoustics - Achieve the requirements relating to sound absorption within residential spaces and within the common spaces of the building described in the relevant building regulations or building standards national guidance.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Formal letter of appointment or other confirmation demonstrating when the acoustician was appointed. - Evidence to confirm that the acoustician is 'suitably qualified' in line with the BREEAM criteria. - Acousticians report demonstrating compliance with appropriate acoustic performance standards and testing requirements for sound insulation, indoor ambient noise levels and room acoustics. - Relevant sections/clauses of the building specification/contract and/or a formal letter confirming that a programme of pre-completion testing will be carried out by a compliant test body in accordance with the relevant acoustic testing and measurement procedures. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - Acousticians' pre-completion testing report confirming that the requirements for sound insulation, indoor ambient noise levels and reverberation have been met.



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						<ul style="list-style-type: none"> - Evidence to confirm that the acoustician is 'suitably qualified' in line with the BREEAM criteria. - Formal letter, where relevant, to confirm that all required remedial works have been carried out in accordance with the acousticians' recommendations.
Hea 6 - Safety and Security						
Hea 6a	Security of Building	1	0	0.73%	Architect/ALO	<p>Credit Not Targeted</p> <p>BREEAM Criteria:</p> <p>1) A Suitably Qualified Security Specialist (SQSS) conducts an evidence-based Security Needs Assessment (SNA) during or prior to Concept Design (RIBA Stage 2 or equivalent). The purpose of the SNA will be to identify attributes of the proposal, site and surroundings which may influence the approach to security for the development.</p> <p>2) The SQSS develops a set of security controls and recommendations for incorporation into the proposals. Those controls and recommendations shall directly relate to the threats and assets identified in the preceding SNA.</p> <p>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.</p>
Hea 07 – Safe and Healthy Surroundings						
Hea 7a	Safe Access	1	0	0.73%	Architect/Landscape Architect	<p>Credit Not Targeted</p> <p>BREEAM Criteria:</p> <p>1) Where external site areas form part of the assessed development the following apply:</p> <p>2) Dedicated and safe cycle paths are provided from the site entrance to any cycle storage and connect to offsite cycle paths where applicable.</p>



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						<p>3) Dedicated and safe footpaths are provided on and around the site providing suitable links for the following:</p> <ul style="list-style-type: none"> a. The site entrance to the building entrance. b. Car parks (where present) to the building entrance. c. The building to outdoor space. d. Connecting to off-site paths where applicable. <p>4) Pedestrian drop-off areas are designed off, or adjoining to, the access road and should provide direct access to other footpaths.</p> <p>5) Where vehicle delivery access and drop-off areas form part of the assessed development, the following apply:</p> <p>Delivery areas are not accessed through general parking areas and do not cross or share the following:</p> <ul style="list-style-type: none"> a. Pedestrian and cyclist paths. b. Outside amenity areas accessible to building users and general public. <p>6) There is a dedicated parking or waiting area for goods vehicles with appropriate separation from the manoeuvring area and staff and visitor car parking.</p> <p>7) Parking and turning areas are designed for simple manoeuvring according to the type of delivery vehicle likely to access the site, thus avoiding the need for repeated shunting.</p>
Hea 7b	Outside Space	1	1	0.73%	Architect/Landscape Architect	<p>BREEAM Criteria:</p> <p>1) There is an outside space providing building users with an external amenity area.</p> <p>The outside space must:</p> <ul style="list-style-type: none"> - be an outdoor landscaped area, for example a garden, balcony or terrace; the majority of the space should be open to the sky.



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						<ul style="list-style-type: none"> - have appropriate seating areas and be non-smoking. - be located to ensure it is accessible to all building users and avoids areas that will have disturbances from sources of noise (e.g. building services, car parks, busy roads, delivery areas etc.). <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Formal letter of commitment. - Design drawings demonstrating the provision of an outside space providing building users with an external amenity area. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - Formal letter of confirmation. - 'As Built' drawings demonstrating the provision of an outside space providing building users with an external amenity area.
Energy						
Ene 1 - Reduction of CO2 Emissions						
Ene 1a MINIMUM STANDARD	Reduction of CO ₂ Emissions	9	4	0.80%	Energy Assessor	<p>BREEAM Criteria:</p> <p>1) Calculate an Energy Performance Ratio for New Construction (EPR NC).</p> <p>The methodology for the EPR NC calculation considers three metrics of modelled building performance when determining the number of credits achieved for this issue. The three metrics are:</p> <ol style="list-style-type: none"> 1. The building's heating and cooling energy demand 2. The building's primary energy consumption 3. The total resulting CO₂-eq emissions. <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - A copy of the building regulations output document from the approved software. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - As per interim design stage., but with the output documents from the approved software reflecting performance at the as-built stage of analysis.



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						This must account for any changes to the specification during construction and the measured air leakage rate, ductwork leakage and fan performances (as required by building regulations).
Ene 1b	Prediction of operational energy consumption	4	0	0.80%	Energy Assessor/Design Team	<p>Credit Not Currently Sought</p> <p>BREEAM Criteria:</p> <ol style="list-style-type: none"> 1) Involve relevant members of the design team in an energy design workshop focusing on operational energy performance. 2) Undertake additional energy modelling during the design and post-construction stage to generate predicted operational energy consumption figures. 3) Report predicted energy consumption targets by end use, design assumptions and input data (with justifications). 4) 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.
Ene 2 - Energy Monitoring						
Ene 2a MINIMUM STANDARD	Sub-metering of major energy consuming systems	1	1	0.78%	M&E	<p>BREEAM Criteria:</p> <ol style="list-style-type: none"> 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. 2) Meter the energy consumption in buildings according to the total useful floor area: If the area is greater than 1,000m², by end-use category with an appropriate energy monitoring and management system.



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						<p>If the area is less than 1,000m², use either:</p> <ul style="list-style-type: none"> - an energy monitoring and management system or - Separate accessible energy sub-meters with pulsed or other open protocol communication outputs, for future connection to an energy monitoring and management system. <p>3) Building users can identify the energy consuming end uses, for example through labelling or data outputs.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Relevant sections/clauses of the building specification/contract and design drawings demonstrating the proposed metering strategy. - Details of the energy monitoring and management system. - Formal written confirmation that the end energy consuming uses will be identifiable to the building users i.e. through labelling or data outputs. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - 'As built' drawings confirming the installed metering strategy in line with the design stage specification. - BREEAM assessor's site inspection.
Ene 3 - External Lighting						
Ene 3	External Lighting	1	1	0.80%	M&E	<p>BREEAM Criteria:</p> <p>1) No external lighting (which includes lighting on the building, at entrances, or signs),</p> <p>OR;</p> <p>2) The average initial luminous efficacy of the external light fittings within the construction zone is not less than 70 luminaire lumens per circuit Watt.</p> <p>External light fittings are automatically controlled for prevention of operation during daylight hours and presence detection in areas of intermittent</p>



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						<p>pedestrian traffic.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Relevant sections/clauses of the building specification/contract and design drawings demonstrating the proposed external lighting strategy, confirming that all external lighting is automatically controlled to prevent operation during daylight hours, with presence detection in areas of intermittent pedestrian traffic. - Manufacturer's datasheets confirming the lamp lumens and circuit Watt for each fitting, confirming an average luminous efficacy of not less than 70 lumens per circuit Watt. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - 'As built' drawings showing the number and type of installed external light fittings, photocell and time clock, in line with the design stage specification. - Where changes have occurred since the design stage specification, please provide manufacturer's datasheets for the installed fittings confirming the lamp lumens and circuit Watt of each fitting. - BREEAM assessor's site inspection.
Ene 4 - Low Carbon Design						
Ene 4a	Passive Design Analysis	1	0	0.80%	M&E / Energy Assessor	<p>Credit Not Targeted</p> <p>BREEAM Criteria:</p> <p>1) Achieve the first credit Hea 04 Thermal comfort: One credit - Thermal modelling to demonstrate that the building design delivers appropriate thermal comfort levels in occupied spaces.</p> <p>2) The project team analyses the proposed building design and development during Concept Design to identify opportunities for the implementation of passive design measures</p> <p>3) Implement passive design measures to reduce the total heating, cooling,</p>



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						<p>mechanical ventilation, lighting loads and energy consumption in line with the passive design analysis findings.</p> <p>4) Quantify the reduced total energy demand and carbon dioxide (CO₂-eq) emissions resulting from the passive design measures.</p>
Ene 4b	Free Cooling	1	0	0.80%	M&E / Energy Assessor	<p>Credit Not Targeted</p> <p>BREEAM Criteria:</p> <p>1) Achieve the passive design analysis credit.</p> <p>2) Include a free cooling analysis in the passive design analysis.</p> <p>3) Identify opportunities for the implementation of free cooling solutions.</p> <p>4) The building is naturally ventilated or uses any combination of the free cooling strategies listed below:</p> <ul style="list-style-type: none"> - Night-time cooling (which could include the use of a high exposed thermal mass) - Ground coupled air cooling - Displacement ventilation (not linked to any active cooling system) - Ground water cooling - Surface water cooling - Evaporative cooling, direct or indirect - Desiccant dehumidification and evaporative cooling, using waste heat - Absorption cooling, using waste heat.



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Ene 4b	LZC Technologies	1	1	0.80%	M&E / Energy Assessor	<p>BREEAM Criteria:</p> <ol style="list-style-type: none"> 1) An energy specialist completes a feasibility study (see Low and zero carbon feasibility study on the next page) by the end of Concept Design. 2) Establish the most appropriate recognised local (on-site or near-site) low and zero carbon (LZC) energy sources for the building or development based on the feasibility study. 3) Specify local LZC technologies for the building or development in line with the feasibility study recommendations. 4) Quantify the reduced regulated carbon dioxide (CO₂-eq) emissions resulting from the feasibility study. <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - LZV Feasibility Report - Results from a dynamic simulation model demonstrating reductions in CO₂-eq emissions from the specified low and zero carbon technology. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - As per interim design stage.
Ene 6 - Energy Efficient Transportation Systems						
Ene 6	Lifts & Escalators	2	2	0.80%	Lift Supplier	<p>BREEAM Criteria: <u>Energy Consumption</u> For specified lifts, escalators or moving walks (transportation types):</p> <ol style="list-style-type: none"> a. Analyse the transportation demand and usage patterns for the building to determine the optimum number and size of lifts, escalators or moving walks. b. Calculate the energy consumption in accordance with BS EN ISO 25745 Part 2 (132) or Part 3 (133) for one of the following:



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						<ul style="list-style-type: none"> - least two options for each transportation type (e.g. for lifts, hydraulic, traction or machine room-less (MRL)) OR; - At least two options considering different system arrangements and control strategies. <p>c. Consider the use of regenerative drives, subject to the requirements in Regenerative drives in the BREEAM manual.</p> <p>d. Specify the transportation system with the lowest energy consumption.</p> <p><u>Energy Efficient Features</u> Specify the following three energy efficient features for each lift:</p> <ul style="list-style-type: none"> 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. <p>Specify regenerative drives where their use is demonstrated to save energy.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Transportation analysis and/or calculations based on usage patterns for the building, which confirms the optimum number and size of lifts required for the development, the energy consumption of at least two types of lift in accordance with BS EN ISO 25745 Part 2 or Part 3, with the lowest energy consuming lift specified and considers the use of regenerative drives. - Manufacturer's product details and/or a formal letter of commitment from the system(s) manufacturer/supplier confirming the energy efficient features are specified. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - Manufacturer's datasheet for the installed lift, in line with the design stage specification.



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						<ul style="list-style-type: none"> - Post completion confirmation that there has been no changes to the information provided at design stage. - BREEAM Assessor's site inspection.
Ene 8 - Energy Efficient Equipment						
Ene 8	Energy Efficient Equipment	2	0	0.80%	M&E/End Occupier	<p>Credit Not Targeted</p> <p>BREEAM Criteria:</p> <p>1) Identify the building's unregulated energy consuming loads. Estimate their contribution to the total annual unregulated energy consumption of the building, assuming a typical or standard specification.</p> <p>2) Identify the systems or processes that use a significant proportion of the total annual unregulated energy consumption of the building.</p> <p>3) Demonstrate a meaningful reduction in the total annual unregulated energy consumption of the building. Table 6.5 (within the BREEAM Technical) lists some examples of significant contributors to unregulated energy consumption, and the associated criteria. If additional significant contributors, not listed in the table, will be specified, the design team should justify how a meaningful reduction will be achieved for these contributors.</p> <p>Estimating annual unregulated energy consumption - A method should be used that estimates actual energy use, based on expected equipment loads and hours of operation. The energy uses may be estimated by using simple hand calculations, or benchmark data, or by the methods described in CIBSE TM54: Evaluating operational energy performance of buildings at the design stage.</p>



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Transport						
Tra 1 - Transport assessment and travel plan						
Tra 1	Transport assessment and travel plan	2	2	0.83%	BREEAM Assessor	<p>BREEAM Criteria:</p> <p>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.</p> <p>2) The site-specific travel assessment (or statement) shall cover as a minimum:</p> <ul style="list-style-type: none"> a: If relevant, travel patterns and attitudes of existing building or site users towards 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, 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), g: Current facilities for cyclists. <p>3) Following a transport assessment, a site-specific travel plan that provides a long-term management strategy which encourages more sustainable travel will be produced.</p> <p>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.</p>



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						<p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Copy of the travel plan based on a site-specific travel survey/assessment, which covers the minimum BREEAM content and proposals to increase or improve sustainable modes of transport and movement of people and goods during the building's operation and use. - Design drawings demonstrating examples of measures specified in support of the travel plan. - Formal letter to confirm that the recommendations of the travel plan will be implemented post construction and supported by the building's management in operation. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - Formal letter confirming that the travel plan will be implemented and supported by the building's management in operation. - BREEAM assessor's site inspection.
Tra 2 – Sustainable Transport Measures						
Tra 2	Sustainable Transport Measures	10	6	0.83%	BREEAM Assessor	<p>BREEAM Criteria:</p> <p>1) Award credits according to the existing Accessible Index (AI) of the project, and the total number of points achieved for the options implemented.</p> <ol style="list-style-type: none"> 1. The existing AI calculated in Tra 01 achieves ≥ 8. 2. Demonstrate an increase over existing accessibility / dedicated service. 3. Provide a public transport information system in a publicly accessible area, to allow building users access to up-to-date information on the available public transport and transport infrastructure. This may include signposting to public transport, cycling, walking infrastructure or local amenities. 6. Provide electric recharging stations of a minimum of 3kW for at least 10% of the total car parking capacity for the development. 7. Set up a car sharing group or facility. 8. Consult with local Authority, agree and implement one proposition. 9. Install compliant cycle storage spaces to meet the minimum levels. 10. Provide at least two compliant cyclists' facilities for the building users:



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						<p>Showers, Changing facilities, Lockers or Drying spaces.</p> <p>11. At least three existing accessible amenities are present.</p> <p>12. Ensure a minimum of one new accessible amenity (eg access to outdoor open space), is provided.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Provide evidence demonstrating the sustainable transport measures being implemented on site. - Design Stage drawings <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - Post Construction Stage drawings - BREEAM assessor's site inspection.
Water						
Wat 1 - Water Consumption						
Wat 1 MINIMUM STANDARD	Water Consumption	5	3	0.77%	Architect/M&E	<p>BREEAM Criteria:</p> <p>1) Use the BREEAM Wat 01 calculator to assess the efficiency of the domestic water-consuming components.</p> <p>2) Use the standard Wat 01 method to compare the water consumption (litres/person/day) for the assessed building against a baseline performance.</p> <p>3) Award BREEAM credits based upon the percentage improvement over baseline building water consumption.</p> <p>The efficiency of the following 'domestic scale' water-consuming components must be included in the assessment:</p> <ul style="list-style-type: none"> - WCs - Urinals - Taps (wash hand basins and where specified kitchen taps and waste disposal unit) - Showers - Baths



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						<div><div><div><div><div></div><div></div></div><div><div></div><div></div></div></div><div><div><div>Dishwashers (domestic and commercial sized) and</div><div>Washing machine (domestic and commercial or industrial sized)</div></div></div></div><div><div><div>No. of BREEAM credits</div><div>% improvement</div></div><div><div>1</div><div>12.5%</div></div><div><div>2</div><div>25%</div></div><div><div>3</div><div>40%</div></div><div><div>4</div><div>50%</div></div><div><div>5</div><div>55%</div></div><div><div>1 exemplary performance credit</div><div>65%</div></div></div><div><div>Design Stage Evidence:</div><div><div><div>-</div><div>A completed copy of the BREEAM Wat 01 calculator.</div></div><div><div>-</div><div>Product data sheets supporting the data used to complete the calculator tool.</div></div></div></div><div><div>Post Construction Stage Evidence:</div><div><div><div>-</div><div>As per Design Stage.</div></div></div></div></div>
Wat 2 - Water Monitoring						
<div><div>Wat 2</div><div>MINIMUM</div><div>STANDARD</div></div>	<div>Water Monitoring</div>	1	1	0.77%	M&E	<div><div>BREEAM Criteria:</div><div><div>1) Specify a water meter on the mains water supply to each building. This includes instances where water is supplied via a borehole or other private source.</div><div>2) For water-consuming plant or building areas consuming 10% or more of the building's total water demand:<div><div>a. Fit easily accessible sub-meters OR</div><div>b. Install water monitoring equipment integral to the plant or area.</div></div></div><div>3) For each meter (main and sub):<div><div>a. Install a pulsed or other open protocol communication output AND</div><div>b. Connect it to an appropriate utility monitoring and management</div></div></div></div></div>



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						<p>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.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Relevant sections/clauses of the building specification/contract and design drawings confirming the specification of a water meter on the mains water supply to the building, and where any water consuming plant or building areas consume 10% or more of the building's total water demand. - Relevant sections/clauses of the building specification/contract and/or a formal letter confirming that the water meter and sub-meters will be pulsed output and connected to a BMS. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - 'As built' drawings confirming the installation of a water meter on the mains water supply to the building. - Formal letter confirming that the water meter and sub-meters will be connected to the BMS. - BREEAM assessor's site inspection.
Wat 3 - Water Leak Detection and Prevention						
Wat 3a	Leak detection system	1	1	0.77%	M&E	<p>BREEAM Criteria:</p> <p>1) A leak detection system which is capable of detecting a major water leak on the mains water supply within the building and between the building and the utilities water meter is installed.</p> <p>The leak detection system must be:</p> <ul style="list-style-type: none"> 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 is installed. b. Activated when the flow of water passing through the water meter/data logger is at a flow rate above a pre-set maximum for a



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						<p>pre-set period of time.</p> <p>c. Able to identify different flow and therefore leakage rates, e.g. continuous, high and/or low level, over set time periods.</p> <p>d. Programmable to suit the owner/occupiers' water consumption criteria.</p> <p>e. Where applicable, designed to avoid false alarms caused by normal operation of large water-consuming plant such as chillers.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Relevant sections/clauses of the building specification/contract and design drawings confirming the specification of a water leak detection system which is capable of detecting a major leak on the mains water supply within the building and between the building and the site boundary. - Manufacturer's product details demonstrating the scope of the leak detection system, in line with the BREEAM criteria. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - 'As built' drawings showing the installation of a BREEAM compliant water leak detection system. - BREEAM assessor's site inspection.
Wat 3b	Flow Control Devices	1	1	0.77%	M&E	<p>BREEAM Criteria:</p> <p>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.</p> <p>RESIDENTIAL INSTITUTIONS SPECIFIC REQUIREMENTS:</p> <p>Flow control devices in WC areas or facilities are not required for facilities in residential areas of long-term residential accommodation, however flow control devices should be installed in any shared publicly accessible W/C' areas (such as staff WC's, etc).</p>



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						<p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Relevant sections/clauses of the building specification/contract and design drawings confirming the specification of flow control devices that regulate the supply of water to each WC area/facility i.e. solenoid valves connected to PIR controls to ensure water is supplied only when needed and therefore prevent minor water leaks. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - 'As built' drawings showing the installation of solenoid valves connected to PIRs in each toilet facility. - BREEAM assessor's site inspection.
Materials						
Mat 1 Environmental impacts from construction products - Building life cycle assessment (LCA)						
Mat 1	Environmental impacts from construction products - Building life cycle assessment (LCA)	6	0	1.07%	Architect/Structural Engineer	<p>Credit Not Targeted</p> <p>BREEAM Criteria:</p> <p>1) During the Concept Design, demonstrate the environmental performance of the building as follows:</p> <ul style="list-style-type: none"> 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. 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). <p>2) During Technical Design, demonstrate the environmental performance of the building as follows:</p> <ul style="list-style-type: none"> 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. b. Submit the Mat 01/02 Results Submission Tool to BRE at the end of



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						Technical Design.
Mat 02 - Environmental impacts from construction products – Environmental Product Declarations (EPD)						
Mat 2	Environmental impacts from construction products – (EPD)	1	0	1.07%	Architect/Structural Engineer	<p>Credit Not Targeted</p> <p>BREEAM Criteria:</p> <p>Specify construction products with EPD that achieve a total EPD points score of at least 20, according to the Methodology in the BREEAM Technical Manual.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - The Mat 01/02 Results Submission tool. - Copies of EPD certificates. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - As per Design Stage. -
Mat 3 - Responsible Sourcing of Materials						
Mat 3a MINIMUM STANDARD	Timber Procurement	Pre-Req.	Pre-req.	-	Main Contractor	<p>BREEAM Criteria:</p> <p>All timber used on site will be sourced in accordance with the UK Government's Timber Procurement Policy.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Letter of Commitment confirming all timber will be legally harvested and traded timber. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - Copies of all relevant certificates or chain of custody evidence.



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Mat 3b	Sustainable Procurement Plan	1	1	1.07%	Main Contractor	<p>BREEAM Criteria:</p> <p>1) A sustainable procurement plan must be used by the design team to guide specification towards sustainable construction products. The plan must:</p> <ul style="list-style-type: none"> 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. <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Copy of the sustainable procurement plan, which has been produced during Concept Design (RIBA Stage 2), and includes sustainability aims, objectives and strategic targets to guide specification towards sustainable construction products. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - As per Design Stage.
Mat 3c	Major Building Elements	3	2	1.07%	Main Contractor	<p>BREEAM Criteria:</p> <p>Key building materials are responsibly sourced to reduce environmental and socio-economic impacts, as demonstrated through the specification of products with compliant Responsible Sourcing Certification (BES 6001, ISO 14001, FSC, PEFC).</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Relevant sections/clauses of the building specification/contract and design drawings confirming:



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						<p>a. The applicable building elements b. Details of the material specification for each applicable element.</p> <ul style="list-style-type: none"> - Relevant sections/clauses of the building specification/contract and/or a formal letter of commitment confirming the requirement to procure all relevant materials from responsible sources. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - 'As built' drawings confirming the installation of materials for the applicable location and use categories as per the design stage. - Responsible sourcing certificates (i.e. ISO 14001, BES 6001 etc.) for each material comprising the applicable building elements.
Mat 5 - Designing for Robustness						
Mat 5	Designing for Robustness	1	1	1.07%	Architect	<p>BREEAM Criteria: Protecting vulnerable parts of the building from damage 1) The building incorporates suitable durability and protection measures or designed features/solutions to prevent damage to vulnerable parts of the internal and external building and landscaping elements. This must include, but is not necessarily limited to:</p> <ul style="list-style-type: none"> a. Protection from the effects of high pedestrian traffic in main entrances, public areas and thoroughfares (corridors, lifts, stairs, doors etc.). b. Protection against any internal vehicular/trolley movement within 1m of the internal building fabric in storage, delivery, corridor and kitchen areas. <p>Protecting exposed parts of the building from material degradation 2) Environmental factors have been identified that are relevant to the site location.</p> <p>3) Existing applicable building elements that are exposed to any relevant environmental factors have been identified.</p>



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						<p>4) Existing applicable building elements have been surveyed have been assessed to identify impacts of material degradation effects including an assessment to grade the severity of any degradation effects.</p> <p>5) Design and specification measures have to be developed to repair and protect existing elements according to the severity of any degradation affects, to limit degradation. Where it is not feasible to implement measures to limit material degradation for existing elements, justification should be provided.</p> <p>6) Newly specified materials or newly constructed elements (e.g. a new external wall) within the scope of refurbishment or fit-out works incorporate appropriate design and specification measures to limit material degradation due to environmental factors.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Design drawings illustrating the vulnerable areas/parts of the building and the durability measures specified to reduce damage to the building's fabric or materials in case of accidental or malicious damage. - Evidence confirming the applicable building elements appropriate to the building and the environmental factors likely to cause material degradation effects in the identified applicable materials. - Relevant sections/clauses of the building specification/contract and/or design drawings confirming the elements/products achieving an appropriate quality or durability standard or design guide, as outlined in Table 9.14 of the BREEAM NC 2018 scheme guidance, or a copy of a detailed assessment of the element's resilience when exposed to the applicable material degradation and environmental factors. - Relevant sections/clauses of the building specification/contract and/or design drawings demonstrating that convenient access to the roof and façade for cost-effective cleaning, replacement and repair has been included in the design, and that the roof and façade has been designed to prevent water damage, ingress and detrimental ponding.



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						Post Construction Stage Evidence: <ul style="list-style-type: none"> - 'As built' drawings confirming the installation of protection measures in order to protect vulnerable areas in line with the design stage specification. - BREEAM assessor's site inspection.
Mat 6 – Material Efficiency						
Mat 6	Material Efficiency	1	0	1.07%	Design Team	Credit Not Targeted BREEAM Criteria: <ol style="list-style-type: none"> 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. <ul style="list-style-type: none"> - Preparation and Brief - Concept Design - Developed Design - Technical Design - Construction. 2) Develop and record the implementation of material efficiency, during: <ul style="list-style-type: none"> - Developed Design - Technical Design - Construction. 3) Report the targets and actual material efficiencies achieved.



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Waste						
Wst 1 - Construction Waste Management						
Wst 1b	Pre-Demolition Audit	N/A	N/A	0.66%	Developer	<p>Credit Not Applicable – No demolition occurring on site</p> <p>BREEAM Criteria:</p> <p>1) Complete a pre-demolition audit of any existing buildings, structures or hard surfaces being considered for demolition. 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.</p> <p>The pre-demolition audit must cover:</p> <ul style="list-style-type: none"> - Identification and quantification of the key materials where present on the project - Potential applications and any related issues for the reuse and recycling of the key materials in accordance with the waste hierarchy - Opportunities for reuse and recycling within the same development - Identification of local re-processors or recyclers for recycling of materials - Identification of overall recycling targets where appropriate - Identification of reuse targets where appropriate - Identification of overall landfill diversion rate for all key materials.
Wst 1c	Construction Resource Efficiency	3	2	0.66%	Main Contractor	<p>BREEAM Criteria:</p> <p>1) Prepare a compliant Resource Management Plan (RMP) covering:</p> <ul style="list-style-type: none"> a. Non-hazardous waste materials(from on-site construction and dedicated off-site manufacture or fabrication, including demolition and excavation waste. b. Accurate data records on waste arisings and waste management routes. <p>2) Meet or improve upon the benchmarks below for non-hazardous</p>



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						<p>construction waste, excluding demolition and excavation waste.</p> <table><thead><tr><th><u>No. of BREEAM credits</u></th><th><u>Amount of waste generated per 100m² (GIFA)</u></th></tr></thead><tbody><tr><td>1</td><td>≤13.3 m³ or ≤11.1 tonnes</td></tr><tr><td>2</td><td>≤7.5 m³ or ≤6.5 tonnes</td></tr><tr><td>3</td><td>≤3.4 m³ or ≤3.2 tonnes</td></tr><tr><td>1 exemplary performance credit</td><td>≤1.6 m³ or ≤1.9 tonnes</td></tr></tbody></table> <p>Design Stage Evidence:</p> <ul style="list-style-type: none">- A copy of the Resource Management Plan.- Relevant sections/clauses of the building specification/contract and/or a formal letter confirming the requirement for the principal contractor to develop a Resource Management Plan (RMP) covering non-hazardous waste materials (from on-site construction and dedicated off-site manufacture or fabrication), including demolition and excavation waste, and accurate data records on waste arisings and waste management routes, meeting the construction resource efficiency benchmarks in Table 10.1 of the BREEAM NC 2018 scheme guidance. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none">- Copy of the final compliant Resource Management Plan confirming the waste types (per waste group) generated on site relating to on site construction and dedicated off site manufacture/fabrication (excluding demolition and excavation waste).	<u>No. of BREEAM credits</u>	<u>Amount of waste generated per 100m² (GIFA)</u>	1	≤13.3 m ³ or ≤11.1 tonnes	2	≤7.5 m³ or ≤6.5 tonnes	3	≤3.4 m ³ or ≤3.2 tonnes	1 exemplary performance credit	≤1.6 m ³ or ≤1.9 tonnes
<u>No. of BREEAM credits</u>	<u>Amount of waste generated per 100m² (GIFA)</u>															
1	≤13.3 m ³ or ≤11.1 tonnes															
2	≤7.5 m³ or ≤6.5 tonnes															
3	≤3.4 m ³ or ≤3.2 tonnes															
1 exemplary performance credit	≤1.6 m ³ or ≤1.9 tonnes															
Wst 1d	Diversion of waste from Landfill	1	1	0.66%	Main Contractor	<p>BREEAM Criteria:</p> <p>1) Meet, where applicable, the diversion from landfill benchmarks in Table 10.2 for non-hazardous construction waste and demolition and excavation waste generated.</p> <p>Sort waste materials into separate key waste groups, either on-site or through a licensed contractor for recovery.</p> <p><u>One Credit</u></p> <p>Non-Demolition – 70% by Volume or 80% by tonnage</p>										



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						Demolition – 80% by Volume or 90% by tonnage Excavation – N/A <u>Exemplary</u> Non-Demolition – 85% by Volume or 90% by tonnage Demolition – 85% by Volume or 95% by tonnage Excavation – 95% by Volume or 95% by tonnage Design Stage Evidence: - Relevant sections/clauses of the building specification/contract and/or a formal letter confirming the requirement for the principal contractor to meet the diversion from landfill benchmarks in Table 10.2 of the BREEAM NC 2018 scheme guidance for non-hazardous construction waste, demolition and excavation waste generated, and to sort waste materials into separate key waste groups as per Table 10.3 of the BREEAM NC 2018 scheme guidance, either on-site or through a licensed contractor for recovery. Post Construction Stage Evidence: - Copy of the final compliant Resource Management Plan confirming the waste types (per waste group) generated on site relating to on site construction and dedicated off site manufacture/fabrication, and the amount of waste that has been diverted from landfill. Note that at least 80% (by weight) or 70% (by volume) of non-hazardous construction waste (on site and off-site manufacture/fabrication in a dedicated facility) must be diverted from landfill.
Wst 2 -Use of recycled and sustainably sourced aggregates						
Wst 2	Recycled Aggregates	1	0	0.66%	Main Contractor/Structural Engineer	Credit Not Targeted BREEAM Criteria: <ul style="list-style-type: none"> - Identify all aggregate uses and types on the project - Determine the quantity in tonnes for each identified use and aggregate type. - Identify the region in which the aggregate source is located.



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						<ul style="list-style-type: none"> - Calculate the distance in kilometres travelled by all aggregates by transport type <p>Enter the information into the BREEAM Wst 02 calculator to calculate the Project Sustainable Aggregate points.</p>
Wst 3 - Recyclable Waste Storage						
Wst 3	Recyclable Waste Storage	1	1	0.66%	Architect/ building Owner	<p>BREEAM Criteria:</p> <p>1) Dedicated space(s) is provided for the segregation and storage of operational recyclable waste volumes generated by the assessed building/unit, its occupant(s) and activities.</p> <p>This space must be:</p> <ul style="list-style-type: none"> 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 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/weekly operational activities and occupancy rates. <p>For consistent and large amounts of operational waste generated, provide:</p> <ul style="list-style-type: none"> 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.



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						<p>ADDITIONAL RESIDENTIAL INSTITUTIONS SPECIFIC REQUIEMENTS:</p> <p><u>Self-Contained Dwellings</u> Provide three internal storage containers for each dwelling or bedsit with:</p> <ul style="list-style-type: none"> - A minimum total capacity of 30 litres - No individual container smaller than 7 litres - All containers in a dedicated non-obstructive position - Storage containers for recycling in addition to non-recyclable waste storage. <p>Provide home composting facilities and a home composting information leaflet within the kitchen area or communal space for each self-contained dwelling or bedsit.</p> <p><u>Individual bedrooms with communal facilities</u> Provide three internal storage containers with a minimum total capacity of 30 litres, with no individual container smaller than 7 litres, for every six bedrooms.</p> <p>Locate recyclable storage in a dedicated, unobstructive position in communal kitchens or other appropriate communal space.</p> <p>Provide home composting facilities and a home composting information leaflet within the kitchen area or communal space.</p> <p>Provide a minimum of 10 litres of internal storage for compostable waste.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Project team meeting minutes or a formal letter confirming the likely waste streams and indicative volumes. - Relevant sections/clauses of the building specification/contract and design drawings confirming the provision and scope of dedicated facilities (i.e. storage of recyclable waste streams, access arrangements, and capacity). - Relevant sections/clauses of the building specification/contract and design drawings confirming the provision of a compactor/baler, where



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						<p>there is a consistent generation in volume of packaging waste, and a vessel(s) for composting or adequate space for storing segregated food waste and compostable organic material, along with a bib tap near to or within the waste/composting storage facility (where applicable).</p> <p>Post Construction Stage Evidence: 'As built' drawings showing the installed areas provided for the storage and segregation of recyclable waste and general waste, in line with the design stage specification. BREEAM assessor's site inspection.</p>
Wst 5 – Adaptability to Climate Change						
Wst 5	Adaptability to Climate Change	1	1	0.66%	Architect / Structural Engineer	<p>BREEAM Criteria:</p> <p>1) Conduct a climate change adaptation strategy appraisal for structural and fabric resilience by the end of Concept Design (RIBA Stage 2 or equivalent), in accordance with the following approach:</p> <p>2) Carry out a systematic (structural and fabric resilience specific) risk assessment to identify and evaluate the impact on the building over its projected life cycle from expected extreme weather conditions arising from climate change and, where feasible, mitigate against these impacts. The assessment should cover the following stages:</p> <ul style="list-style-type: none"> • Hazard identification • Hazard assessment • Risk estimation • iv. Risk evaluation • Risk management. <p>3) Develop recommendations or solutions based on the climate change adaptation strategy appraisal, before or during Concept Design, that aim to mitigate the identified impact.</p> <p>4) Provide an update during Technical Design demonstrating how the recommendations or solutions proposed at Concept Design have been</p>



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						<p>implemented where practical and cost effective. Omissions have been justified in writing by the assessor</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Copy of the climate change adaptation strategy appraisal, developed during Concept Design (RIBA Stage 2), which identifies the impact of expected extreme weather conditions arising from climate change on the building over its projected life cycle, and covers the installation of building services and renewable systems, as well as structural and fabric resilience aspects in line with the BREEAM methodology. - Provide an updated appraisal during Technical Design (RIBA Stage 4) demonstrating how the recommendations or solutions proposed at Concept Design have been implemented where practical and cost effective, with any omissions justified in writing. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - As per Design Stage.
Wst 6 – Design for disassembly and adaptability						
Wst 6	Functional Adaptability	2	0	0.66%	Architect / Structural Engineer	<p>Credit Not Targeted</p> <p>BREEAM Criteria: <u>Design for Disassembly and Functional Adaptability – Recommendations</u> 1) Conduct a study to explore the ease of disassembly and the functional adaptation potential of different design scenarios by the end of Concept Design. 2) Develop recommendations or solutions based on the study during or prior to Concept Design, that aim to enable and facilitate disassembly and functional adaptation.</p> <p><u>Disassembly and Functional Adaptability – Implementation</u> 3) Provide an update, during Technical Design, on: a. How the recommendations or solutions proposed by Concept Design</p>



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						<p>have been implemented where practical and cost effective. Omissions have been justified in writing to the assessor.</p> <p>b. Changes to the recommendations and solutions during the development of the Technical Design.</p> <p>4) Produce a building adaptability and disassembly guide to communicate the characteristics allowing functional adaptability and disassembly to prospective tenants.</p>
Land Use and Ecology						
Le 1 – Site Selection						
Le 1a	Site Selection	1	1	1%	Architect	<p>BREEAM Criteria: Proposed development on a pre-developed site - At least 75% of the proposed development's footprint is on an area of land which has previously been occupied.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Design drawings, report and site photographs confirming: <ul style="list-style-type: none"> a. Type and duration of previous land use b. Area (m2) of previous land use c. Location and footprint (m2) of proposed development and temporary works. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - 'As built' drawings confirming that there have been no changes to the site layout building orientation.
Le1b	Contaminated Land	1	0	1%	Contaminated Land Specialist	<p>Credit Not Targeted</p> <p>BREEAM Criteria:</p>



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						<p>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 assessment and appraisal have identified:</p> <ul style="list-style-type: none"> - The degree of contamination - The contaminant sources or types - The options for remediating sources of contamination which present an unacceptable risk. <p>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.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Copy of remediation strategy and implementation plan <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - Evidence to demonstrate the recommendations set out in the remediation strategy and implementation plan have been implemented.
LE 2 – Ecological Risks and Opportunities						
Le 2	Pre-Requisite	Pre-Req	Pre-Req	-	Ecologist / Design Team	<p>BREEAM Criteria:</p> <p>The client or contractor confirms compliance is monitored against all relevant UK and EU or international legislation relating to the ecology of the site.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Ecologist Report - Completed BREEAM GN13 Document <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - As per Design Stage.



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Le 2a	Survey and Evaluation	1	1	1%	Ecologist / Design Team	<p>BREEAM Criteria:</p> <p>1) A Suitably Qualified Ecologist (SQE) carries out a survey and evaluation for the site early enough to influence site preparation works, layout and, where necessary, strategic planning decisions (typically Preparation and Brief or Concept Design stage).</p> <p>The SQE's survey and evaluation determines the site's ecological baseline, including:</p> <ul style="list-style-type: none"> a. Current and potential ecological value and condition of the site and related areas within the Zone of Influence. b. Direct and indirect risks to current ecological value from the project. c. Capacity and feasibility for enhancement of the site's ecological value and, where relevant, areas within the Zone of Influence. <p>Recommendations and data collected from the survey and evaluation are shared with appropriate project team members to influence decisions made for activities during site preparation, design and construction works, which can support ecological features.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Ecologist Report - Completed BREEAM GN13 Document <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - As per Design Stage.
Le 2b	Determining Ecological Outcomes	1	1	1%	Ecologist / Design Team	<p>BREEAM Criteria:</p> <p>1) Achieve the 'Survey and Evaluation' credit.</p> <p>2) The project team liaise and collaborate with representative stakeholders early enough to influence key planning decisions (typically Concept Design stage), to:</p>



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						<p>a. Identify the optimal ecological outcomes for the site. b. Identify, appraise and select measures to meet the optimal ecological outcomes for the site, in line with the mitigation hierarchy of action:</p> <ol style="list-style-type: none"> 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. <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Ecologist Report - Completed BREEAM GN13 Document <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - As per Design Stage.
LE 3 – Managing Impacts on Ecology						
Le 3	Pre-Requisite	Pre-Req	Pre-Req	-	Ecologist / Design Team / Contractor	<p>BREEAM Criteria: Le 02's 'Survey and evaluation and Determining ecological outcomes' criteria have been achieved.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Ecologist Report - Completed BREEAM GN13 Document <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - As per Design Stage.
Le 3a	Planning and Measures on Site	1	1	1%	Ecologist / Design Team / Contractor	<p>BREEAM Criteria: 1) Further planning to avoid and manage negative ecological impacts on-site is carried out early enough to influence the concept design and design brief as well as site preparation planning (typically Concept Design stage).</p>



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						<p>2) On-site measures for managing negative ecological impacts during site preparation and construction are implemented in-practice (e.g. mitigation measures to protect existing ecological features).</p> <p>3) Measures are based on input from the project team in collaboration with representative stakeholders and data collated as part of the 'Determining ecological outcomes' in LE02 Ecological risks and opportunities.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Ecologist Report - Completed BREEAM GN13 Document <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - As per Design Stage.
Le 3b	Managing Negative Impacts	2	1	1%	Ecologist / Design Team / Contractor	<p>BREEAM Criteria:</p> <p>1) Negative impacts from site preparation and construction works have been managed according to the mitigation hierarchy, in line with the SQE's recommendations and, either:</p> <ul style="list-style-type: none"> a. No overall loss of ecological value has occurred (two credits). b. The loss of ecological value has been minimised (Minimising Loss) (one credit). <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Ecologist Report - Completed BREEAM GN13 Document <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - As per Design Stage.



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LE 4 – Ecological Change and Enhancement						
Le 4	Pre-Requisite	Pre-Req	Pre-Req	-	Ecologist / Design Team / Main Contractor	<p>BREEAM Criteria:</p> <p>1) Achieve the ‘Managing Negative Impacts’ credit.</p> <p>2) The client or contractor confirms compliance is monitored against all relevant UK, EU or international legislation relating to the ecology of the site.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Ecologist Report - Completed BREEAM GN13 Document <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - As per Design Stage.
Le 4a	Ecological Enhancement	1	1	1%	Ecologist / Design Team / Main Contractor	<p>BREEAM Criteria:</p> <p>1) Measures have been implemented that enhance ecological value, which are based on input from the project team and SQE in collaboration with representative stakeholders and data collated as part of the ‘Determining ecological outcomes’ in Le 02. Measures are implemented in the following order:</p> <p>a. On site, and where this is not feasible, b. Off site within the Zone of Influence.</p> <p>2) Data collated are analysed and where potentially valuable, provided to the local environmental records centres nearest to, or relevant for, the site.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Ecologist Report - Completed BREEAM GN13 Document <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - As per Design Stage.



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Le 4c	Change and Enhancement of Ecology	3	2	1%	Ecologist / Design Team / Main Contractor	<p>BREEAM Criteria:</p> <p>1) Up to three credits are awarded based on the change in ecological value occurring as a result of the project.</p> <p>This must be calculated in accordance with the process set out in GN36 – BREEAM, CEEQUAL and HQM Ecology Calculation Methodology – Route 2.</p> <p>Credits are awarded in line with the Reward Scale table in GN36 where there are no residual impacts on protected sites or irreplaceable habitats.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Ecologist Report - Completed BREEAM GN13 Document <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - As per Design Stage.
LE 5 - Long Term Ecology Management and Maintenance						
Le 5	Pre-Requisite	Pre-Req	Pre-Req	-	Ecologist/ Main Contractor	<p>BREEAM Criteria:</p> <p>1) The client or contractor has confirmed that compliance is being monitored against all relevant UK, EU and international standards relating to the ecology of the site.</p> <p>2) Achieve the 'Managing Negative Impacts' credit.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Ecologist Report - Completed BREEAM GN13 Document <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - As per Design Stage.



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Le 5a	Management and Maintenance Throughout the Project	1	1	1%	Ecologist/ Main Contractor	<p>BREEAM Criteria:</p> <p>1) Measures have been implemented to manage and maintain ecology throughout the project. These measures are based on input from the project team in collaboration with representative stakeholders and data collated as part of the 'Determining ecological outcomes' in Le 02.</p> <p>2) To ensure the optimal ecological outcomes agreed in Le 02 are met in-practice, these measures must monitor and review the effectiveness of the mitigation and enhancement measures in place for Le 03 & Le 04 to ensure they are implemented.</p> <p>3) A section on Ecology and Biodiversity has been included as part of the tenant or building owner information supplied, to inform the owner or occupant of local ecological features, value and biodiversity on or near the site. This should include detailed management and maintenance plans as required by landscape and asset managers as well as relevant parts of the handover information for occupiers written in a format that encourages understanding and supportive behaviours.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Ecologist Report - Completed BREEAM GN13 Document <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - As per Design Stage. - As-built evidence showing measures have been carried out in practice.
Le 5b	Landscape and Ecology Management Plan	1	1	1%	Ecologist/ Main Contractor	<p>BREEAM Criteria:</p> <p>1) A Landscape and Ecology Management Plan, or equivalent, has been developed in accordance with BS 42020:2013 Section 11.1(213) covering at least the first five years after project completion as a minimum and including:</p> <p>a. Actions and responsibilities of relevant individuals prior to handover</p> <p>b. The ecological value and condition of the site at handover and how</p>



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						<p>this is expected to develop and change over time</p> <p>c. Identification of opportunities for ongoing alignment with activities beyond the development project, which support the aims of BREEAM's Strategic Ecology Framework.</p> <p>d. Identification and guidance to trigger appropriate remedial actions to address previously unforeseen impacts</p> <p>e. Clearly defined and allocated roles and responsibilities for delivering the plan.</p> <p>2) The landscape and management plan or similar will be updated to support maintenance of the ecological value of the site.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Ecologist Report - Completed BREEAM GN13 Document <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - As per Design Stage. - Copy of the Landscape and Ecology Management Plan.
Pollution						
Pol 1 – Impact of Refrigerants						
Pol 1	Pre-Requisite	Pre-Req	Pre-Req	-	M&E	<p>BREEAM Criteria:</p> <p>All systems with electric compressors comply with the requirements of BS EN 378:2016(204) (parts 2 and 3). Refrigeration systems containing ammonia comply with the Institute of Refrigeration Ammonia Refrigeration Systems code of practice.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Relevant sections/clauses of the building specification/contract confirming that all refrigeration systems (with electric compressors) comply with the requirements of BS EN 378: 20016 (parts 2 and 3) and where refrigeration systems containing ammonia are specified, the Institute of Refrigeration Ammonia Refrigeration Systems Code of Practice.



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						Post Construction Stage Evidence: <ul style="list-style-type: none"> - Formal letter confirming that there have been no changes since the design stage. - BREEAM assessor's site inspection.
Pol 1a	Impact of Refrigerants	3	1	0.66%	M&E	BREEAM Criteria: <u>Three Credits</u> No refrigerant within the installed plant or systems. <u>Two Credits</u> The direct effect life cycle CO ₂ equivalent emissions (DELC) of ≤100 CO ₂ -eq/kW. For systems which provide cooling and heating, the worst performing output based on the lower of kW cooling output and kW heating output is used to complete the calculation. OR All refrigerants used have a global warming potential (GWP) ≤10. <u>One Credit</u> Systems using refrigerants have a DELC of ≤1000kgCO ₂ -eq/kW cooling and heating capacity. Design Stage Evidence: <ul style="list-style-type: none"> - Completed copy of the Pol 01 Calculator tool. - Documentary evidence supporting the data used to complete the calculator tool. Post Construction Stage Evidence: <ul style="list-style-type: none"> - As per interim design stage.



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Pol 1b	Leak Detection	1	1	0.66%	M&E	<p>BREEAM Criteria:</p> <p>All systems are hermetically sealed or only use environmentally benign refrigerants</p> <p>OR</p> <p>Where the systems are not hermetically sealed:</p> <p>a Systems have:</p> <p>a.i A permanent automated refrigerant leak detection system, that is robust and tested, and capable of continuously monitoring for leaks.</p> <p>OR</p> <p>a.ii An inbuilt automated diagnostic procedure for detecting leakage is enabled.</p> <p>b In the event of a leak, the system must be capable of automatically responding and managing the remaining refrigerant charge to limit loss of refrigerant.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - M&E Specification - Design Drawings - Manufacturers literature <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - As Fitted Drawings - Manufacturers literature



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Pol 2 – Local Air Quality						
Pol 2	Local Air Quality	2	2	0.66%	M&E	<p>BREEAM Criteria: <u>Two Credits</u> 1) All heating and hot water is supplied by non-combustion systems. For example, only powered by electricity.</p> <p>OR;</p> <p>Emissions from all installed combustion plant that provide space heating and domestic hot water do not exceed the levels as follows:</p> <p style="padding-left: 40px;">Gas boiler = NOx 24 mg/kWh.</p> <p><u>One Credit</u></p> <p>Emissions from all installed combustion plant that provide space heating and domestic hot water do not exceed the levels as follows:</p> <p style="padding-left: 40px;">Gas boiler = NOx 27 mg/kWh.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Relevant sections/clauses of the building specification/contract confirming that all heating and hot water is supplied by non-combustion systems, or 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 of the BREEAM NC 2018 scheme guidance. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - Formal letter confirming that there have been no changes since the design stage. - BREEAM assessor's site inspection.



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Pol 3 Surface Water Run-Off						
Pol 3	Pre-Requisite	Pre-Req	Pre-Req	-	Flood Risk Specialist	<p>BREEAM Criteria: An appropriate consultant is appointed to carry out and demonstrate the development's compliance with all criteria.</p> <p>Design Stage Evidence: - Completed BREEAM GN13 Document</p> <p>Post Construction Stage Evidence: - As per Design Stage.</p>
Pol 3a	Flood Risk	2	1	0.66%	Flood Risk Specialist	<p>BREEAM Criteria: <u>Low Flood Risk – 2 Credits</u> 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.</p> <p><u>Medium or High Flood Risk – 1 Credit</u> 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. For smaller sites refer to Level of detail required in the FRA for smaller sites on page 340, which overrides criterion 2 above.</p> <p>To increase the resilience and resistance of the development to flooding, one of the following must be achieved:</p> <ol style="list-style-type: none"> The ground level of the building and access to both the building and the site, are designed (or zoned) so they are at least 600 mm above the design flood level of the site's flood zone.



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						<p>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 BS8533:2017 (222).</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Flood Risk Assessment <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - Formal letter confirming that there have been no changes to the flood risk associated with the development site.
Pol 3	Surface Water Run-Off	Pre-Req	Pre-Req	-	Drainage Consultant	<p>BREEAM Criteria:</p> <p>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 appropriate consultant where water is allowed to leave the site.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Completed BREEAM GN13 Document <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - As per Design Stage.
Pol 3b	Surface Water Run-off (Rate)	1	1	0.66%	Drainage Consultant	<p>BREEAM Criteria:</p> <p>1) For brownfield 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 predeveloped site.</p> <p>This should comply at the 1-year and 100-year return period events.</p>



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						<p>2) For Greenfield sites, drainage measures are specified so that the peak rate of run-off from the site to the watercourses (natural or municipal) is no greater for the developed site than it was for the pre-development site.</p> <p>This should comply at the 1-year and 100-year return period events.</p> <p>3) Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified Sustainable Drainage Systems (SuDS) are in place.</p> <p>4) Calculations include an allowance for climate change. This should be made in accordance with current best practice planning guidance.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Calculation results for the pre and post-development peak rate of run-off. - Completed BREEAM GN13 Document <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - Formal letter confirming that the drainage solutions assessed at the design stage have been implemented. - 'As built' drawings showing the impermeable areas pre and post development.
Pol 3c	Surface Water Run-off (Volume)	1	1	0.66%	Drainage Consultant	<p>BREEAM Criteria:</p> <p>1) 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</p> <p>EITHER</p> <p>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.</p>



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						<p>Any additional predicted volume of run-off for this event is prevented from leaving the site by using infiltration or other SuDS techniques.</p> <p>OR</p> <p>Justification from the appropriate consultant indicating why the above criteria cannot be achieved, i.e. where infiltration or other SuDS techniques are not technically viable options.</p> <p>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 flowrate from the following options:</p> <ul style="list-style-type: none"> a. The pre-development one-year peak flowrate b. The mean annual flowrate (Qbar) c. 2L/s/ha. <p>2) For the one-year peak flowrate, the one-year return period event criterion applies.</p> <p>3) Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified SuDS are in place</p> <p>For either option, above calculations must include an allowance for climate change; this should be made in accordance with current best practice planning guidance.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Information showing the proposed drainage solution, system failure flood flow routes, potential flood ponding levels and ground floor levels. - Calculation results for the pre- and post-development volume of run-off. - Calculation results for the limiting discharge. - Completed BREEAM GN13 Document.



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						Post Construction Stage Evidence: <ul style="list-style-type: none"> - Formal letter confirming that the drainage solutions assessed at the design stage have been implemented. - 'As built' drawings showing the impermeable areas pre and post development.
Pol 3d	Minimising Watercourse Pollution	1	0	0.66%	Drainage Consultant	Credit Not Targeted BREEAM Criteria: <ol style="list-style-type: none"> 1) There is no discharge from the developed site for rainfall up to 5 mm (confirmed by the appropriate consultant). 2) Areas with a low risk source of watercourse pollution, an appropriate level of pollution prevention treatment is provided, using appropriate SuDS techniques. 3) 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. 4) 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. 5) All water pollution prevention systems have been designed and installed in accordance with the recommendations of documents such as the SuDS manual and other relevant industry best practice. They must be bespoke solutions taking account of the specific site requirements and natural or man-made environment of and surrounding the site. 6) A comprehensive and up to date drainage plan of the site will be made available for the building or site occupiers.



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						<p>7) Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified SuDS must be in place.</p> <p>8) All external storage and delivery areas are designed and detailed in accordance with the current best practice planning guidance.</p>
Pol 4 – Reduction of Night-time Light Pollution						
Pol 4	Reduction of Night-time Light Pollution	1	1	0.66%	M&E	<p>BREEAM Criteria:</p> <p>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.</p> <p>OR;</p> <p>2) The external lighting strategy has been designed in compliance with Table 2 (and its accompanying notes) of the Institution of Lighting Professionals (ILP) Guidance notes for the reduction of obtrusive light, 2011.</p> <p>3) All external lighting (except for safety and security lighting) can be automatically switched off between 23:00 and 07:00.</p> <p>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.</p> <p>5) Where specified, illuminated advertisements are designed in compliance with ILP PLG05 The Brightness of Illuminated Advertisements.</p> <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Relevant sections/clauses of the building specification/contract and/or a formal letter confirming that all external lighting has been designed out of the development, or has been designed in compliance with Table 2 of the ILP Guidance notes for the reduction of obtrusive light, 2011 and all external lighting is automatically switched off between 23.00 and 07.00, except where safety and security lighting is provided and will be used between 23.00 and 07.00, this part of the lighting system complies with



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						<p>the lower levels of lighting recommended during these hours in Table 2 of the ILP Guidance notes (or provides these lower levels at all times).</p> <ul style="list-style-type: none"> - Formal written confirmation that there are no illuminated advertisements specified as part of the development. <p>Post Construction Stage Evidence:</p> <ul style="list-style-type: none"> - Formal letter confirming that the external lighting has been designed out of the development, or has been designed and installed in accordance with Table 2 of the ILP Guidance notes for the reduction of obtrusive light, 2011 and that all external lighting will automatically be switched off during 07.00hr and 23.00hr, excepting safety and security lighting that will switch to the lower levels of lighting recommended during these hours. - Formal letter confirming that there are no illuminated advertisements installed. - 'As built' drawing showing the installed external light fittings, photocell and time clock, in line with the design stage specification. - BREEAM assessor's site inspection.
Pol 5 – Noise Attenuation						
Pol 5	Noise Attenuation	1	1	0.66%	Acoustician/M&E	<p>BREEAM Criteria:</p> <p>1) There are no noise-sensitive areas within the assessed building or within 800 m radius of the assessed site.</p> <p>OR;</p> <p>2) Where there are noise-sensitive areas within the assessed building or noise-sensitive areas within 800 m radius of the assessed site, a noise impact assessment compliant with BS 4142:2014 is commissioned. Noise levels must be measured or determined for:</p> <ul style="list-style-type: none"> - Existing background noise levels: at the nearest or most exposed noise-sensitive development to the proposed assessed site including



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Issue		Available Credits	Targeted Credits	Credit Weighting (%)	Responsibility	BREEAM Criteria
						<p>existing plant on a building, where the assessed development is an extension to the building</p> <ul style="list-style-type: none"> - Noise rating level from the assessed building. - The noise impact assessment must be carried out by a suitably qualified acoustic consultant. - 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. - If the noise sources from the assessed building are greater than the levels, measures have been installed to attenuate the noise at its source to a level where it will comply with the criterion. <p>Design Stage Evidence:</p> <ul style="list-style-type: none"> - Design drawings highlighting: <ul style="list-style-type: none"> a. All existing and proposed noise-sensitive buildings local to, and within, the site boundary b. Proposed sources of noise from the new development c. Distance (m) from these buildings to the assessed development. - Acousticians report confirming the existing background noise levels, measured in accordance with BS 4142: 2014 for both daytime and night time, and noise levels from the assessed building, as measured in the locality of the nearest or most exposed noise sensitive development, which are at least 5dB lower than the background noise throughout the day and night. - Marked-up design plan highlighting the specification of the acousticians attenuation measures. - Evidence to confirm that the acoustician is 'suitably qualified' in line with the BREEAM definition. - Relevant sections/clauses of the building specification/contract and/or a formal letter confirming the requirement for a 'suitably qualified acoustician' to be appointed to carry out a noise impact assessment in compliance with BS 4142: 2014, with any recommended attenuation measures installed.



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Issue		Available Credits	Targeted Credits	Credit Weighting (%)	Responsibility	BREEAM Criteria
						Post Construction Stage Evidence: <ul style="list-style-type: none">- Evidence that testing results based on as-installed and operating plant, confirm that post completion noise levels do not exceed the recommended limits for both daytime and night time and, where applicable, a formal letter to confirm the measures taken to reduce the levels to within the required limits.

