



Redefine, Reading

SUSTAINABILITY REPORT

Steve Moseley Limited | Mechanical & Electrical Services | Rev. 4 June 2019

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Introduction

Steve Moseley Limited has been instructed by Redefine BDL to provide a sustainability report to support the planning application of the new Redefine, Reading Hotel.

BENEFICIARIES

This report has been prepared for the benefit of the following companies,

Redefine Hotels Reading Ltd,

Redefine/BDL Hotels, Glasgow.

Disclaimer

Steve Moseley Ltd (for itself and as agent for its staff) and its staff shall not be liable whether in contract or in tort or otherwise for any loss or damage sustained as a result of using or relying on the information given in this report.

Executive Summary

General

This energy statement has been undertaken for the proposed Redefine Hotel at Richfield Avenue, Reading RG1 8BD in order to address the requirements of the 'Reading Borough Local Development Framework Core Strategy' adopted January 2008 with alterations adopted 27 January 2015.

The proposed development comprises a 132 bed hotel development with front of house and back of house accommodation at ground floor.

The proposed development has been designed to minimise operational carbon emissions. Savings are delivered through following the energy hierarchy which identifies three stages of an energy strategy.

The construction of this development will result in baseline Building Regulations target CO₂ emissions of 304,343 kg/annum.

The Reading Core Strategy/Core Strategy Policy Sustainable Design & Construction Supplementary Planning Document and Policy DM1 & DM2 of the Sites and Detailed Policies Documents requires the development to achieve a BREEAM score of 62.5 (between Very Good and Excellent). The Core Strategy/Core Strategy Policy states the energy statement having to achieve a 20% improvement over 2013 Part L Building Regulations compliance.

Use Less Energy via Energy Efficiency and Demand Reduction Measures (BE LEAN)

The following energy efficiency and demand reduction measures will be adopted:

- i) Improve U-values of the external envelope.
- ii) Improve U-value of glazing.
- iii) Improve air permeability of building envelope.
- iv) Improve efficiency of the space heating and cooling.
- v) Use of energy efficient lighting.
- vi) Use of intelligent lighting controls.
- vii) Use of variable speed pumps, fans and drives to match supply and demand.
- viii) Improve efficiency of heat recovery to mechanical ventilation systems.

Following the adoption of these energy efficiency measures the predicted total regulated CO₂ emissions will be 274,423 kg/annum which is below the Building Regulations compliant building by 29,920 kgCO₂/annum. This would achieve 3 credits under the BREEAM assessment.

Supply Energy Efficiently via Decentralised Energy (BE CLEAN)

Decentralised energy is an efficient means of generating and distributing heat and power. A mini combined heat and power (CHP) system has been considered for this development. CHP is recognised under Policy CS1 of the Reading Core Strategy as a compliant renewable energy technology.

A detailed analysis has been undertaken to demonstrate that an appropriately designed CHP installation would save 41% below the baseline building of the predicted annual CO₂ emissions after the energy efficiency and demand reduction measures have been adopted. The total predicted CO₂ emissions following the incorporation of CHP will be 201,493 kg/annum which represents a 33% reduction below the Building Regulations compliant building.

Renewable Energy Technologies (BE GREEN)

Air source heat pumps are already incorporated into the scheme from the initial baseline assessment as a source of renewable energy. These are to provide heating and cooling to the bedrooms.

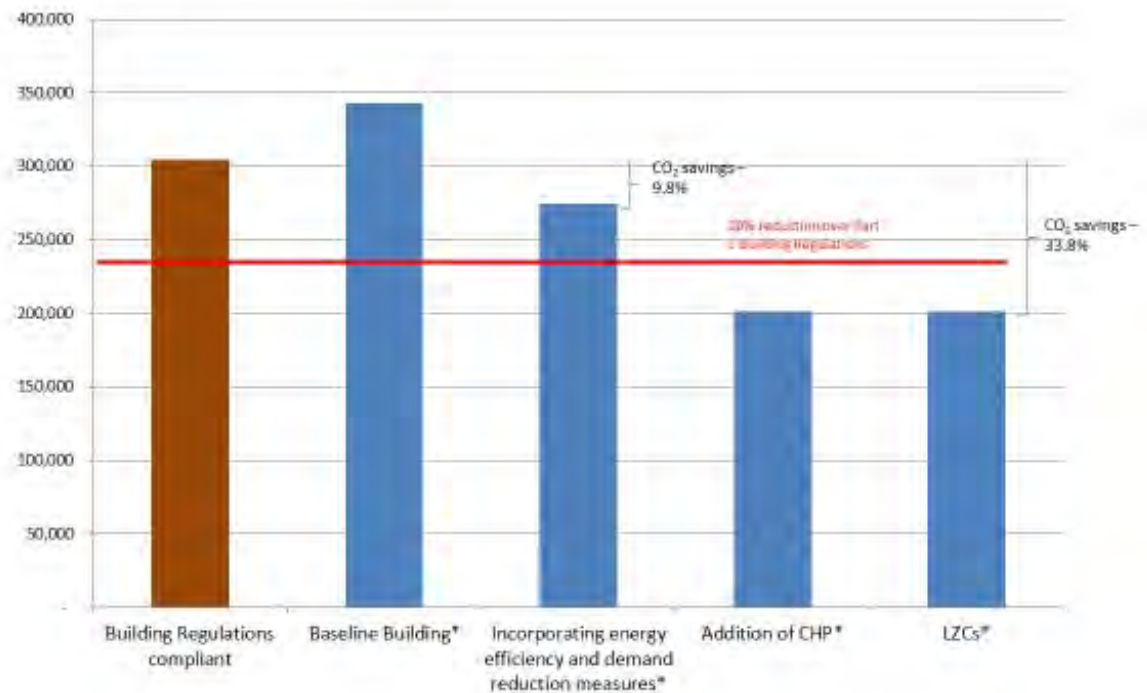
The scheme will incorporate facilities for decentralised energy with CHP included to meet the hot water requirement for the hotel. It is acknowledged that the potential energy saving from biomass hot water or solar water heating could be significant however these technologies are not compatible with CHP.

The only suitable option for the hotel which would be compatible with the air source heat pumps and CHP unit is the incorporation of a solar photovoltaic array to generate zero carbon energy. However, due to the financial viability of the scheme and the lack of roof space due to plant it is not feasible to include photovoltaics.

High efficiency air source heat pumps are incorporated into the proposed hotel extension scheme as a source of renewable energy through meeting a significant proportion of the heating and cooling demand.

Summary of CO₂ Savings

The following chart summarises the carbon dioxide savings predicted for this project.



*ASHPs included as a source of renewable energy.

Predicted Achievements Compared to Targets

The total predicted CO₂ emissions for the development have been reduced by 33.8% (102,850 kgCO₂/annum) below the Building Regulations compliant development target of 304,343 kgCO₂/annum.

To meet the Reading Core Strategy/Core Strategy Policy of 20% improvement over Building Regulations, the building should target 243,474 kgCO₂/annum. Therefore, the current CO₂ emissions of 201,493 kg are 41,981 kg below the Reading Plan target.

As discussed within the report, the energy hierarchy set out within the Reading Plan has been followed for this development to firstly reduce the energy demand followed by the incorporation of low energy lighting and efficient systems before the incorporation of decentralised and renewable technologies. The proposed combined heat and power units will contribute towards the hot water demand, air source heat pumps will provide heating and cooling to the majority of areas.

The thermal efficiency of the building envelope will be improved significantly above the minimum Building Regulations targets, 52.00% for the roof, 31% for the external walls, 4% for the ground floor and 27.3% for the glazing. Renewables will be incorporated through air source heat pumps to allow the building to pass Part L.

It is requested that, as no other renewable technology can be integrated due to operator requirements, site constraints and financial viability, as because the potential benefit of energy efficiency measures has been maximised that the carbon emission reduction of 33.8% is accepted for this development.

Introduction

General

This energy statement has been prepared in support of the planning application for the proposed Redefine Hotel, Reading development at Richfield Avenue, Reading RG1 8BD.

This statement provides an assessment of the energy consumption and associated carbon dioxide emission reductions for the proposed development utilising predicted consumption data and identifies the target amount of energy generation and carbon savings to be provided from decentralised energy and on-site renewable energy generation technology.

Targets

A range of renewable energy technologies have been evaluated to determine how the following target for the development can be met;

Reading Borough Council Core Policy

On larger developments of more than 10 dwellings or 1,000sq.m of floorspace, ensure that 50% of the provisions meets the most up to date Eco-homes and BREEAM 'Excellent' standards.

All developments of more than 10 dwellings or 1,000sq.m floorspace incorporate on-site generation of energy from renewable sources and energy efficient design measures (including the use of CHP where appropriate) to offset at least 20% of predicted carbon dioxide emissions from the estimated energy usage of the completed and occupied development.

The Sustainable Design & Construction Policy further expands on Core Policy as follows; (Table 3.2 Pg 13) :

- i) Larger non residential developments of more than 1,000sq.m non-residential floor-space - minimum 50% BREEAM level 'Excellent' and remainder BREEAM level 'Very Good'.
- ii) For larger developments of non-residential developments i.e. 1,000sq.m and above floor space, proposals will ideally meet the standard set out above, or as a minimum, where the above split is not appropriate for the development, achieve a BREEAM score of 62.5%.

The energy statement for this development will target achieving a minimum 20% improvement over 2013 Part L Building Regulations compliance.

Policy Review

Summary Review of Planning Policy Context

This section summarises the policy context for the development energy statement.

The various policies from international to local level that aim to reduce greenhouse gas emissions, particularly carbon dioxide and hence contribute to sustainable development are identified below.

International Energy Policy – The Kyoto Protocol

The Kyoto Protocol obligates countries to commit to reduce national carbon dioxide (CO₂) emissions. Total reductions from the combined nations must equal at least 5% from 1990 levels in the commitment period 2008-2012.

For its part under Kyoto, the UK has a legally binding commitment to reduce greenhouse gases by 12.5% below base year levels over the period of 2008-2012.

EU Policy

In 2006, the Energy Performance of Buildings Directive (EPBD) was introduced to contribute to achieving the Kyoto Protocol obligations. The directive works by facilitating requirements to measure energy use in buildings by:

- i) Introducing agreed measurements of relative energy performance.
- ii) Regular inspections and re-evaluations.
- iii) Requiring higher standards for upgrading larger buildings.
- iv) Improving standards for new buildings.

National Planning Policy Framework

The National Planning Policy Framework (March 2012) sets out the Government's planning policies for England and how these are expected to be applied. It sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate and necessary to do so. It provides a framework within which local people and their accountable councils can produce their own local and neighbourhood plans, which reflect the needs and priorities of their communities.

At the heart of the National Planning Policy Framework is a 'presumption in favour of sustainable development', which requires Local Plans to meet development needs, unless any adverse impacts would significantly and demonstrably outweigh the benefits. National Guidance says that:

- i) The purpose of the planning system is to contribute towards achieving sustainable development.
- ii) Sustainable development comprises of economic, social and environmental dimensions, which leads the planning system to perform the following three roles:
 - Economic- contributing to building a strong, responsive and competitive economy.
 - Social- supporting strong, vibrant and healthy communities.
 - Environmental- contributing to protecting and enhancing the natural, built and historic environment.
- iii) These roles are mutually dependent therefore to achieve sustainable development economic, social and environmental gains should be sought jointly through the planning system. Planning should also actively guide development to sustainable solutions.
- iv) In order to achieve sustainable development, improvements in the quality of the built, natural and historic environment, as well as in people's quality of life must be pursued, including (but not limited to): improving the ease of job creation, moving from a net loss of bio diversity to a net gain for nature, replacing poor design with better design, improving working, living, travelling and leisure conditions for people and widening the choice of high quality homes.
- v) Plans and decisions must take into account local circumstances to ensure sustainable development is responded to appropriately in different areas.
- vi) At the heart of the National Planning Policy Framework is a presumption in favour of sustainable development, which should be seen as a golden thread running through both plan-making and decision-taking. For plan-making this means that:
 - Local Planning Authorities should positively seek opportunities to meet the development needs of their area; and
 - Local Plans should meet objectively assessed needs, with sufficient flexibility to adapt to rapid change, unless: any adverse impacts of doing so would

significantly and demonstrably outweigh the benefits, when assessed against the policies in this framework taken as a whole; or specific policies in this Framework indicate development should be restricted.

Planning policies should follow the presumption in favour of sustainable development approach so development which is sustainable can be approved without delay. All plans should set clear policies that will guide how the presumption should be applied locally.

Regional Energy Policy

Reading Borough Council Core Strategy – Adopted in January 2008

The following sections of the Reading Plan are specifically pertinent to the production of an energy statement.

Policy CS1 Sustainable Construction & Design

- On larger developments of more than 10 dwellings or 1,000sq.m of floorspace, ensure that 50% of the provisions meets the most up to date Eco-homes and BREEAM 'Excellent' standards.
- All new developments maximise the use of energy efficiency and energy conservation measures in their design, layout and orientation to reduce overall energy demand. This is carried using the following energy hierarchy;
 - o Be lean: use less energy.
 - o Be clean: supply energy efficiently.
 - o Be green: use renewable energy.
- All developments of more than 10 dwellings or 1,000sq.m floorspace incorporate on-site generation of energy from renewable sources and energy efficient design measures (including the use of CHP where appropriate) to offset at least 20% of predicted carbon dioxide emissions from the estimated energy usage of the completed and occupied development.

The Sustainable Design & Construction Policy (SPD) further expands on Core Strategy/Core Strategy Policy as follows; (Table 3.2 Pg 13) :

- Larger non residential developments of more than 1,000sq.m non-residential floor-space - minimum 50% BREEAM level 'Excellent' and remainder BREEAM level 'Very Good'.

- For larger developments of non-residential developments i.e. 1,000sq.m and above floor space, proposals will ideally meet the standard set out above, or as a minimum, where the above split is not appropriate for the development, achieve a BREEAM score of 62.5%.

Reading Borough Local Development Framework Sites and Detailed Policies Document

DM1: ADAPTATION TO CLIMATE CHANGE

All developments will demonstrate how they have been designed to incorporate measures to adapt to climate change. The following measures shall be incorporated into development:

- *New buildings shall be orientated to maximise the opportunities for both natural heating and ventilation and reducing exposure to wind and other elements;*
- *Proposals involving both new and existing buildings shall demonstrate how they have been designed to maximise resistance and resilience to climate change for example by including measures such as solar shading, heating and ventilation of the building and appropriately coloured materials in areas exposed to direct sunlight, green and brown roofs, etc;*
- *Use of trees and other planting, where appropriate as part of a landscape scheme, to provide shading of amenity areas, buildings and streets, designed with plants that are carefully selected, managed and adaptable to meet the predicted changed climatic conditions; and*
- *All development shall minimise the impact of surface water runoff from the development in the design of the drainage system.*

DM2: DECENTRALISED ENERGY

In meeting the most up to date Ecohomes (including Code for Sustainable Homes for new build residential) or BREEAM standard, developments of the sizes set out below shall demonstrate how consideration has been given to securing energy for the development from a decentralised energy source, including CHP.

Any development of more than 20 dwellings and/ or non-residential development of over 1,000 sq m shall consider the inclusion of a CHP plant, or biomass-fuelled heating scheme, or other form of decentralised energy provision, within the site, unless it can be demonstrated that the scheme is not suitable or feasible for this form of energy provision.

Where there is existing decentralised energy provision, including a CHP plant or a district energy network present within the vicinity of an application site, further developments of over 10 dwellings or non-residential development of 1,000 sq m will be expected to link into the existing decentralised energy network or demonstrate why this is not feasible.

The Building Regulations Approved Document L

General

In order to demonstrate compliance with the requirements for Approved Document L2A (2013) for the proposed hotel there are five separate criteria that must be met which are outlined below.

Criterion 1 - Achieving the Target Emission Rate (TER)

To demonstrate compliance with Criterion 1 the actual buildings emission rate is compared to the notional buildings emission rate and has to be at least equal.

The actual buildings emission rate is calculated when the building is modelled using approved software and the proposed construction values are detailed, for example, u-values, efficiency of M&E plant etc. Following this exercise the software will generate a notional building, the notional building has the same layout as the actual building but the construction values and energy performance of the M&E equipment is pre-set, this allows the software to generate a target emission rate (TER) for the actual building, the TER is the anticipated emission rate from the notional building.

The BER is then compared to the TER and if it is equal to or lower than then the building is deemed to comply with Criterion 1.

This process needs to be completed and issued to Building Control at the “As-Designed” stage to demonstrate to Building Control that the proposals for the building comply with the criteria.

Criterion 2 - Limits on Design Flexibility

Each element of the construction has pre-set performance limits within the document; these are generally split into 2 categories, an average value and an upper limit value which cannot be exceeded.

To demonstrate compliance with criterion 2 then criterion 1 must be achieved with no individual element exceeding the upper limit set for performance.

Criterion 3 - Limiting the Effects of Heat Gains in Summer

It is a requirement to demonstrate that solar gains have been limited during the summer period to either reduce the need for air conditioning; or to reduce the installed capacity of any air conditioning system that is installed.

To demonstrate compliance with criterion 3 an assessment of the solar gains must be undertaken, the actual building results are then compared to a pre-defined standard and if

the performance of the actual building is no worse than that of the pre-defined building then it is deemed to comply with the criterion.

Criterion 4 – Building Performance Consistent with BER

The process for demonstrating compliance with criterion 4 is generally the same as criterion 1, the difference is that the actual building performance is compared to the notional building, for example, the air permeability results, building services commissioning figures and achieved construction u-values are used rather than the design assumptions.

It then must be demonstrated that the actual building performance is equal to or better than the TER.

Notice should be given that commissioning has been carried out according to a procedure approved by the Secretary of State.

Criterion 5 – Provisions for Energy Efficient Operation of the Building

The owner of the building should be provided with sufficient information about the building, the fixed building services and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances.

This is generally achieved by production of a building log book.

Energy Assessment

General

In accordance with Core Policy 1 of The Reading Plan, in order to identify and highlight appropriate energy saving and renewable energy measures an outline energy assessment has been undertaken to establish the predicted energy consumption and associated carbon dioxide emissions for the proposed development utilising the methodology outlined in Criterion 1 of Approved Document L2A.

Proposed Development

The baseline energy model has been developed based upon the following building fabric and air permeability in line with the minimum standards allowed under the Non Domestic Building Services Compliance Guide 2013 Edition:

- i) External Walls = $0.35\text{W/m}^2\text{K}$.
- ii) Roof = $0.25\text{W/m}^2\text{K}$.
- iii) Floor = $0.25\text{W/m}^2\text{K}$.
- iv) Personnel Door = $2.20\text{W/m}^2\text{K}$.
- v) Windows = $1.6\text{W/m}^2\text{K}$.
- vi) Air permeability = $10\text{m}^3/(\text{h.m}^2)$ at 50Pa.
- vii) Electric Power Factor <0.9 .

Hotel M&E Services

Redefine has the following standard services strategy which is detailed within their Gen 4 Standards Technical Handbook:

- i) Hot water via gas fired direct water heaters.
- ii) Mechanically ventilated bedrooms, heated and cooled via a VRF heat pump system.
- iii) En-suite bathrooms and linen rooms to have mechanical extract ventilation.

The air source heat pumps to the bedrooms will provide heat at typically 250% efficiency and cooling at a COP of 2.6. The mechanical ventilation heat recovery efficiency will be 50% typically with an overall system fan power of 1.5W/l/s .

Hot water will be provided through 90% typically efficient direct gas-fired water heaters.

The staircores will have supplementary heating with the use of electric panel heaters

The following lighting efficiency and controls have been assumed in line with the Non Domestic Building Services Compliance Guide 2013 Edition:

- i) Bedrooms and En-suite Bathrooms: 60 lumens/circuit watt, manual lighting control.
- ii) GF Front of House areas: 60 lumens/circuit watt, manual lighting control
- iii) GF Back of House areas: 60 lumens/circuit watt, manual lighting control
- iv) Circulation: 60 lumens/circuit watt, manual lighting control
- v) Store: 60 lumens/circuit watt, manual lighting control

Building Regulations Methodology

The development has been modelled using the computer modelling package EDSL Tas Part L2A 2013 Version 9.4.2 interfaced to SBEM Version 5.4.a.1 which is based on BRE's standard calculation tool and uses a dynamic simulation method for checking compliance.

The geographically nearest CIBSE Test Reference Year (TRY) has been used which is London.

The energy model has been produced to predict the actual energy consumption of the building. When a simulation is performed, a 'notional' building is created. This building has the same shape and patterns of use as the actual designed building, but makes standard assumptions regarding the heating, cooling and ventilation plant, lighting and building fabric. The energy consumption of this building is predicted using the software.

The results of the preliminary Baseline Building Regulations calculations are contained within Appendix A of this report and are summarised below. These results indicate the CO₂ emissions associated with achieving Part L compliance.

Calculated Emission Rate	Calculated CO ₂ Emissions (kgCO ₂ /m ² /annum)
Target Emission Rate (TER)	65.1
Building Emission Rate (BER)	73.4

Carbon emissions are calculated based on an internal floor area of 4,675 m². The TER is equivalent to CO₂ emissions of 304,343 kg/annum, the BER for the baseline building is equivalent to CO₂ emissions of 343,145 kg/annum.

Summary

In order to comply with The Reading Plan: Core Strategy 1 it will be necessary to seek to save 20% of 304,343 kgCO₂/annum i.e. 60,869 kg of the annual TER regulated CO₂ emissions using demand reduction and energy efficiency measures, decentralised energy and renewable energy technologies. Hence, the target CO₂ emissions for the development will be 243,474 kg/annum.

The CO₂ emissions for the baseline building is 343,145 kg/annum which is 99,671 kg above the 20% improvement over Building Regulations target of 243,474 kg to comply with The Reading Plan: Core Policy 1.

Energy Efficiency and Demand Reduction Measures (BE LEAN)

General

Prioritising a reduction in overall energy demand is the most effective way in which to minimise environmental impacts associated with energy use. The use of efficient technologies and renewables to supply the remaining load results in lower greenhouse gas emissions as compared with the use of conventional alternatives.

Cost effective measures can be adopted to reduce energy demand without making a significant impact on the design, appearance or character of the building. It is intended to implement energy efficiency measures to improve on the minimum standards required in Part L of the Building Regulations.

The following specific measures are proposed to achieve an energy demand reduction at the development:

- i) Improve U-values of the external envelope.
- ii) Improve U-value of glazing.
- iii) Improved efficiency of the space heating, cooling and hot water.
- iv) Use of energy efficient lighting.
- v) Use of intelligent lighting controls.
- vi) Use of variable speed pumps, fans and drives to match supply and demand.
- vii) Use of heat recovery to mechanical ventilation systems.

Improve U-values of the External Envelope

As detailed in Proposed Development section, the following limiting U-values were initially proposed for the development in line with the notional building under Building Regulations Part L2A.

- i) External Walls = $0.35 \text{ W/m}^2\text{K}$.
- ii) Roof = $0.25 \text{ W/m}^2\text{K}$.
- iii) Exposed Floor = $0.25 \text{ W/m}^2\text{K}$.

In order to reduce overall energy demand further the following improved U-values will be targeted.

- i) External Walls = $0.24 \text{ W/m}^2\text{K}$.
- ii) Roof = $0.12 \text{ W/m}^2\text{K}$.
- iii) Exposed Floor = $0.24 \text{ W/m}^2\text{K}$.

The improvements in the thermal efficiency of the building envelope represent a significant increase in performance above the minimum Building Regulations requirements.

The external walls, roof and floor U-values are targeted to be improved above the minimum Building Regulations requirements by 31.4%, 52% and 4% respectively.

Improve U-values of Glazing

The largest source of heat loss from the building after infiltration and ventilation is the windows.

As detailed the previous section, the following U-values were initially proposed for the development.

i) Windows = $2.20\text{W/m}^2\text{K}$

In order to reduce overall energy demand further the following improved U-values will be targeted:

i) Windows = $1.60\text{W/m}^2\text{K}$, G Value = 0.60.

The improvements in the thermal efficiency of the windows represent a significant increase in performance above the minimum Building Regulations requirements.

U-value improvements for the glazing elements represent a 27.3% improvement above the minimum Building Regulations requirements.

Improve Air Permeability of Building Envelope

Air leakage through the building envelope is a significant cause of energy loss.

As detailed in the Proposed Development Section, the following air permeability levels of $10\text{m}^3/(\text{h.m}^2)$ at 50Pa was proposed for the development.

In order to further reduce energy demand through the reduction of heat loss, the proposed hotel will target an air permeability of $5\text{m}^3/(\text{h.m}^2)$ at 50Pa.

Improved Efficiency of the Space Heating, Cooling and Hot Water

Once the heat loss through the external building envelope has been reduced through improvements in the U values, the efficiency of the delivered heat can be addressed to further reduce the heating and cooling demand within a building.

The air source heat pump manufacturer is not known at this stage however typical heating efficiencies of 550% and cooling SEER of 5.6 are available from most common manufacturers.

The hot water heaters are typically used by Redefine developments would use high efficiency water heaters with an efficiency of 98%.

Use of Energy Efficient Lighting

Lighting accounts for a significant proportion of the predicted electrical consumption and carbon emissions of the building.

Hotels traditionally use very large numbers of halogen downlighters. The use of these will be restricted with LED alternatives now utilised more commonly.

It is proposed that the hotel bedroom and ensuite lighting will be improved to LED's with a minimum efficiency of 80 lumens/cctW. The bedroom corridor will be improved to LED's with an efficiency of 80 lumens/cctW. The GF front of house and back of house accommodation lighting will be improved to LED's with an efficiency of 70 lumens/cctW.

Use of Intelligent Lighting Controls

Even with efficient lamps and luminaires, the energy used for lighting can be wasted in various ways. There are a number of ways of lighting control, local manual switching, timed control, reset control (manual on, timed off), occupancy control (presence detectors) and photoelectric switching and dimming. Lighting controls should ensure that light is provided in the right amount, in the right place for the required time.

The circulation areas and GF back of house accommodation will be improved to utilise auto on/off lighting control.

Use of Variable Speed Pumps, Fans and Drives to Match Supply and Demand

There are a number of ways to control the pump or fan speed with the most efficient being an inverter. An inverter rectifies the alternating current to a direct current supply and then uses this to produce a smooth variable frequency alternating current output to the pump/fan motor. Controlling the frequency of the output device provides the desired speed modulation for the motor driving the fan or pump. As power consumption falls by the cube of the speed, cutting the motor speed to match the demand dramatically reduces electricity consumption (i.e. cutting speed from 100% to 80% halves the energy use, reducing the speed further to 50% reduces the energy use to 15%).

Variable speed equipment, particularly fans will be utilised on this project wherever possible.

The fan power of the overall central ventilation system serving the bedrooms/ensuites, foyer, reception and office will be reduced to 1.4W/l/s.

Improve Efficiency of Heat Recovery to Mechanical Ventilation Systems

Where it is necessary to provide ventilation it is good practice to recover the heat from the extract air to pre heat the fresh air being introduced to the building. A typical heat recovery system will recover between 40-70% of the heat that would have been lost to atmosphere.

Whilst there is an offset of additional resistance to the ventilation system fan due to the heat recovery device this is normally offset by the energy recovery from the extract air which can give, in some cases a payback of 2-5 years for the additional capital outlay.

A heat recovery efficiency of 50% had been assumed for the bedrooms, foyer, reception and office. The efficiency of the units will be increased to 70%.

Carbon Savings Associated with Energy Efficiency and Demand Reduction Measures

The baseline Building Regulations energy model has been rerun to incorporate the identified energy efficiency and demand reduction measures. The results are contained within Appendix B of this report and are summarised below. These results indicate the CO₂ emissions from the baseline building compared to a Building Regulations Part L compliant building as a direct result of incorporating these energy efficiency and demand reduction measures outlined above.

Building Regulations TER = 65.1kgCO₂/m²/annum

Baseline BER = 73.4kgCO₂/m²/annum

Energy Efficient and Demand Reduction BER = 58.7 kgCO₂/m²/annum

	CO ₂ Emissions (kg/annum)
Building Regulations compliant building	304,343
Building for baseline comparison	343,145
Building incorporating energy efficiency measures	274,423

The integration of demand reduction and energy efficiency measures could reduce the BER of the proposed hotel to 274,423 kgCO₂/m²/annum, which is below the TER of 304,343 kgCO₂/m²/annum by 29,920 kg.

The total CO₂ emissions for the development has been reduced by 68,722 CO₂/annum from the baseline building through the use of energy efficient and demand reduction measures, equivalent to a 20% saving in the total predicted CO₂ emissions of the development.

The total predicted CO₂ emissions are 30,949 kg above the 20% improvement over Building Regulations target of 242,474 kg to comply with The Reading Plan: Core Policy 1.

Decentralised Energy (BE CLEAN)

General

The Core Policy of The Reading Plan requires that possible connection to existing heating or cooling networks should be evaluated before site wide combined heat and power systems are investigated.

The high year round domestic hot water demand makes the use of a combined heat and power plant potentially feasible for this building. However, the pattern of demand for both heat and electricity across the day needs to be considered which has implications for the economic feasibility of combined heat and power plant.

A combined heat and power system is an efficient way of generating electricity onsite with the benefit of reduced fuel costs (gas being cheaper than electricity) and reduced carbon emissions. Heat generated from the gas engine can be used to produce hot water for heating and domestic hot water. CHP for heating and hot water will potentially be suitable however the proposed hotel's requirement for electric heating via heat pumps means a CHP scheme will be required to serve the hot water installation only.

Operator Constraints

CCHP requires cooling to form a significant element of the development's energy consumption. The proposed requirement for cooling via air source pumps means CCHP would not be feasible.

Engineering Feasibility

Integrated CHP into a hotel facility without the type of constant base load which would normally be provided by leisure facilities requires careful consideration since the CHP units need to be sized to match the available base load without excessive cycling which would reduce the effectiveness and life expectancy of the units.

The base load for the hotel would be provided by the hot water requirements. The CHP will be sized to provide 75% of the hot water load for the proposed hotel, with the remainder met through 98% efficient direct gas fired water heaters.

It is anticipated that a single large CHP unit would be unable to modulate down to the loads experienced in quiet periods. Therefore, in order to ensure the CHP units remain operational for the maximum period possible in order to maximise the unit's efficiency and maximise the period of electricity generation. It is proposed that a suitably sized number of mini-CHP units are specified such as Dachs SE mini-CHP units or similar connected to buffer vessels.

Several mini-CHP units could be installed in parallel which could theoretically demonstrate even further savings in CO₂ emissions. However, due to potentially fluctuating hot water demands experience has demonstrated that on a project of this size, it is likely only 1 unit could be expected to operate continuously to satisfy the hot water requirements.

The proposed mini-CHP units to the hotel will be 89% efficient with a heat to power ratio of 2.67. Based on previous experience a CHP unit with an electrical output of 5.5kW and heat output of 15.5kW would be suitable to meet the domestic hot water proportion. The power generated will be reused on site. The energy model has been rerun to incorporate the proposed decentralised CHP solution and the results are contained within Appendix C.

CO₂ Emissions

The Be Lean Building Regulations energy model has been rerun to incorporate the identified CHP system. The results are contained within Appendix C of this report and are summarised below. These results indicate the CO₂ emissions from the Be Lean building compared to a Building Regulations Part L compliant building as a direct result of incorporating the CHP system outlined above.

Building Regulations TER = 65.1 kgCO₂/m²/annum

Baseline BER = 73.4 kgCO₂/m²/annum

Energy Efficient and Demand Reduction BER = 58.7 kgCO₂/m²/annum

Addition of CHP BER = 43.1 kgCO₂/m²/annum

	CO₂ Emissions (kg/annum)
Building Regulations compliant building	304,343
Building for baseline comparison	343,145
Building incorporating energy efficiency measures	274,423
Building incorporating CHP	201,493

The installation of a CHP unit could reduce the BER of the proposed hotel to 201,493 kgCO₂/m²/annum, an improvement of 33.8% above the TER of 304,343 kgCO₂/m²/annum.

Summary

It is proposed that the CHP unit would contribute towards the domestic hot water load for the proposed hotel.

The total CO₂ emissions for the hotel has been offset by a further 72,930 kgCO₂/annum above the energy efficient and demand reduction building through incorporating CHP.

The total predicted CO₂ emissions are 41,981 kg below the 20% improvement over Building Regulations target of 243,474 kg to comply with The Reading Core Policy 1.

Renewable Energy Technologies (BE GREEN)

General

The feasibility of a number of potentially appropriate renewable energy technologies has been investigated for the proposed development.

Technology	Suitable?	Observations
Air source heat pumps	√	Proposed within the energy efficient design.
Ground source heat pumps	X	Building and lack of available ground space precludes formation of boreholes.
Biomass hot water	X	Not compatible with CHP. Insufficient plant, fuel storage and delivery space at basement/ ground floor for fuel storage. Fuel delivery difficulties.
Solar water heating	X	Not compatible with CHP in the hotel.
Photovoltaics	X	Limited flat roof space available, however not financially viable.
Wind turbines	X	Poor yield within urbanised area and likely planning issues.

The Redefine specification requires the use of air source heat pumps within the bedrooms.

The only suitable option for the hotel which would be compatible with the air source heat pumps and CHP unit is the incorporation of a solar photovoltaic array to generate zero carbon energy. However, due to the limiting roof height and financial viability of the scheme it is not feasible to include photovoltaics.

Potential carbon emission savings from biomass are significant however this technology is not compatible with CHP. Additionally, there is limited ground floor area for biomass fuel storage and plant space.

It is acknowledged that the potential energy saving from solar water heating could be significant, however this technology is not compatible with CHP.

A wind turbine would be able to provide zero carbon energy, however the yield would be compromised by the urbanised surroundings creating greater wind turbulence.

Hotel Development

Air source heat pumps are included within the Redefine specification as a low carbon energy source to provide space heating and cooling.

Building Regulations TER = 65.1 kgCO₂/m²/annum

Baseline BER = 73.4 kgCO₂/m²/annum

Energy Efficient and Demand Reduction BER = 58.7 kgCO₂/m²/annum

Addition of CHP BER = 43.1 kgCO₂/m²/annum

	CO ₂ Emissions (kg/annum)
Building Regulations compliant building	304,343
Building for baseline comparison	343,145
Building incorporating energy efficiency measures	274,423
Building incorporating CHP	201,493
Building incorporating LZCs	201,493

The Baseline building already includes air source heat pumps to generate space heating and cooling from a low or zero carbon energy source. The BER of the proposed hotel is 201,493 kgCO₂/m²/annum, an improvement of 33.8 % above the TER of 304,343 kgCO₂/m²/annum.

The total predicted CO₂ emissions for the development have been reduced by 33.8% (102,850 kgCO₂/annum) over the Building Regulations compliant development target of 304,343 kgCO₂/annum. The total predicted CO₂ emissions are 41,981 kg below the 20% improvement over Building Regulations target of 243,474 kg to comply with The Reading Core Policy 1.

Summary

As far as possible energy efficiency measures will be applied to the development to improve the performance beyond the minimum requirements in Part L of the Building Regulations.

The scheme will incorporate facilities for decentralised energy with CHP included to meet the hot water requirement for the hotel.

Air source heat pumps are incorporated into the proposed hotel extension scheme as a source of renewable energy through meeting the proportion of the heating and cooling demand.

	CO₂ Emissions (kg/annum)	% Reduction Through Decentralised and Renewable Technologies	% Reduction Over Building Regulations Compliant
Building Regulations compliant	304,343	-	-
Baseline Building*	343,145	-	-
Incorporating energy efficiency and demand reduction measures*	274,423	20%	9.8%
Addition of CHP*	201,493	41.2%	33.8%
LZCs*	201,493	41.2%	33.8%

*ASHPs included as a source of renewable energy.

The total predicted CO₂ emissions for the development have been reduced by 41.2% (141,652 kgCO₂/annum) below the Baseline Building result of 343,145 kgCO₂/annum and 33.8% below the Building Regulations compliant development target of 304,343 kgCO₂/annum.

As discussed within the report, the energy hierarchy has been followed for this development to firstly reduce the energy demand followed by the incorporation of low energy lighting and efficient systems before the incorporation of decentralised and renewable technologies. The proposed combined heat and power units will contribute towards the hot water demand with air source heat pumps will provide heating and cooling to the majority of areas.

To meet the Reading Core Policy 20% improvement over Building Regulations, the building should target 243,474 kgCO₂/annum. Therefore, the current CO₂ emissions of 201,493 kg are 41,981 kg below the Reading Core Policy target thereby demonstrating compliance with the Reading Core Policy target.

APPENDIX A: ENERGY MODEL DATA – BASELINE BUILDING MODEL

Project name

Redefine Reading

As designed

Date: Fri Apr 13 13:58:25 2018

Administrative information

Building Details

Address: Reading,

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.4.2"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.4.2

BRUKL compliance check version: v5.4.a.1

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name:

Telephone number:

Address: , ,

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

The building does not comply with England Building Regulations Part L 2013

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	65.1
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	65.1
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	73.4
Are emissions from the building less than or equal to the target?	BER > TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.35	0.35	External Wall
Floor	0.25	0.21	0.25	Exposed Floor
Roof	0.25	0.25	0.25	Roof
Windows***, roof windows, and rooflights	2.2	1.62	1.63	Entrance Door
Personnel doors	2.2	0.95	0.99	Single FE Door
Vehicle access & similar large doors	1.5	-	-	No vehicle doors in project
High usage entrance doors	3.5	-	-	No high usage entrance doors in project

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)]

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

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

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

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

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

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- GF Vent AC Areas (5 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.5	2.6	-	1.5	0.5
Standard value	2.5*	2.6	N/A	1.5^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					
^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

2- GF WCs (5 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

3- Bedrooms (136 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.5	2.6	-	1.5	0.5
Standard value	2.5*	2.6	N/A	1.5^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					
^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

4- Circulation

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

5- Kitchen (C1_FoodPrep 1)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- HW Generators

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.9	0
Standard value	0.9*	N/A
* Standard shown is for gas boilers >30 kW output. For boilers <=30 kW output, limiting efficiency is 0.73.		

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I			
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard	
C1_EatDrink 1	-	-	-	1.5	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 1	-	-	-	1.5	-	-	-	-	-	-	N/A	
C1_FitGym 1	-	-	-	1.5	-	-	-	-	-	-	N/A	
C1_FoodPrep 1	-	-	-	-	-	-	-	-	1	-	N/A	
C1_Office 1	-	-	-	1.5	-	-	-	-	-	-	N/A	
C1_Reception 1	-	-	-	1.5	-	-	-	-	-	-	N/A	
C1_Toilet 1	-	-	0.5	-	-	-	-	-	-	-	N/A	
C1_Toilet 2	-	-	0.5	-	-	-	-	-	-	-	N/A	
C1_Toilet 3	-	-	0.5	-	-	-	-	-	-	-	N/A	
C1_Toilet 4	-	-	0.5	-	-	-	-	-	-	-	N/A	
C1_Toilet 5	-	-	0.5	-	-	-	-	-	-	-	N/A	
C1_Office 2	-	-	-	1.5	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 2	-	-	-	1.5	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 3	-	-	-	1.5	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 4	-	-	-	1.5	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 5	-	-	-	1.5	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 6	-	-	-	1.5	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 7	-	-	-	1.5	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 8	-	-	-	1.5	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 9	-	-	-	1.5	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 10	-	-	-	1.5	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 11	-	-	-	1.5	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 12	-	-	-	1.5	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 13	-	-	-	1.5	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 14	-	-	-	1.5	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 15	-	-	-	1.5	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 16	-	-	-	1.5	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 17	-	-	-	1.5	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 18	-	-	-	1.5	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 19	-	-	-	1.5	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 20	-	-	-	1.5	-	-	-	-	-	-	N/A	

Zone name	SFP [W/(l/s)]										HR efficiency	
	ID of system type	A	B	C	D	E	F	G	H	I		
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
C1_EnsuiteBedroom 21		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 22		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 23		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 24		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 25		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 26		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 27		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 28		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 29		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 30		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 31		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 32		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 33		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 34		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 35		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 36		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 37		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 38		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 39		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 40		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 41		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 42		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 43		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 44		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 45		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 46		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 47		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 48		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 49		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 50		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 51		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 52		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 53		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 54		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 55		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 56		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 57		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 58		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 59		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 60		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 61		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 62		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 63		-	-	-	1.5	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]										HR efficiency	
	ID of system type	A	B	C	D	E	F	G	H	I		
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
C1_EnsuiteBedroom 64		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 65		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 66		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 67		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 68		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 69		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 70		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 71		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 72		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 73		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 74		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 75		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 76		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 77		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 78		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 79		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 80		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 81		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 82		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 83		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 84		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 85		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 86		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 87		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 88		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 89		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 90		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 91		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 92		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 93		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 94		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 95		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 96		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 97		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 98		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 99		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 100		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 101		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 102		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 103		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 104		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 105		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 106		-	-	-	1.5	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]										HR efficiency	
	ID of system type	A	B	C	D	E	F	G	H	I		
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
C1_EnsuiteBedroom 107		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 108		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 109		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 110		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 111		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 112		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 113		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 114		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 115		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 116		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 117		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 118		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 119		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 120		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 121		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 122		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 123		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 124		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 125		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 126		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 127		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 128		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 129		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 130		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 131		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 132		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 133		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 134		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 135		-	-	-	1.5	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 136		-	-	-	1.5	-	-	-	-	-	-	N/A

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
C1_Circulation 1		-	60	-	869
C1_EatDrink 1		-	60	22	1279
C1_EnsuiteBedroom 1		-	60	-	68
C1_FitGym 1		-	60	-	304
C1_FoodPrep 1		-	60	-	1015
C1_Office 1		60	-	-	587
C1_Reception 1		-	60	22	413
C1_Store 1		60	-	-	86
C1_Toilet 1		-	60	-	150

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
C1_Toilet 2		-	60	-	149
C1_Toilet 3		-	60	-	65
C1_Toilet 4		-	60	-	99
C1_Toilet 5		-	60	-	108
C1_Store 2		60	-	-	18
C1_Store 3		60	-	-	31
C1_Store 4		60	-	-	47
C1_Office 2		60	-	-	456
C1_Circulation 2		-	60	-	74
C1_Circulation 3		-	60	-	72
C1_Circulation 4		-	60	-	54
C1_Circulation 5		-	60	-	51
C1_Circulation 6		-	60	-	101
C1_Circulation 7		-	60	-	335
C1_Circulation 8		-	60	-	166
C1_Store 5		60	-	-	20
C1_Circulation 9		-	60	-	180
C1_Circulation 10		-	60	-	166
C1_Store 6		60	-	-	20
C1_EnsuiteBedroom 2		-	60	-	68
C1_EnsuiteBedroom 3		-	60	-	68
C1_EnsuiteBedroom 4		-	60	-	68
C1_EnsuiteBedroom 5		-	60	-	68
C1_EnsuiteBedroom 6		-	60	-	68
C1_EnsuiteBedroom 7		-	60	-	68
C1_EnsuiteBedroom 8		-	60	-	68
C1_EnsuiteBedroom 9		-	60	-	68
C1_EnsuiteBedroom 10		-	60	-	68
C1_EnsuiteBedroom 11		-	60	-	69
C1_EnsuiteBedroom 12		-	60	-	68
C1_EnsuiteBedroom 13		-	60	-	67
C1_EnsuiteBedroom 14		-	60	-	67
C1_EnsuiteBedroom 15		-	60	-	69
C1_EnsuiteBedroom 16		-	60	-	67
C1_EnsuiteBedroom 17		-	60	-	68
C1_EnsuiteBedroom 18		-	60	-	68
C1_EnsuiteBedroom 19		-	60	-	68
C1_EnsuiteBedroom 20		-	60	-	68
C1_EnsuiteBedroom 21		-	60	-	70
C1_EnsuiteBedroom 22		-	60	-	68
C1_EnsuiteBedroom 23		-	60	-	68
C1_EnsuiteBedroom 24		-	60	-	68
C1_EnsuiteBedroom 25		-	60	-	68

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
C1_EnsuiteBedroom 26		-	60	-	69
C1_EnsuiteBedroom 27		-	60	-	68
C1_EnsuiteBedroom 28		-	60	-	68
C1_EnsuiteBedroom 29		-	60	-	68
C1_EnsuiteBedroom 30		-	60	-	69
C1_EnsuiteBedroom 31		-	60	-	68
C1_EnsuiteBedroom 32		-	60	-	68
C1_EnsuiteBedroom 33		-	60	-	69
C1_EnsuiteBedroom 34		-	60	-	68
C1_EnsuiteBedroom 35		-	60	-	68
C1_Store 7		60	-	-	20
C1_Store 8		60	-	-	20
C1_Circulation 11		-	60	-	184
C1_Circulation 12		-	60	-	166
C1_EnsuiteBedroom 36		-	60	-	68
C1_EnsuiteBedroom 37		-	60	-	68
C1_EnsuiteBedroom 38		-	60	-	68
C1_EnsuiteBedroom 39		-	60	-	68
C1_EnsuiteBedroom 40		-	60	-	68
C1_EnsuiteBedroom 41		-	60	-	68
C1_EnsuiteBedroom 42		-	60	-	68
C1_EnsuiteBedroom 43		-	60	-	68
C1_EnsuiteBedroom 44		-	60	-	68
C1_EnsuiteBedroom 45		-	60	-	69
C1_EnsuiteBedroom 46		-	60	-	68
C1_EnsuiteBedroom 47		-	60	-	68
C1_EnsuiteBedroom 48		-	60	-	68
C1_EnsuiteBedroom 49		-	60	-	69
C1_EnsuiteBedroom 50		-	60	-	68
C1_EnsuiteBedroom 51		-	60	-	68
C1_EnsuiteBedroom 52		-	60	-	68
C1_EnsuiteBedroom 53		-	60	-	68
C1_EnsuiteBedroom 54		-	60	-	68
C1_EnsuiteBedroom 55		-	60	-	70
C1_EnsuiteBedroom 56		-	60	-	68
C1_EnsuiteBedroom 57		-	60	-	69
C1_EnsuiteBedroom 58		-	60	-	68
C1_EnsuiteBedroom 59		-	60	-	68
C1_EnsuiteBedroom 60		-	60	-	69
C1_EnsuiteBedroom 61		-	60	-	68
C1_EnsuiteBedroom 62		-	60	-	68
C1_EnsuiteBedroom 63		-	60	-	68
C1_EnsuiteBedroom 64		-	60	-	69

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
C1_EnsuiteBedroom 65		-	60	-	68
C1_EnsuiteBedroom 66		-	60	-	68
C1_EnsuiteBedroom 67		-	60	-	69
C1_EnsuiteBedroom 68		-	60	-	68
C1_EnsuiteBedroom 69		-	60	-	68
C1_Circulation 13		-	60	-	184
C1_Circulation 14		-	60	-	166
C1_EnsuiteBedroom 70		-	60	-	68
C1_EnsuiteBedroom 71		-	60	-	68
C1_EnsuiteBedroom 72		-	60	-	68
C1_EnsuiteBedroom 73		-	60	-	68
C1_EnsuiteBedroom 74		-	60	-	68
C1_EnsuiteBedroom 75		-	60	-	68
C1_EnsuiteBedroom 76		-	60	-	68
C1_EnsuiteBedroom 77		-	60	-	68
C1_EnsuiteBedroom 78		-	60	-	68
C1_EnsuiteBedroom 79		-	60	-	69
C1_EnsuiteBedroom 80		-	60	-	68
C1_EnsuiteBedroom 81		-	60	-	68
C1_EnsuiteBedroom 82		-	60	-	68
C1_EnsuiteBedroom 83		-	60	-	69
C1_EnsuiteBedroom 84		-	60	-	68
C1_EnsuiteBedroom 85		-	60	-	68
C1_EnsuiteBedroom 86		-	60	-	68
C1_EnsuiteBedroom 87		-	60	-	68
C1_EnsuiteBedroom 88		-	60	-	68
C1_EnsuiteBedroom 89		-	60	-	70
C1_EnsuiteBedroom 90		-	60	-	68
C1_EnsuiteBedroom 91		-	60	-	69
C1_EnsuiteBedroom 92		-	60	-	68
C1_EnsuiteBedroom 93		-	60	-	68
C1_EnsuiteBedroom 94		-	60	-	69
C1_EnsuiteBedroom 95		-	60	-	68
C1_EnsuiteBedroom 96		-	60	-	68
C1_EnsuiteBedroom 97		-	60	-	68
C1_EnsuiteBedroom 98		-	60	-	69
C1_EnsuiteBedroom 99		-	60	-	68
C1_EnsuiteBedroom 100		-	60	-	68
C1_EnsuiteBedroom 101		-	60	-	69
C1_EnsuiteBedroom 102		-	60	-	68
C1_EnsuiteBedroom 103		-	60	-	68
C1_Circulation 15		-	60	-	184
C1_EnsuiteBedroom 104		-	60	-	68

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
C1_EnsuiteBedroom 105		-	60	-	68
C1_EnsuiteBedroom 106		-	60	-	68
C1_EnsuiteBedroom 107		-	60	-	68
C1_EnsuiteBedroom 108		-	60	-	68
C1_EnsuiteBedroom 109		-	60	-	68
C1_EnsuiteBedroom 110		-	60	-	68
C1_EnsuiteBedroom 111		-	60	-	68
C1_EnsuiteBedroom 112		-	60	-	68
C1_EnsuiteBedroom 113		-	60	-	69
C1_EnsuiteBedroom 114		-	60	-	68
C1_EnsuiteBedroom 115		-	60	-	68
C1_EnsuiteBedroom 116		-	60	-	68
C1_EnsuiteBedroom 117		-	60	-	69
C1_EnsuiteBedroom 118		-	60	-	68
C1_EnsuiteBedroom 119		-	60	-	68
C1_EnsuiteBedroom 120		-	60	-	68
C1_EnsuiteBedroom 121		-	60	-	68
C1_EnsuiteBedroom 122		-	60	-	68
C1_EnsuiteBedroom 123		-	60	-	70
C1_EnsuiteBedroom 124		-	60	-	68
C1_EnsuiteBedroom 125		-	60	-	69
C1_EnsuiteBedroom 126		-	60	-	68
C1_EnsuiteBedroom 127		-	60	-	68
C1_EnsuiteBedroom 128		-	60	-	69
C1_EnsuiteBedroom 129		-	60	-	68
C1_EnsuiteBedroom 130		-	60	-	68
C1_EnsuiteBedroom 131		-	60	-	68
C1_EnsuiteBedroom 132		-	60	-	69
C1_EnsuiteBedroom 133		-	60	-	68
C1_EnsuiteBedroom 134		-	60	-	68
C1_EnsuiteBedroom 135		-	60	-	69
C1_EnsuiteBedroom 136		-	60	-	68

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
C1_EatDrink 1	NO (-32%)	NO
C1_EnsuiteBedroom 1	NO (-86%)	NO
C1_FitGym 1	NO (-40%)	NO
C1_Office 1	NO (-56%)	NO
C1_Reception 1	YES (+41%)	NO
C1_Office 2	NO (-66%)	NO
C1_EnsuiteBedroom 2	NO (-51%)	NO
C1_EnsuiteBedroom 3	NO (-51%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
C1_EnsuiteBedroom 4	NO (-51%)	NO
C1_EnsuiteBedroom 5	NO (-51%)	NO
C1_EnsuiteBedroom 6	NO (-51%)	NO
C1_EnsuiteBedroom 7	NO (-51%)	NO
C1_EnsuiteBedroom 8	NO (-51%)	NO
C1_EnsuiteBedroom 9	NO (-51%)	NO
C1_EnsuiteBedroom 10	NO (-51%)	NO
C1_EnsuiteBedroom 11	NO (-52%)	NO
C1_EnsuiteBedroom 12	NO (-51%)	NO
C1_EnsuiteBedroom 13	NO (-51%)	NO
C1_EnsuiteBedroom 14	NO (-51%)	NO
C1_EnsuiteBedroom 15	NO (-52%)	NO
C1_EnsuiteBedroom 16	NO (-50%)	NO
C1_EnsuiteBedroom 17	NO (-51%)	NO
C1_EnsuiteBedroom 18	NO (-51%)	NO
C1_EnsuiteBedroom 19	NO (-86%)	NO
C1_EnsuiteBedroom 20	NO (-80%)	NO
C1_EnsuiteBedroom 21	NO (-34%)	NO
C1_EnsuiteBedroom 22	NO (-31%)	NO
C1_EnsuiteBedroom 23	NO (-32%)	NO
C1_EnsuiteBedroom 24	NO (-32%)	NO
C1_EnsuiteBedroom 25	NO (-31%)	NO
C1_EnsuiteBedroom 26	NO (-32%)	NO
C1_EnsuiteBedroom 27	NO (-32%)	NO
C1_EnsuiteBedroom 28	NO (-32%)	NO
C1_EnsuiteBedroom 29	NO (-32%)	NO
C1_EnsuiteBedroom 30	NO (-32%)	NO
C1_EnsuiteBedroom 31	NO (-32%)	NO
C1_EnsuiteBedroom 32	NO (-31%)	NO
C1_EnsuiteBedroom 33	NO (-32%)	NO
C1_EnsuiteBedroom 34	NO (-31%)	NO
C1_EnsuiteBedroom 35	NO (-86%)	NO
C1_EnsuiteBedroom 36	NO (-51%)	NO
C1_EnsuiteBedroom 37	NO (-51%)	NO
C1_EnsuiteBedroom 38	NO (-51%)	NO
C1_EnsuiteBedroom 39	NO (-51%)	NO
C1_EnsuiteBedroom 40	NO (-51%)	NO
C1_EnsuiteBedroom 41	NO (-51%)	NO
C1_EnsuiteBedroom 42	NO (-51%)	NO
C1_EnsuiteBedroom 43	NO (-51%)	NO
C1_EnsuiteBedroom 44	NO (-51%)	NO
C1_EnsuiteBedroom 45	NO (-52%)	NO
C1_EnsuiteBedroom 46	NO (-51%)	NO
C1_EnsuiteBedroom 47	NO (-51%)	NO
C1_EnsuiteBedroom 48	NO (-51%)	NO
C1_EnsuiteBedroom 49	NO (-52%)	NO
C1_EnsuiteBedroom 50	NO (-50%)	NO
C1_EnsuiteBedroom 51	NO (-51%)	NO
C1_EnsuiteBedroom 52	NO (-51%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
C1_EnsuiteBedroom 53	NO (-86%)	NO
C1_EnsuiteBedroom 54	NO (-80%)	NO
C1_EnsuiteBedroom 55	NO (-34%)	NO
C1_EnsuiteBedroom 56	NO (-31%)	NO
C1_EnsuiteBedroom 57	NO (-32%)	NO
C1_EnsuiteBedroom 58	NO (-32%)	NO
C1_EnsuiteBedroom 59	NO (-31%)	NO
C1_EnsuiteBedroom 60	NO (-32%)	NO
C1_EnsuiteBedroom 61	NO (-32%)	NO
C1_EnsuiteBedroom 62	NO (-32%)	NO
C1_EnsuiteBedroom 63	NO (-32%)	NO
C1_EnsuiteBedroom 64	NO (-32%)	NO
C1_EnsuiteBedroom 65	NO (-32%)	NO
C1_EnsuiteBedroom 66	NO (-31%)	NO
C1_EnsuiteBedroom 67	NO (-32%)	NO
C1_EnsuiteBedroom 68	NO (-31%)	NO
C1_EnsuiteBedroom 69	NO (-86%)	NO
C1_EnsuiteBedroom 70	NO (-51%)	NO
C1_EnsuiteBedroom 71	NO (-51%)	NO
C1_EnsuiteBedroom 72	NO (-51%)	NO
C1_EnsuiteBedroom 73	NO (-51%)	NO
C1_EnsuiteBedroom 74	NO (-51%)	NO
C1_EnsuiteBedroom 75	NO (-51%)	NO
C1_EnsuiteBedroom 76	NO (-51%)	NO
C1_EnsuiteBedroom 77	NO (-51%)	NO
C1_EnsuiteBedroom 78	NO (-51%)	NO
C1_EnsuiteBedroom 79	NO (-52%)	NO
C1_EnsuiteBedroom 80	NO (-51%)	NO
C1_EnsuiteBedroom 81	NO (-51%)	NO
C1_EnsuiteBedroom 82	NO (-51%)	NO
C1_EnsuiteBedroom 83	NO (-52%)	NO
C1_EnsuiteBedroom 84	NO (-50%)	NO
C1_EnsuiteBedroom 85	NO (-51%)	NO
C1_EnsuiteBedroom 86	NO (-51%)	NO
C1_EnsuiteBedroom 87	NO (-86%)	NO
C1_EnsuiteBedroom 88	NO (-80%)	NO
C1_EnsuiteBedroom 89	NO (-34%)	NO
C1_EnsuiteBedroom 90	NO (-31%)	NO
C1_EnsuiteBedroom 91	NO (-32%)	NO
C1_EnsuiteBedroom 92	NO (-32%)	NO
C1_EnsuiteBedroom 93	NO (-31%)	NO
C1_EnsuiteBedroom 94	NO (-32%)	NO
C1_EnsuiteBedroom 95	NO (-32%)	NO
C1_EnsuiteBedroom 96	NO (-32%)	NO
C1_EnsuiteBedroom 97	NO (-32%)	NO
C1_EnsuiteBedroom 98	NO (-32%)	NO
C1_EnsuiteBedroom 99	NO (-32%)	NO
C1_EnsuiteBedroom 100	NO (-31%)	NO
C1_EnsuiteBedroom 101	NO (-32%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
C1_EnsuiteBedroom 102	NO (-31%)	NO
C1_EnsuiteBedroom 103	NO (-88%)	NO
C1_EnsuiteBedroom 104	NO (-61%)	NO
C1_EnsuiteBedroom 105	NO (-61%)	NO
C1_EnsuiteBedroom 106	NO (-61%)	NO
C1_EnsuiteBedroom 107	NO (-61%)	NO
C1_EnsuiteBedroom 108	NO (-61%)	NO
C1_EnsuiteBedroom 109	NO (-61%)	NO
C1_EnsuiteBedroom 110	NO (-61%)	NO
C1_EnsuiteBedroom 111	NO (-61%)	NO
C1_EnsuiteBedroom 112	NO (-61%)	NO
C1_EnsuiteBedroom 113	NO (-61%)	NO
C1_EnsuiteBedroom 114	NO (-61%)	NO
C1_EnsuiteBedroom 115	NO (-60%)	NO
C1_EnsuiteBedroom 116	NO (-61%)	NO
C1_EnsuiteBedroom 117	NO (-61%)	NO
C1_EnsuiteBedroom 118	NO (-60%)	NO
C1_EnsuiteBedroom 119	NO (-61%)	NO
C1_EnsuiteBedroom 120	NO (-61%)	NO
C1_EnsuiteBedroom 121	NO (-88%)	NO
C1_EnsuiteBedroom 122	NO (-84%)	NO
C1_EnsuiteBedroom 123	NO (-47%)	NO
C1_EnsuiteBedroom 124	NO (-45%)	NO
C1_EnsuiteBedroom 125	NO (-46%)	NO
C1_EnsuiteBedroom 126	NO (-46%)	NO
C1_EnsuiteBedroom 127	NO (-45%)	NO
C1_EnsuiteBedroom 128	NO (-46%)	NO
C1_EnsuiteBedroom 129	NO (-46%)	NO
C1_EnsuiteBedroom 130	NO (-46%)	NO
C1_EnsuiteBedroom 131	NO (-46%)	NO
C1_EnsuiteBedroom 132	NO (-46%)	NO
C1_EnsuiteBedroom 133	NO (-46%)	NO
C1_EnsuiteBedroom 134	NO (-45%)	NO
C1_EnsuiteBedroom 135	NO (-46%)	NO
C1_EnsuiteBedroom 136	NO (-45%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m ²]	4675	4675
External area [m ²]	4678	4678
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	10	3
Average conductance [W/K]	2113	2118
Average U-value [W/m ² K]	0.45	0.45
Alpha value* [%]	12.59	12.59

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

Building Use

% Area Building Type

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	15.59	12
Cooling	6.88	6.93
Auxiliary	10.98	7.03
Lighting	16.13	13.95
Hot water	220.47	218.05
Equipment*	18.35	18.35
TOTAL**	270.04	257.95

* 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

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	180.83	131.76
Primary energy* [kWh/m ²]	421.15	362.75
Total emissions [kg/m ²]	73.4	65.1

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

HVAC Systems Performance

System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
Actual	57.7	427	6.8	48	17.7	2.37	2.47	2.5	2.6
Notional	17.1	599.4	5.8	46.3	10.9	0.82	3.6	----	----
[ST] Other local room heater - unfanned, [HS] Room heater, [HFT] Electricity, [CFT] Electricity									
Actual	106.7	0	29.6	0	39.3	1	0	1	0
Notional	75.5	0	25.6	0	31.5	0.82	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
Actual	102.1	18.2	11.9	2	12.9	2.37	2.47	2.5	2.6
Notional	36.6	31.7	12.4	2.5	8	0.82	3.6	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity									
Actual	103.8	0	28.8	0	0	1	0	1	0
Notional	54.3	0	18.4	0	0	0.82	0	----	----
[ST] No Heating or Cooling									
Actual	3.1	0	0.9	0	19.7	1	0	1	0
Notional	0	0	0	0	22	0	0	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Key Features

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

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.35	External Wall
Floor	0.2	0.21	Ground Floor
Roof	0.15	0.25	Roof
Windows, roof windows, and rooflights	1.5	1.6	Entrance Side Light Fixed
Personnel doors	1.5	0.93	Double FE Door
Vehicle access & similar large doors	1.5	-	No vehicle doors in project
High usage entrance doors	1.5	-	No high usage entrance doors in project
U _{i-Typ} = Typical individual element U-values [W/(m²K)]			U _{i-Min} = Minimum individual element U-values [W/(m²K)]
* There might be more than one surface where the minimum U-value occurs.			

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

APPENDIX B: ENERGY MODEL DATA – INCORPORATING ENERGY EFFICIENCY AND
DEMAND REDUCTION MEASURES

Project name

Redefine Reading

As designed

Date: Sat Apr 14 10:16:02 2018

Administrative information

Building Details

Address: Reading,

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.4.2"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.4.2

BRUKL compliance check version: v5.4.a.1

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name:

Telephone number:

Address: , ,

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

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	65.1
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	65.1
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	58.7
Are emissions from the building less than or equal to the target?	BER ≤ TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.24	0.24	External Wall
Floor	0.25	0.21	0.24	Exposed Floor
Roof	0.25	0.12	0.12	Roof
Windows***, roof windows, and rooflights	2.2	1.62	1.63	Entrance Door
Personnel doors	2.2	1.57	1.59	Single FE Door
Vehicle access & similar large doors	1.5	-	-	No vehicle doors in project
High usage entrance doors	3.5	-	-	No high usage entrance doors in project

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)]

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

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

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

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

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

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- GF Vent AC Areas (5 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	5.5	5.6	-	1.4	0.7
Standard value	2.5*	2.6	N/A	1.5^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					
^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

2- GF WCs (5 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

3- Bedrooms (136 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	5.5	5.6	-	1.4	0.7
Standard value	2.5*	2.6	N/A	1.5^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					
^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

4- Circulation

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

5- Kitchen (C1_FoodPrep 1)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- HW Generators

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.98	0
Standard value	0.9*	N/A
* Standard shown is for gas boilers >30 kW output. For boilers <=30 kW output, limiting efficiency is 0.73.		

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I			
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard	
C1_EatDrink 1	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 1	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_FitGym 1	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_FoodPrep 1	-	-	-	-	-	-	-	-	0.8	-	N/A	
C1_Office 1	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_Reception 1	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_Toilet 1	-	-	0.4	-	-	-	-	-	-	-	N/A	
C1_Toilet 2	-	-	0.4	-	-	-	-	-	-	-	N/A	
C1_Toilet 3	-	-	0.4	-	-	-	-	-	-	-	N/A	
C1_Toilet 4	-	-	0.4	-	-	-	-	-	-	-	N/A	
C1_Toilet 5	-	-	0.4	-	-	-	-	-	-	-	N/A	
C1_Office 2	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 2	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 3	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 4	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 5	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 6	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 7	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 8	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 9	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 10	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 11	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 12	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 13	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 14	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 15	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 16	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 17	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 18	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 19	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 20	-	-	-	1.4	-	-	-	-	-	-	N/A	

Zone name	SFP [W/(l/s)]										HR efficiency	
	ID of system type	A	B	C	D	E	F	G	H	I		
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
C1_EnsuiteBedroom 21		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 22		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 23		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 24		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 25		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 26		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 27		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 28		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 29		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 30		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 31		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 32		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 33		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 34		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 35		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 36		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 37		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 38		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 39		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 40		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 41		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 42		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 43		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 44		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 45		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 46		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 47		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 48		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 49		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 50		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 51		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 52		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 53		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 54		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 55		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 56		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 57		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 58		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 59		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 60		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 61		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 62		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 63		-	-	-	1.4	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]										HR efficiency	
	ID of system type	A	B	C	D	E	F	G	H	I		
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
C1_EnsuiteBedroom 64		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 65		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 66		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 67		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 68		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 69		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 70		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 71		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 72		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 73		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 74		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 75		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 76		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 77		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 78		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 79		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 80		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 81		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 82		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 83		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 84		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 85		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 86		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 87		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 88		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 89		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 90		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 91		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 92		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 93		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 94		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 95		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 96		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 97		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 98		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 99		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 100		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 101		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 102		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 103		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 104		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 105		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 106		-	-	-	1.4	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]										HR efficiency	
	ID of system type	A	B	C	D	E	F	G	H	I		
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
C1_EnsuiteBedroom 107		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 108		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 109		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 110		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 111		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 112		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 113		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 114		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 115		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 116		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 117		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 118		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 119		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 120		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 121		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 122		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 123		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 124		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 125		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 126		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 127		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 128		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 129		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 130		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 131		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 132		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 133		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 134		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 135		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 136		-	-	-	1.4	-	-	-	-	-	-	N/A

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
C1_Circulation 1		-	80	-	652
C1_EatDrink 1		-	70	22	1096
C1_EnsuiteBedroom 1		-	80	-	51
C1_FitGym 1		-	80	-	228
C1_FoodPrep 1		-	80	-	762
C1_Office 1		80	-	-	440
C1_Reception 1		-	70	22	354
C1_Store 1		80	-	-	64
C1_Toilet 1		-	70	-	129

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
C1_Toilet 2		-	70	-	128
C1_Toilet 3		-	70	-	55
C1_Toilet 4		-	70	-	85
C1_Toilet 5		-	70	-	93
C1_Store 2		80	-	-	13
C1_Store 3		80	-	-	23
C1_Store 4		80	-	-	35
C1_Office 2		80	-	-	342
C1_Circulation 2		-	80	-	56
C1_Circulation 3		-	80	-	54
C1_Circulation 4		-	80	-	40
C1_Circulation 5		-	80	-	38
C1_Circulation 6		-	80	-	76
C1_Circulation 7		-	80	-	252
C1_Circulation 8		-	80	-	125
C1_Store 5		80	-	-	15
C1_Circulation 9		-	80	-	135
C1_Circulation 10		-	80	-	125
C1_Store 6		80	-	-	15
C1_EnsuiteBedroom 2		-	80	-	51
C1_EnsuiteBedroom 3		-	80	-	51
C1_EnsuiteBedroom 4		-	80	-	51
C1_EnsuiteBedroom 5		-	80	-	51
C1_EnsuiteBedroom 6		-	80	-	51
C1_EnsuiteBedroom 7		-	80	-	51
C1_EnsuiteBedroom 8		-	80	-	51
C1_EnsuiteBedroom 9		-	80	-	51
C1_EnsuiteBedroom 10		-	80	-	51
C1_EnsuiteBedroom 11		-	80	-	52
C1_EnsuiteBedroom 12		-	80	-	51
C1_EnsuiteBedroom 13		-	80	-	50
C1_EnsuiteBedroom 14		-	80	-	51
C1_EnsuiteBedroom 15		-	80	-	52
C1_EnsuiteBedroom 16		-	80	-	51
C1_EnsuiteBedroom 17		-	80	-	51
C1_EnsuiteBedroom 18		-	80	-	51
C1_EnsuiteBedroom 19		-	80	-	51
C1_EnsuiteBedroom 20		-	80	-	51
C1_EnsuiteBedroom 21		-	80	-	53
C1_EnsuiteBedroom 22		-	80	-	51
C1_EnsuiteBedroom 23		-	80	-	51
C1_EnsuiteBedroom 24		-	80	-	51
C1_EnsuiteBedroom 25		-	80	-	51

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
C1_EnsuiteBedroom 26		-	80	-	51
C1_EnsuiteBedroom 27		-	80	-	51
C1_EnsuiteBedroom 28		-	80	-	51
C1_EnsuiteBedroom 29		-	80	-	51
C1_EnsuiteBedroom 30		-	80	-	52
C1_EnsuiteBedroom 31		-	80	-	51
C1_EnsuiteBedroom 32		-	80	-	51
C1_EnsuiteBedroom 33		-	80	-	51
C1_EnsuiteBedroom 34		-	80	-	51
C1_EnsuiteBedroom 35		-	80	-	51
C1_Store 7		80	-	-	15
C1_Store 8		80	-	-	15
C1_Circulation 11		-	80	-	138
C1_Circulation 12		-	80	-	125
C1_EnsuiteBedroom 36		-	80	-	51
C1_EnsuiteBedroom 37		-	80	-	51
C1_EnsuiteBedroom 38		-	80	-	51
C1_EnsuiteBedroom 39		-	80	-	51
C1_EnsuiteBedroom 40		-	80	-	51
C1_EnsuiteBedroom 41		-	80	-	51
C1_EnsuiteBedroom 42		-	80	-	51
C1_EnsuiteBedroom 43		-	80	-	51
C1_EnsuiteBedroom 44		-	80	-	51
C1_EnsuiteBedroom 45		-	80	-	52
C1_EnsuiteBedroom 46		-	80	-	51
C1_EnsuiteBedroom 47		-	80	-	51
C1_EnsuiteBedroom 48		-	80	-	51
C1_EnsuiteBedroom 49		-	80	-	52
C1_EnsuiteBedroom 50		-	80	-	51
C1_EnsuiteBedroom 51		-	80	-	51
C1_EnsuiteBedroom 52		-	80	-	51
C1_EnsuiteBedroom 53		-	80	-	51
C1_EnsuiteBedroom 54		-	80	-	51
C1_EnsuiteBedroom 55		-	80	-	53
C1_EnsuiteBedroom 56		-	80	-	51
C1_EnsuiteBedroom 57		-	80	-	52
C1_EnsuiteBedroom 58		-	80	-	51
C1_EnsuiteBedroom 59		-	80	-	51
C1_EnsuiteBedroom 60		-	80	-	51
C1_EnsuiteBedroom 61		-	80	-	51
C1_EnsuiteBedroom 62		-	80	-	51
C1_EnsuiteBedroom 63		-	80	-	51
C1_EnsuiteBedroom 64		-	80	-	52

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
C1_EnsuiteBedroom 65		-	80	-	51
C1_EnsuiteBedroom 66		-	80	-	51
C1_EnsuiteBedroom 67		-	80	-	52
C1_EnsuiteBedroom 68		-	80	-	51
C1_EnsuiteBedroom 69		-	80	-	51
C1_Circulation 13		-	80	-	138
C1_Circulation 14		-	80	-	125
C1_EnsuiteBedroom 70		-	80	-	51
C1_EnsuiteBedroom 71		-	80	-	51
C1_EnsuiteBedroom 72		-	80	-	51
C1_EnsuiteBedroom 73		-	80	-	51
C1_EnsuiteBedroom 74		-	80	-	51
C1_EnsuiteBedroom 75		-	80	-	51
C1_EnsuiteBedroom 76		-	80	-	51
C1_EnsuiteBedroom 77		-	80	-	51
C1_EnsuiteBedroom 78		-	80	-	51
C1_EnsuiteBedroom 79		-	80	-	52
C1_EnsuiteBedroom 80		-	80	-	51
C1_EnsuiteBedroom 81		-	80	-	51
C1_EnsuiteBedroom 82		-	80	-	51
C1_EnsuiteBedroom 83		-	80	-	52
C1_EnsuiteBedroom 84		-	80	-	51
C1_EnsuiteBedroom 85		-	80	-	51
C1_EnsuiteBedroom 86		-	80	-	51
C1_EnsuiteBedroom 87		-	80	-	51
C1_EnsuiteBedroom 88		-	80	-	51
C1_EnsuiteBedroom 89		-	80	-	53
C1_EnsuiteBedroom 90		-	80	-	51
C1_EnsuiteBedroom 91		-	80	-	52
C1_EnsuiteBedroom 92		-	80	-	51
C1_EnsuiteBedroom 93		-	80	-	51
C1_EnsuiteBedroom 94		-	80	-	51
C1_EnsuiteBedroom 95		-	80	-	51
C1_EnsuiteBedroom 96		-	80	-	51
C1_EnsuiteBedroom 97		-	80	-	51
C1_EnsuiteBedroom 98		-	80	-	52
C1_EnsuiteBedroom 99		-	80	-	51
C1_EnsuiteBedroom 100		-	80	-	51
C1_EnsuiteBedroom 101		-	80	-	52
C1_EnsuiteBedroom 102		-	80	-	51
C1_EnsuiteBedroom 103		-	80	-	51
C1_Circulation 15		-	80	-	138
C1_EnsuiteBedroom 104		-	80	-	51

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name	Standard value	Luminaire	Lamp	Display lamp	
		60	60	22	
C1_EnsuiteBedroom 105		-	80	-	51
C1_EnsuiteBedroom 106		-	80	-	51
C1_EnsuiteBedroom 107		-	80	-	51
C1_EnsuiteBedroom 108		-	80	-	51
C1_EnsuiteBedroom 109		-	80	-	51
C1_EnsuiteBedroom 110		-	80	-	51
C1_EnsuiteBedroom 111		-	80	-	51
C1_EnsuiteBedroom 112		-	80	-	51
C1_EnsuiteBedroom 113		-	80	-	52
C1_EnsuiteBedroom 114		-	80	-	51
C1_EnsuiteBedroom 115		-	80	-	51
C1_EnsuiteBedroom 116		-	80	-	51
C1_EnsuiteBedroom 117		-	80	-	52
C1_EnsuiteBedroom 118		-	80	-	51
C1_EnsuiteBedroom 119		-	80	-	51
C1_EnsuiteBedroom 120		-	80	-	51
C1_EnsuiteBedroom 121		-	80	-	51
C1_EnsuiteBedroom 122		-	80	-	51
C1_EnsuiteBedroom 123		-	80	-	53
C1_EnsuiteBedroom 124		-	80	-	51
C1_EnsuiteBedroom 125		-	80	-	52
C1_EnsuiteBedroom 126		-	80	-	51
C1_EnsuiteBedroom 127		-	80	-	51
C1_EnsuiteBedroom 128		-	80	-	51
C1_EnsuiteBedroom 129		-	80	-	51
C1_EnsuiteBedroom 130		-	80	-	51
C1_EnsuiteBedroom 131		-	80	-	51
C1_EnsuiteBedroom 132		-	80	-	52
C1_EnsuiteBedroom 133		-	80	-	51
C1_EnsuiteBedroom 134		-	80	-	51
C1_EnsuiteBedroom 135		-	80	-	52
C1_EnsuiteBedroom 136		-	80	-	51

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
C1_EatDrink 1	NO (-32%)	NO
C1_EnsuiteBedroom 1	NO (-86%)	NO
C1_FitGym 1	NO (-40%)	NO
C1_Office 1	NO (-56%)	NO
C1_Reception 1	YES (+41%)	NO
C1_Office 2	NO (-66%)	NO
C1_EnsuiteBedroom 2	NO (-51%)	NO
C1_EnsuiteBedroom 3	NO (-51%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
C1_EnsuiteBedroom 4	NO (-51%)	NO
C1_EnsuiteBedroom 5	NO (-51%)	NO
C1_EnsuiteBedroom 6	NO (-51%)	NO
C1_EnsuiteBedroom 7	NO (-51%)	NO
C1_EnsuiteBedroom 8	NO (-51%)	NO
C1_EnsuiteBedroom 9	NO (-51%)	NO
C1_EnsuiteBedroom 10	NO (-51%)	NO
C1_EnsuiteBedroom 11	NO (-52%)	NO
C1_EnsuiteBedroom 12	NO (-51%)	NO
C1_EnsuiteBedroom 13	NO (-51%)	NO
C1_EnsuiteBedroom 14	NO (-51%)	NO
C1_EnsuiteBedroom 15	NO (-52%)	NO
C1_EnsuiteBedroom 16	NO (-50%)	NO
C1_EnsuiteBedroom 17	NO (-51%)	NO
C1_EnsuiteBedroom 18	NO (-51%)	NO
C1_EnsuiteBedroom 19	NO (-86%)	NO
C1_EnsuiteBedroom 20	NO (-80%)	NO
C1_EnsuiteBedroom 21	NO (-34%)	NO
C1_EnsuiteBedroom 22	NO (-31%)	NO
C1_EnsuiteBedroom 23	NO (-32%)	NO
C1_EnsuiteBedroom 24	NO (-32%)	NO
C1_EnsuiteBedroom 25	NO (-31%)	NO
C1_EnsuiteBedroom 26	NO (-32%)	NO
C1_EnsuiteBedroom 27	NO (-32%)	NO
C1_EnsuiteBedroom 28	NO (-32%)	NO
C1_EnsuiteBedroom 29	NO (-32%)	NO
C1_EnsuiteBedroom 30	NO (-32%)	NO
C1_EnsuiteBedroom 31	NO (-32%)	NO
C1_EnsuiteBedroom 32	NO (-31%)	NO
C1_EnsuiteBedroom 33	NO (-32%)	NO
C1_EnsuiteBedroom 34	NO (-31%)	NO
C1_EnsuiteBedroom 35	NO (-86%)	NO
C1_EnsuiteBedroom 36	NO (-51%)	NO
C1_EnsuiteBedroom 37	NO (-51%)	NO
C1_EnsuiteBedroom 38	NO (-51%)	NO
C1_EnsuiteBedroom 39	NO (-51%)	NO
C1_EnsuiteBedroom 40	NO (-51%)	NO
C1_EnsuiteBedroom 41	NO (-51%)	NO
C1_EnsuiteBedroom 42	NO (-51%)	NO
C1_EnsuiteBedroom 43	NO (-51%)	NO
C1_EnsuiteBedroom 44	NO (-51%)	NO
C1_EnsuiteBedroom 45	NO (-52%)	NO
C1_EnsuiteBedroom 46	NO (-51%)	NO
C1_EnsuiteBedroom 47	NO (-51%)	NO
C1_EnsuiteBedroom 48	NO (-51%)	NO
C1_EnsuiteBedroom 49	NO (-52%)	NO
C1_EnsuiteBedroom 50	NO (-50%)	NO
C1_EnsuiteBedroom 51	NO (-51%)	NO
C1_EnsuiteBedroom 52	NO (-51%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
C1_EnsuiteBedroom 53	NO (-86%)	NO
C1_EnsuiteBedroom 54	NO (-80%)	NO
C1_EnsuiteBedroom 55	NO (-34%)	NO
C1_EnsuiteBedroom 56	NO (-31%)	NO
C1_EnsuiteBedroom 57	NO (-32%)	NO
C1_EnsuiteBedroom 58	NO (-32%)	NO
C1_EnsuiteBedroom 59	NO (-31%)	NO
C1_EnsuiteBedroom 60	NO (-32%)	NO
C1_EnsuiteBedroom 61	NO (-32%)	NO
C1_EnsuiteBedroom 62	NO (-32%)	NO
C1_EnsuiteBedroom 63	NO (-32%)	NO
C1_EnsuiteBedroom 64	NO (-32%)	NO
C1_EnsuiteBedroom 65	NO (-32%)	NO
C1_EnsuiteBedroom 66	NO (-31%)	NO
C1_EnsuiteBedroom 67	NO (-32%)	NO
C1_EnsuiteBedroom 68	NO (-31%)	NO
C1_EnsuiteBedroom 69	NO (-86%)	NO
C1_EnsuiteBedroom 70	NO (-51%)	NO
C1_EnsuiteBedroom 71	NO (-51%)	NO
C1_EnsuiteBedroom 72	NO (-51%)	NO
C1_EnsuiteBedroom 73	NO (-51%)	NO
C1_EnsuiteBedroom 74	NO (-51%)	NO
C1_EnsuiteBedroom 75	NO (-51%)	NO
C1_EnsuiteBedroom 76	NO (-51%)	NO
C1_EnsuiteBedroom 77	NO (-51%)	NO
C1_EnsuiteBedroom 78	NO (-51%)	NO
C1_EnsuiteBedroom 79	NO (-52%)	NO
C1_EnsuiteBedroom 80	NO (-51%)	NO
C1_EnsuiteBedroom 81	NO (-51%)	NO
C1_EnsuiteBedroom 82	NO (-51%)	NO
C1_EnsuiteBedroom 83	NO (-52%)	NO
C1_EnsuiteBedroom 84	NO (-50%)	NO
C1_EnsuiteBedroom 85	NO (-51%)	NO
C1_EnsuiteBedroom 86	NO (-51%)	NO
C1_EnsuiteBedroom 87	NO (-86%)	NO
C1_EnsuiteBedroom 88	NO (-80%)	NO
C1_EnsuiteBedroom 89	NO (-34%)	NO
C1_EnsuiteBedroom 90	NO (-31%)	NO
C1_EnsuiteBedroom 91	NO (-32%)	NO
C1_EnsuiteBedroom 92	NO (-32%)	NO
C1_EnsuiteBedroom 93	NO (-31%)	NO
C1_EnsuiteBedroom 94	NO (-32%)	NO
C1_EnsuiteBedroom 95	NO (-32%)	NO
C1_EnsuiteBedroom 96	NO (-32%)	NO
C1_EnsuiteBedroom 97	NO (-32%)	NO
C1_EnsuiteBedroom 98	NO (-32%)	NO
C1_EnsuiteBedroom 99	NO (-32%)	NO
C1_EnsuiteBedroom 100	NO (-31%)	NO
C1_EnsuiteBedroom 101	NO (-32%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
C1_EnsuiteBedroom 102	NO (-31%)	NO
C1_EnsuiteBedroom 103	NO (-88%)	NO
C1_EnsuiteBedroom 104	NO (-61%)	NO
C1_EnsuiteBedroom 105	NO (-61%)	NO
C1_EnsuiteBedroom 106	NO (-61%)	NO
C1_EnsuiteBedroom 107	NO (-61%)	NO
C1_EnsuiteBedroom 108	NO (-61%)	NO
C1_EnsuiteBedroom 109	NO (-61%)	NO
C1_EnsuiteBedroom 110	NO (-61%)	NO
C1_EnsuiteBedroom 111	NO (-61%)	NO
C1_EnsuiteBedroom 112	NO (-61%)	NO
C1_EnsuiteBedroom 113	NO (-61%)	NO
C1_EnsuiteBedroom 114	NO (-61%)	NO
C1_EnsuiteBedroom 115	NO (-60%)	NO
C1_EnsuiteBedroom 116	NO (-61%)	NO
C1_EnsuiteBedroom 117	NO (-61%)	NO
C1_EnsuiteBedroom 118	NO (-60%)	NO
C1_EnsuiteBedroom 119	NO (-61%)	NO
C1_EnsuiteBedroom 120	NO (-61%)	NO
C1_EnsuiteBedroom 121	NO (-88%)	NO
C1_EnsuiteBedroom 122	NO (-84%)	NO
C1_EnsuiteBedroom 123	NO (-47%)	NO
C1_EnsuiteBedroom 124	NO (-45%)	NO
C1_EnsuiteBedroom 125	NO (-46%)	NO
C1_EnsuiteBedroom 126	NO (-46%)	NO
C1_EnsuiteBedroom 127	NO (-45%)	NO
C1_EnsuiteBedroom 128	NO (-46%)	NO
C1_EnsuiteBedroom 129	NO (-46%)	NO
C1_EnsuiteBedroom 130	NO (-46%)	NO
C1_EnsuiteBedroom 131	NO (-46%)	NO
C1_EnsuiteBedroom 132	NO (-46%)	NO
C1_EnsuiteBedroom 133	NO (-46%)	NO
C1_EnsuiteBedroom 134	NO (-45%)	NO
C1_EnsuiteBedroom 135	NO (-46%)	NO
C1_EnsuiteBedroom 136	NO (-45%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m ²]	4675	4675
External area [m ²]	4678	4678
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	5	3
Average conductance [W/K]	1773	2118
Average U-value [W/m ² K]	0.38	0.45
Alpha value* [%]	12.59	12.59

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

Building Use

% Area Building Type

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	4.15	12
Cooling	4.45	6.93
Auxiliary	10.15	7.03
Lighting	12.71	13.95
Hot water	196.3	218.05
Equipment*	18.35	18.35
TOTAL**	227.76	257.95

* 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

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	136.62	131.76
Primary energy* [kWh/m ²]	336.07	362.75
Total emissions [kg/m ²]	58.7	65.1

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

HVAC Systems Performance

System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
Actual	21.2	614.3	1.1	31.1	16.5	5.39	5.49	5.5	5.6
Notional	17.1	599.4	5.8	46.3	10.9	0.82	3.6	----	----
[ST] Other local room heater - unfanned, [HS] Room heater, [HFT] Electricity, [CFT] Electricity									
Actual	59.8	0	16.6	0	31.5	1	0	1	0
Notional	75.5	0	25.6	0	31.5	0.82	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
Actual	44.6	26	2.3	1.3	12	5.39	5.49	5.5	5.6
Notional	36.6	31.7	12.4	2.5	8	0.82	3.6	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity									
Actual	55.3	0	15.4	0	0	1	0	1	0
Notional	54.3	0	18.4	0	0	0.82	0	----	----
[ST] No Heating or Cooling									
Actual	1.2	0	0.3	0	15.8	1	0	1	0
Notional	0	0	0	0	22	0	0	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Key Features

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

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.24	External Wall
Floor	0.2	0.21	Ground Floor
Roof	0.15	0.12	Roof
Windows, roof windows, and rooflights	1.5	1.6	Entrance Side Light Fixed
Personnel doors	1.5	1.56	Double FE Door
Vehicle access & similar large doors	1.5	-	No vehicle doors in project
High usage entrance doors	1.5	-	No high usage entrance doors in project
U _{i-Typ} = Typical individual element U-values [W/(m²K)]			U _{i-Min} = Minimum individual element U-values [W/(m²K)]
* There might be more than one surface where the minimum U-value occurs.			

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

APPENDIX C: ENERGY MODEL DATA – INCORPORATING DECENTRALISED
COMBINED HEAT AND POWER UNIT

Project name

Redefine Reading

As designed

Date: Sat Apr 14 11:25:50 2018

Administrative information

Building Details

Address: Reading,

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.4.2"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.4.2

BRUKL compliance check version: v5.4.a.1

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name:

Telephone number:

Address: , ,

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

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	65.1
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	65.1
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	43.1
Are emissions from the building less than or equal to the target?	BER ≤ TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.24	0.24	External Wall
Floor	0.25	0.21	0.24	Exposed Floor
Roof	0.25	0.12	0.12	Roof
Windows***, roof windows, and rooflights	2.2	1.62	1.63	Entrance Door
Personnel doors	2.2	1.57	1.59	Single FE Door
Vehicle access & similar large doors	1.5	-	-	No vehicle doors in project
High usage entrance doors	3.5	-	-	No high usage entrance doors in project

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)]

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

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

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

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

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

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- GF Vent AC Areas (5 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	5.5	5.6	-	1.4	0.7
Standard value	2.5*	2.6	N/A	1.5^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					
^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

2- GF WCs (5 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

3- Bedrooms (136 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	5.5	5.6	-	1.4	0.7
Standard value	2.5*	2.6	N/A	1.5^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					
^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

4- Circulation

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

5- Kitchen (C1_FoodPrep 1)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.6	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- CHP

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.98	0
Standard value	0.9*	N/A
* Standard shown is for gas boilers >30 kW output. For boilers <=30 kW output, limiting efficiency is 0.73.		

1- CHP

	CHPQA quality index	CHP electrical efficiency
This building	135	0.24
Standard value	105	0.2

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I			
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard	
C1_EatDrink 1	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 1	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_FitGym 1	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_FoodPrep 1	-	-	-	-	-	-	-	-	0.8	-	N/A	
C1_Office 1	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_Reception 1	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_Toilet 1	-	-	0.4	-	-	-	-	-	-	-	N/A	
C1_Toilet 2	-	-	0.4	-	-	-	-	-	-	-	N/A	
C1_Toilet 3	-	-	0.4	-	-	-	-	-	-	-	N/A	
C1_Toilet 4	-	-	0.4	-	-	-	-	-	-	-	N/A	
C1_Toilet 5	-	-	0.4	-	-	-	-	-	-	-	N/A	
C1_Office 2	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 2	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 3	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 4	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 5	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 6	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 7	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 8	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 9	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 10	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 11	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 12	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 13	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 14	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 15	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 16	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 17	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 18	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 19	-	-	-	1.4	-	-	-	-	-	-	N/A	
C1_EnsuiteBedroom 20	-	-	-	1.4	-	-	-	-	-	-	N/A	

Zone name	SFP [W/(l/s)]										HR efficiency	
	ID of system type	A	B	C	D	E	F	G	H	I		
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
C1_EnsuiteBedroom 21		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 22		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 23		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 24		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 25		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 26		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 27		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 28		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 29		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 30		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 31		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 32		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 33		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 34		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 35		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 36		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 37		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 38		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 39		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 40		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 41		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 42		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 43		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 44		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 45		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 46		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 47		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 48		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 49		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 50		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 51		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 52		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 53		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 54		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 55		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 56		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 57		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 58		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 59		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 60		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 61		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 62		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 63		-	-	-	1.4	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]										HR efficiency	
	ID of system type	A	B	C	D	E	F	G	H	I		
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
C1_EnsuiteBedroom 64		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 65		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 66		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 67		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 68		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 69		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 70		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 71		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 72		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 73		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 74		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 75		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 76		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 77		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 78		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 79		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 80		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 81		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 82		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 83		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 84		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 85		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 86		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 87		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 88		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 89		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 90		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 91		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 92		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 93		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 94		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 95		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 96		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 97		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 98		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 99		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 100		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 101		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 102		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 103		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 104		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 105		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 106		-	-	-	1.4	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]										HR efficiency	
	ID of system type	A	B	C	D	E	F	G	H	I		
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
C1_EnsuiteBedroom 107		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 108		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 109		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 110		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 111		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 112		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 113		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 114		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 115		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 116		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 117		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 118		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 119		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 120		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 121		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 122		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 123		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 124		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 125		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 126		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 127		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 128		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 129		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 130		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 131		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 132		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 133		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 134		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 135		-	-	-	1.4	-	-	-	-	-	-	N/A
C1_EnsuiteBedroom 136		-	-	-	1.4	-	-	-	-	-	-	N/A

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
C1_Circulation 1		-	80	-	652
C1_EatDrink 1		-	70	22	1096
C1_EnsuiteBedroom 1		-	80	-	51
C1_FitGym 1		-	80	-	228
C1_FoodPrep 1		-	80	-	762
C1_Office 1		80	-	-	440
C1_Reception 1		-	70	22	354
C1_Store 1		80	-	-	64
C1_Toilet 1		-	70	-	129

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
C1_Toilet 2		-	70	-	128
C1_Toilet 3		-	70	-	55
C1_Toilet 4		-	70	-	85
C1_Toilet 5		-	70	-	93
C1_Store 2		80	-	-	13
C1_Store 3		80	-	-	23
C1_Store 4		80	-	-	35
C1_Office 2		80	-	-	342
C1_Circulation 2		-	80	-	56
C1_Circulation 3		-	80	-	54
C1_Circulation 4		-	80	-	40
C1_Circulation 5		-	80	-	38
C1_Circulation 6		-	80	-	76
C1_Circulation 7		-	80	-	252
C1_Circulation 8		-	80	-	125
C1_Store 5		80	-	-	15
C1_Circulation 9		-	80	-	135
C1_Circulation 10		-	80	-	125
C1_Store 6		80	-	-	15
C1_EnsuiteBedroom 2		-	80	-	51
C1_EnsuiteBedroom 3		-	80	-	51
C1_EnsuiteBedroom 4		-	80	-	51
C1_EnsuiteBedroom 5		-	80	-	51
C1_EnsuiteBedroom 6		-	80	-	51
C1_EnsuiteBedroom 7		-	80	-	51
C1_EnsuiteBedroom 8		-	80	-	51
C1_EnsuiteBedroom 9		-	80	-	51
C1_EnsuiteBedroom 10		-	80	-	51
C1_EnsuiteBedroom 11		-	80	-	52
C1_EnsuiteBedroom 12		-	80	-	51
C1_EnsuiteBedroom 13		-	80	-	50
C1_EnsuiteBedroom 14		-	80	-	51
C1_EnsuiteBedroom 15		-	80	-	52
C1_EnsuiteBedroom 16		-	80	-	51
C1_EnsuiteBedroom 17		-	80	-	51
C1_EnsuiteBedroom 18		-	80	-	51
C1_EnsuiteBedroom 19		-	80	-	51
C1_EnsuiteBedroom 20		-	80	-	51
C1_EnsuiteBedroom 21		-	80	-	53
C1_EnsuiteBedroom 22		-	80	-	51
C1_EnsuiteBedroom 23		-	80	-	51
C1_EnsuiteBedroom 24		-	80	-	51
C1_EnsuiteBedroom 25		-	80	-	51

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
C1_EnsuiteBedroom 26		-	80	-	51
C1_EnsuiteBedroom 27		-	80	-	51
C1_EnsuiteBedroom 28		-	80	-	51
C1_EnsuiteBedroom 29		-	80	-	51
C1_EnsuiteBedroom 30		-	80	-	52
C1_EnsuiteBedroom 31		-	80	-	51
C1_EnsuiteBedroom 32		-	80	-	51
C1_EnsuiteBedroom 33		-	80	-	51
C1_EnsuiteBedroom 34		-	80	-	51
C1_EnsuiteBedroom 35		-	80	-	51
C1_Store 7		80	-	-	15
C1_Store 8		80	-	-	15
C1_Circulation 11		-	80	-	138
C1_Circulation 12		-	80	-	125
C1_EnsuiteBedroom 36		-	80	-	51
C1_EnsuiteBedroom 37		-	80	-	51
C1_EnsuiteBedroom 38		-	80	-	51
C1_EnsuiteBedroom 39		-	80	-	51
C1_EnsuiteBedroom 40		-	80	-	51
C1_EnsuiteBedroom 41		-	80	-	51
C1_EnsuiteBedroom 42		-	80	-	51
C1_EnsuiteBedroom 43		-	80	-	51
C1_EnsuiteBedroom 44		-	80	-	51
C1_EnsuiteBedroom 45		-	80	-	52
C1_EnsuiteBedroom 46		-	80	-	51
C1_EnsuiteBedroom 47		-	80	-	51
C1_EnsuiteBedroom 48		-	80	-	51
C1_EnsuiteBedroom 49		-	80	-	52
C1_EnsuiteBedroom 50		-	80	-	51
C1_EnsuiteBedroom 51		-	80	-	51
C1_EnsuiteBedroom 52		-	80	-	51
C1_EnsuiteBedroom 53		-	80	-	51
C1_EnsuiteBedroom 54		-	80	-	51
C1_EnsuiteBedroom 55		-	80	-	53
C1_EnsuiteBedroom 56		-	80	-	51
C1_EnsuiteBedroom 57		-	80	-	52
C1_EnsuiteBedroom 58		-	80	-	51
C1_EnsuiteBedroom 59		-	80	-	51
C1_EnsuiteBedroom 60		-	80	-	51
C1_EnsuiteBedroom 61		-	80	-	51
C1_EnsuiteBedroom 62		-	80	-	51
C1_EnsuiteBedroom 63		-	80	-	51
C1_EnsuiteBedroom 64		-	80	-	52

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
C1_EnsuiteBedroom 65		-	80	-	51
C1_EnsuiteBedroom 66		-	80	-	51
C1_EnsuiteBedroom 67		-	80	-	52
C1_EnsuiteBedroom 68		-	80	-	51
C1_EnsuiteBedroom 69		-	80	-	51
C1_Circulation 13		-	80	-	138
C1_Circulation 14		-	80	-	125
C1_EnsuiteBedroom 70		-	80	-	51
C1_EnsuiteBedroom 71		-	80	-	51
C1_EnsuiteBedroom 72		-	80	-	51
C1_EnsuiteBedroom 73		-	80	-	51
C1_EnsuiteBedroom 74		-	80	-	51
C1_EnsuiteBedroom 75		-	80	-	51
C1_EnsuiteBedroom 76		-	80	-	51
C1_EnsuiteBedroom 77		-	80	-	51
C1_EnsuiteBedroom 78		-	80	-	51
C1_EnsuiteBedroom 79		-	80	-	52
C1_EnsuiteBedroom 80		-	80	-	51
C1_EnsuiteBedroom 81		-	80	-	51
C1_EnsuiteBedroom 82		-	80	-	51
C1_EnsuiteBedroom 83		-	80	-	52
C1_EnsuiteBedroom 84		-	80	-	51
C1_EnsuiteBedroom 85		-	80	-	51
C1_EnsuiteBedroom 86		-	80	-	51
C1_EnsuiteBedroom 87		-	80	-	51
C1_EnsuiteBedroom 88		-	80	-	51
C1_EnsuiteBedroom 89		-	80	-	53
C1_EnsuiteBedroom 90		-	80	-	51
C1_EnsuiteBedroom 91		-	80	-	52
C1_EnsuiteBedroom 92		-	80	-	51
C1_EnsuiteBedroom 93		-	80	-	51
C1_EnsuiteBedroom 94		-	80	-	51
C1_EnsuiteBedroom 95		-	80	-	51
C1_EnsuiteBedroom 96		-	80	-	51
C1_EnsuiteBedroom 97		-	80	-	51
C1_EnsuiteBedroom 98		-	80	-	52
C1_EnsuiteBedroom 99		-	80	-	51
C1_EnsuiteBedroom 100		-	80	-	51
C1_EnsuiteBedroom 101		-	80	-	52
C1_EnsuiteBedroom 102		-	80	-	51
C1_EnsuiteBedroom 103		-	80	-	51
C1_Circulation 15		-	80	-	138
C1_EnsuiteBedroom 104		-	80	-	51

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
C1_EnsuiteBedroom 105		-	80	-	51
C1_EnsuiteBedroom 106		-	80	-	51
C1_EnsuiteBedroom 107		-	80	-	51
C1_EnsuiteBedroom 108		-	80	-	51
C1_EnsuiteBedroom 109		-	80	-	51
C1_EnsuiteBedroom 110		-	80	-	51
C1_EnsuiteBedroom 111		-	80	-	51
C1_EnsuiteBedroom 112		-	80	-	51
C1_EnsuiteBedroom 113		-	80	-	52
C1_EnsuiteBedroom 114		-	80	-	51
C1_EnsuiteBedroom 115		-	80	-	51
C1_EnsuiteBedroom 116		-	80	-	51
C1_EnsuiteBedroom 117		-	80	-	52
C1_EnsuiteBedroom 118		-	80	-	51
C1_EnsuiteBedroom 119		-	80	-	51
C1_EnsuiteBedroom 120		-	80	-	51
C1_EnsuiteBedroom 121		-	80	-	51
C1_EnsuiteBedroom 122		-	80	-	51
C1_EnsuiteBedroom 123		-	80	-	53
C1_EnsuiteBedroom 124		-	80	-	51
C1_EnsuiteBedroom 125		-	80	-	52
C1_EnsuiteBedroom 126		-	80	-	51
C1_EnsuiteBedroom 127		-	80	-	51
C1_EnsuiteBedroom 128		-	80	-	51
C1_EnsuiteBedroom 129		-	80	-	51
C1_EnsuiteBedroom 130		-	80	-	51
C1_EnsuiteBedroom 131		-	80	-	51
C1_EnsuiteBedroom 132		-	80	-	52
C1_EnsuiteBedroom 133		-	80	-	51
C1_EnsuiteBedroom 134		-	80	-	51
C1_EnsuiteBedroom 135		-	80	-	52
C1_EnsuiteBedroom 136		-	80	-	51

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
C1_EatDrink 1	NO (-32%)	NO
C1_EnsuiteBedroom 1	NO (-86%)	NO
C1_FitGym 1	NO (-40%)	NO
C1_Office 1	NO (-56%)	NO
C1_Reception 1	YES (+41%)	NO
C1_Office 2	NO (-66%)	NO
C1_EnsuiteBedroom 2	NO (-51%)	NO
C1_EnsuiteBedroom 3	NO (-51%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
C1_EnsuiteBedroom 4	NO (-51%)	NO
C1_EnsuiteBedroom 5	NO (-51%)	NO
C1_EnsuiteBedroom 6	NO (-51%)	NO
C1_EnsuiteBedroom 7	NO (-51%)	NO
C1_EnsuiteBedroom 8	NO (-51%)	NO
C1_EnsuiteBedroom 9	NO (-51%)	NO
C1_EnsuiteBedroom 10	NO (-51%)	NO
C1_EnsuiteBedroom 11	NO (-52%)	NO
C1_EnsuiteBedroom 12	NO (-51%)	NO
C1_EnsuiteBedroom 13	NO (-51%)	NO
C1_EnsuiteBedroom 14	NO (-51%)	NO
C1_EnsuiteBedroom 15	NO (-52%)	NO
C1_EnsuiteBedroom 16	NO (-50%)	NO
C1_EnsuiteBedroom 17	NO (-51%)	NO
C1_EnsuiteBedroom 18	NO (-51%)	NO
C1_EnsuiteBedroom 19	NO (-86%)	NO
C1_EnsuiteBedroom 20	NO (-80%)	NO
C1_EnsuiteBedroom 21	NO (-34%)	NO
C1_EnsuiteBedroom 22	NO (-31%)	NO
C1_EnsuiteBedroom 23	NO (-32%)	NO
C1_EnsuiteBedroom 24	NO (-32%)	NO
C1_EnsuiteBedroom 25	NO (-31%)	NO
C1_EnsuiteBedroom 26	NO (-32%)	NO
C1_EnsuiteBedroom 27	NO (-32%)	NO
C1_EnsuiteBedroom 28	NO (-32%)	NO
C1_EnsuiteBedroom 29	NO (-32%)	NO
C1_EnsuiteBedroom 30	NO (-32%)	NO
C1_EnsuiteBedroom 31	NO (-32%)	NO
C1_EnsuiteBedroom 32	NO (-31%)	NO
C1_EnsuiteBedroom 33	NO (-32%)	NO
C1_EnsuiteBedroom 34	NO (-31%)	NO
C1_EnsuiteBedroom 35	NO (-86%)	NO
C1_EnsuiteBedroom 36	NO (-51%)	NO
C1_EnsuiteBedroom 37	NO (-51%)	NO
C1_EnsuiteBedroom 38	NO (-51%)	NO
C1_EnsuiteBedroom 39	NO (-51%)	NO
C1_EnsuiteBedroom 40	NO (-51%)	NO
C1_EnsuiteBedroom 41	NO (-51%)	NO
C1_EnsuiteBedroom 42	NO (-51%)	NO
C1_EnsuiteBedroom 43	NO (-51%)	NO
C1_EnsuiteBedroom 44	NO (-51%)	NO
C1_EnsuiteBedroom 45	NO (-52%)	NO
C1_EnsuiteBedroom 46	NO (-51%)	NO
C1_EnsuiteBedroom 47	NO (-51%)	NO
C1_EnsuiteBedroom 48	NO (-51%)	NO
C1_EnsuiteBedroom 49	NO (-52%)	NO
C1_EnsuiteBedroom 50	NO (-50%)	NO
C1_EnsuiteBedroom 51	NO (-51%)	NO
C1_EnsuiteBedroom 52	NO (-51%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
C1_EnsuiteBedroom 53	NO (-86%)	NO
C1_EnsuiteBedroom 54	NO (-80%)	NO
C1_EnsuiteBedroom 55	NO (-34%)	NO
C1_EnsuiteBedroom 56	NO (-31%)	NO
C1_EnsuiteBedroom 57	NO (-32%)	NO
C1_EnsuiteBedroom 58	NO (-32%)	NO
C1_EnsuiteBedroom 59	NO (-31%)	NO
C1_EnsuiteBedroom 60	NO (-32%)	NO
C1_EnsuiteBedroom 61	NO (-32%)	NO
C1_EnsuiteBedroom 62	NO (-32%)	NO
C1_EnsuiteBedroom 63	NO (-32%)	NO
C1_EnsuiteBedroom 64	NO (-32%)	NO
C1_EnsuiteBedroom 65	NO (-32%)	NO
C1_EnsuiteBedroom 66	NO (-31%)	NO
C1_EnsuiteBedroom 67	NO (-32%)	NO
C1_EnsuiteBedroom 68	NO (-31%)	NO
C1_EnsuiteBedroom 69	NO (-86%)	NO
C1_EnsuiteBedroom 70	NO (-51%)	NO
C1_EnsuiteBedroom 71	NO (-51%)	NO
C1_EnsuiteBedroom 72	NO (-51%)	NO
C1_EnsuiteBedroom 73	NO (-51%)	NO
C1_EnsuiteBedroom 74	NO (-51%)	NO
C1_EnsuiteBedroom 75	NO (-51%)	NO
C1_EnsuiteBedroom 76	NO (-51%)	NO
C1_EnsuiteBedroom 77	NO (-51%)	NO
C1_EnsuiteBedroom 78	NO (-51%)	NO
C1_EnsuiteBedroom 79	NO (-52%)	NO
C1_EnsuiteBedroom 80	NO (-51%)	NO
C1_EnsuiteBedroom 81	NO (-51%)	NO
C1_EnsuiteBedroom 82	NO (-51%)	NO
C1_EnsuiteBedroom 83	NO (-52%)	NO
C1_EnsuiteBedroom 84	NO (-50%)	NO
C1_EnsuiteBedroom 85	NO (-51%)	NO
C1_EnsuiteBedroom 86	NO (-51%)	NO
C1_EnsuiteBedroom 87	NO (-86%)	NO
C1_EnsuiteBedroom 88	NO (-80%)	NO
C1_EnsuiteBedroom 89	NO (-34%)	NO
C1_EnsuiteBedroom 90	NO (-31%)	NO
C1_EnsuiteBedroom 91	NO (-32%)	NO
C1_EnsuiteBedroom 92	NO (-32%)	NO
C1_EnsuiteBedroom 93	NO (-31%)	NO
C1_EnsuiteBedroom 94	NO (-32%)	NO
C1_EnsuiteBedroom 95	NO (-32%)	NO
C1_EnsuiteBedroom 96	NO (-32%)	NO
C1_EnsuiteBedroom 97	NO (-32%)	NO
C1_EnsuiteBedroom 98	NO (-32%)	NO
C1_EnsuiteBedroom 99	NO (-32%)	NO
C1_EnsuiteBedroom 100	NO (-31%)	NO
C1_EnsuiteBedroom 101	NO (-32%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
C1_EnsuiteBedroom 102	NO (-31%)	NO
C1_EnsuiteBedroom 103	NO (-88%)	NO
C1_EnsuiteBedroom 104	NO (-61%)	NO
C1_EnsuiteBedroom 105	NO (-61%)	NO
C1_EnsuiteBedroom 106	NO (-61%)	NO
C1_EnsuiteBedroom 107	NO (-61%)	NO
C1_EnsuiteBedroom 108	NO (-61%)	NO
C1_EnsuiteBedroom 109	NO (-61%)	NO
C1_EnsuiteBedroom 110	NO (-61%)	NO
C1_EnsuiteBedroom 111	NO (-61%)	NO
C1_EnsuiteBedroom 112	NO (-61%)	NO
C1_EnsuiteBedroom 113	NO (-61%)	NO
C1_EnsuiteBedroom 114	NO (-61%)	NO
C1_EnsuiteBedroom 115	NO (-60%)	NO
C1_EnsuiteBedroom 116	NO (-61%)	NO
C1_EnsuiteBedroom 117	NO (-61%)	NO
C1_EnsuiteBedroom 118	NO (-60%)	NO
C1_EnsuiteBedroom 119	NO (-61%)	NO
C1_EnsuiteBedroom 120	NO (-61%)	NO
C1_EnsuiteBedroom 121	NO (-88%)	NO
C1_EnsuiteBedroom 122	NO (-84%)	NO
C1_EnsuiteBedroom 123	NO (-47%)	NO
C1_EnsuiteBedroom 124	NO (-45%)	NO
C1_EnsuiteBedroom 125	NO (-46%)	NO
C1_EnsuiteBedroom 126	NO (-46%)	NO
C1_EnsuiteBedroom 127	NO (-45%)	NO
C1_EnsuiteBedroom 128	NO (-46%)	NO
C1_EnsuiteBedroom 129	NO (-46%)	NO
C1_EnsuiteBedroom 130	NO (-46%)	NO
C1_EnsuiteBedroom 131	NO (-46%)	NO
C1_EnsuiteBedroom 132	NO (-46%)	NO
C1_EnsuiteBedroom 133	NO (-46%)	NO
C1_EnsuiteBedroom 134	NO (-45%)	NO
C1_EnsuiteBedroom 135	NO (-46%)	NO
C1_EnsuiteBedroom 136	NO (-45%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m ²]	4675	4675
External area [m ²]	4678	4678
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	5	3
Average conductance [W/K]	1773	2118
Average U-value [W/m ² K]	0.38	0.45
Alpha value* [%]	12.59	12.59

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

Building Use

% Area Building Type

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	4.14	12
Cooling	4.45	6.93
Auxiliary	10.15	7.03
Lighting	12.71	13.95
Hot water	297.11	218.05
Equipment*	18.35	18.35
TOTAL**	256.52	257.95

* 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	72.04	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	136.62	131.76
Primary energy* [kWh/m ²]	237.86	362.75
Total emissions [kg/m ²]	43.1	65.1

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

HVAC Systems Performance

System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
Actual	21.2	614.3	1.1	31.1	16.5	5.39	5.49	5.5	5.6
Notional	17.1	599.4	5.8	46.3	10.9	0.82	3.6	----	----
[ST] Other local room heater - unfanned, [HS] Room heater, [HFT] Electricity, [CFT] Electricity									
Actual	59.8	0	16.6	0	31.5	1	0	1	0
Notional	75.5	0	25.6	0	31.5	0.82	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
Actual	44.6	26	2.3	1.3	12	5.39	5.49	5.5	5.6
Notional	36.6	31.7	12.4	2.5	8	0.82	3.6	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity									
Actual	55.3	0	15.4	0	0	1	0	1	0
Notional	54.3	0	18.4	0	0	0.82	0	----	----
[ST] No Heating or Cooling									
Actual	1.2	0	0.1	0	15.8	4.51	0	4.6	0
Notional	0	0	0	0	22	0	0	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Key Features

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

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.24	External Wall
Floor	0.2	0.21	Ground Floor
Roof	0.15	0.12	Roof
Windows, roof windows, and rooflights	1.5	1.6	Entrance Side Light Fixed
Personnel doors	1.5	1.56	Double FE Door
Vehicle access & similar large doors	1.5	-	No vehicle doors in project
High usage entrance doors	1.5	-	No high usage entrance doors in project
U _{i-Typ} = Typical individual element U-values [W/(m²K)]			U _{i-Min} = Minimum individual element U-values [W/(m²K)]
* There might be more than one surface where the minimum U-value occurs.			

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