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ENERGY AND SUSTAINABILITY ASSESSMENT

Strategic MEP and Sustainability Consultants

10 Apr 2025

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Background

This Energy Strategy Report has been prepared on behalf of Whitbread Plc in relation to the proposed demolition of vacant supermarket building; erection of four storey hotel and restaurant building; public realm and landscape improvements; retention of associated car park and all associated works at Avon Rd, Littlehampton BN17 6AT.

This Energy and Sustainability Assessment will demonstrate that the proposed scheme will improve the sustainability and environmental performance of the built environment by increasing energy efficiency, reducing CO_2 emissions, generating energy services efficiently and implementing building integrated Low or Zero Carbon (LZC) technology when compared to a notional equivalent scheme.

The calculations and results contained within this document are based on the information available at the time of planning and therefore may be subject to change following detailed design stage.

Development Description and Planning Context

- Demolition of the vacant supermarket building
- Erection of a 130 bedroom, four storey with bedrooms at roof level Premier Inn hotel
- Provision of a restaurant facility available to hotel guests and members of the public.
- Creation of public realm areas to Anchor Springs, East Street and Avon Road and general landscape improvements.
- Retention of associated car park and all associated works

The site comprises the vacant former Waitrose supermarket building to the south of Avon Road. The site also includes the vacant 95-space private car park to the north of Avon Road. It is understood that the retail unit has been vacant for over 8 years following the relocation of Waitrose to Rustington. The car park has also been out of use and inaccessible during this period

Overview

The Energy and Sustainability Assessment will take account of guidance given in the national, regional and local policies including Arun District Council's planning documents.

This document will demonstrate how the proposed scheme meets the energy and sustainability policies of Arun District Council.

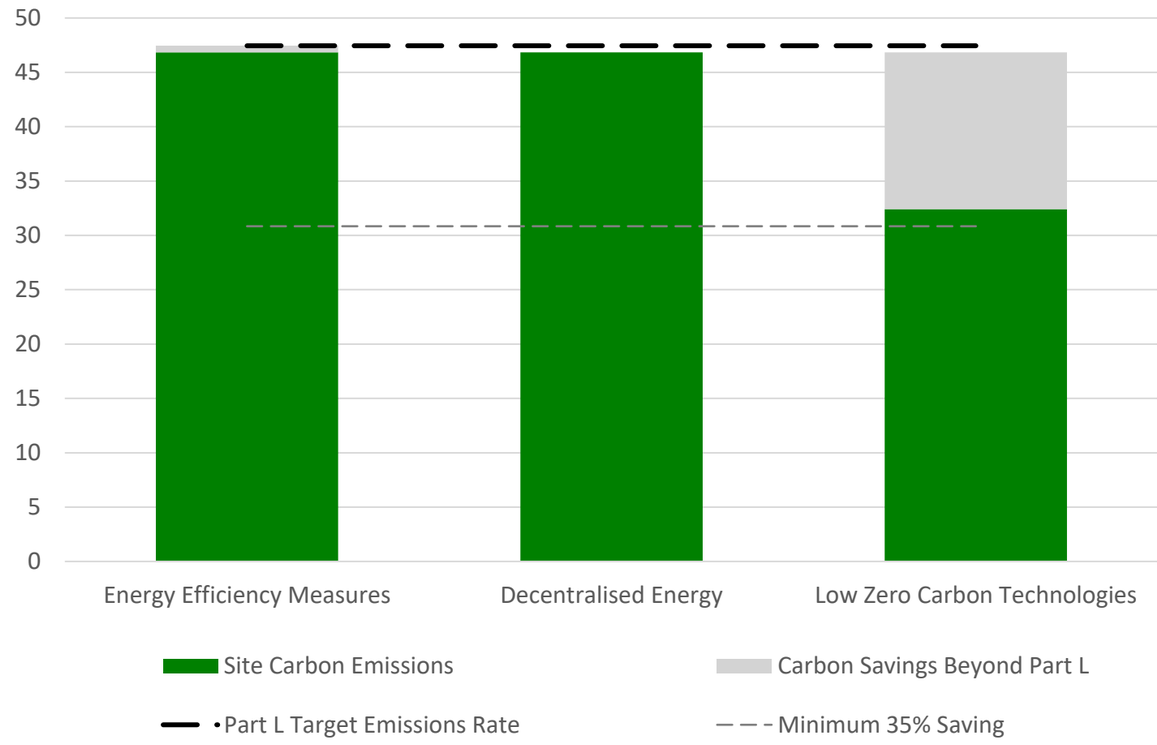
- 10% of the total predicted energy requirements from renewable or low carbon energy generation on site

Energy Hierarchy Stage	Commercial Total Regulated Emissions (tonnes CO2 pa)	Commercial Total Savings (%)
Baseline	47.4	0.0%
Energy Efficiency Measures	46.8	1.3%
Decentralised Energy	46.8	1.3%
Low Zero Carbon Technologies	32.4	31.7%

Commercial CO_2 Emissions after each stage of the Energy Hierarchy

Modelling Name	Modelling Area
Hotel	3,817

Commercial Modelling Areas



Emissions Chart - Low Zero Carbon Technologies

INTRODUCTION

Background

Applied Energy have been commissioned by Whitbread Plc to prepare this Energy Strategy Report to accompany the planning submission for the proposed building. This Energy and Sustainability Assessment identifies how the proposed works address the energy related policies of Arun District Council .

Options have been reviewed for reducing CO_2 emissions through energy efficiency measures, heating, cooling, domestic hot water and renewable energy technologies. The local environment and proposed site have been considered throughout.

Site Description

- Demolition of the vacant supermarket building
- Erection of a 130 bedroom, four storey with bedrooms at roof level Premier Inn hotel
- Provision of a restaurant facility available to hotel guests and members of the public.
- Creation of public realm areas to Anchor Springs, East Street and Avon Road and general landscape improvements.
- Retention of associated car park and all associated works

Site Location

The site comprises the vacant former Waitrose supermarket building to the south of Avon Road. The site also includes the vacant 95-space private car park to the north of Avon Road. It is understood that the retail unit has been vacant for over 8 years following the relocation of Waitrose to Rustington. The car park has also been out of use and inaccessible during this period

Site Location

Site Aerial

POLICY AND PLANNING CONTEXT

Introduction

This Energy and Sustainability Assessment is based on the requirements of Part L of the Building Regulations with guidance taken from Arun District Council core strategy, it includes:

- An energy demand assessment for heating, cooling, electricity and baseline CO_2 emissions.
- A summary identifying the preferred energy strategy and the overall CO_2 emissions reductions achieved over the Building Regulations 2021 compliance baseline.

National Planning Policy Framework (NPPF) December 2024

The NPPF sets out planning policies for England and how these are expected to be applied.

In determining planning applications, local planning authorities should expect new developments to:

- Comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and
- Take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

Adoption Arun Local Plan 2011-2031 (July 2018)

Policy ECC SP1

Adapting to climate change

The Council will support development which is located and appropriately designed to adapt to impacts arising from climate change such as the increased probability of tidal and fluvial flooding; water stress; health impacts as a result of extreme temperatures and a decline in the quality of habitats and richness of biodiversity.

In order to achieve this, development must be designed to take account of the following issues:

a. Location (in relation to flood risk and vulnerability to coastal erosion);

b. Water efficiency;

c. Shade, cooling, ventilation, solar gain;

d. Connectivity to the green infrastructure network;

e. Layout and massing;

f. Resilience of buildings and building materials to extreme weather events; and

g. Capacity of drainage systems and incorporation of Sustainable urban Drainage Systems (SuDS)

Policy ECC SP2

Energy and climate change mitigation

All new residential and commercial development (including conversions, extensions and changes of use) will be expected to be energy efficient and to demonstrate how they will:

a. Achieve energy efficiency measures that reflect the current standards applicable at

the time of submission;

b. Use design and layout to promote energy efficiency; and

c. Incorporate decentralised, renewable and low carbon energy supply systems, for

example small scale renewable energy systems such as solar panels.

All major developments(47) must produce 10% of the total predicted energy requirements from renewable or low carbon energy generation on site, unless it can be demonstrated that this is unviable. Energy efficiency measures will be taken into consideration when the total predicted energy requirements are calculated. The Council will consider 'allowable solutions' where it is clearly demonstrated that the provision of on site renewable or low carbon energy generation is unviable or not feasible.

Where planning permission is required to retrofit energy efficiency measures into existing development, schemes will be permitted, subject to the Design and Built Heritage policies.

In assessing the achievement of these standards the Council will consider:

- Site constraints;
- Technical viability;
- Financial viability; and
- Delivery of additional benefits

Policy ECC DM1

Renewable energy

The Council will support renewable energy development subject to the criteria in this Policy. Schemes will be expected to contribute to the social, economic and environmental development and overall regeneration of the District.

Within areas of protected landscapes, areas or buildings, development should generally be small scale or community based.

The Council will support proposals for appropriately located renewable energy development, and their ancillary development where they meet the following criteria:

a. The proposal is located and designed to minimise adverse impacts to landscape,

habitats, the historic environment and residential amenity including visual, noise

and odour impacts;

b. The location and design of proposals will need to take account of the Council's

landscape assessment and landscape sensitivity studies (or successor documents)

and proposals for large scale renewable energy projects will need to be supported

by a zone of theoretical visibility and viewpoint assessment;

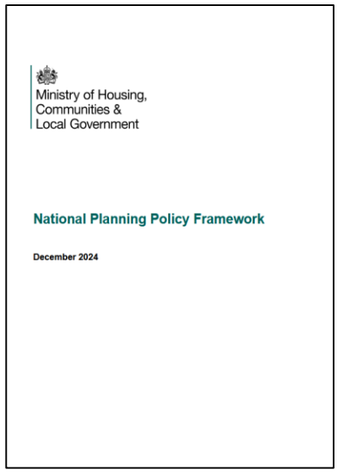
c. Priority should be given to proposals that integrate with existing or new development

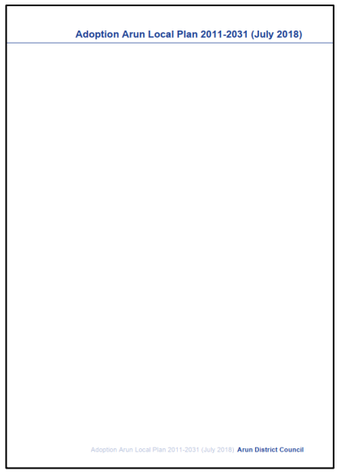
where appropriate to do so having regard to (a); and

d. All proposals will need to demonstrate a suitable connection to the electricity distribution network, or appropriate energy storage facility, and provide evidence to

demonstrate that the connection will not result in unacceptable impacts upon the

landscape, natural and historic environment or visual and residential amenity





BUILDING ENERGY MODELLING

Building Summary

The proposed commercial areas Premier Inn hotel

have been thermally modelled using EDSL TAS, version v9.5.6, dynamic simulation modelling software.

This model has been produced to determine the annual energy demands and quantify the reductions in energy use and CO_2 emissions as a result of energy efficiency improvements.

This software contains the construction database which defines all the construction U-values for each of the building elements. Outputs from the simulation program include hourly kW demands arising from heating, cooling, small power, lighting and fan power.

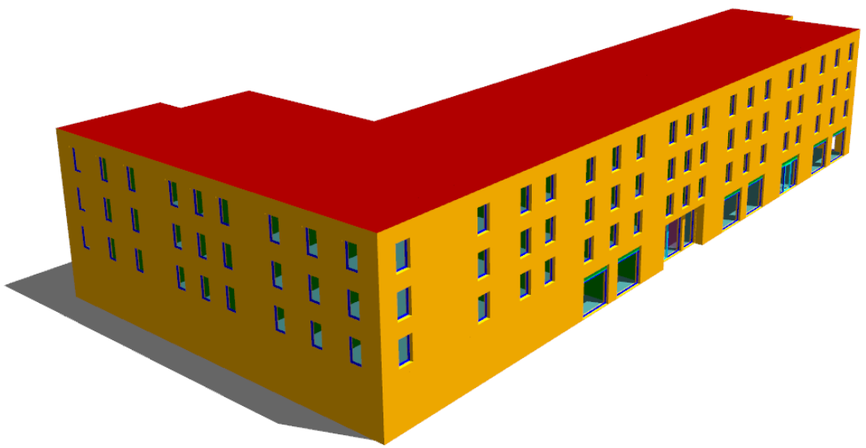
The model was simulated using the CIBSE test reference year (TRY) weather data for Southampton .

Modelling Output

The outputs from the software allow gas and electrical consumption and related CO_2 emissions to be calculated. The building's performance can therefore be measured for compliance against the targeted reduction in CO_2 emissions.

Floor Area Clarification

The floor area referenced within this Energy and Sustainability Assessment is the modelled floor area of the building and excludes areas such as lift shafts, risers and voids etc. hence why there may be a discrepancy with architectural floor areas listed elsewhere in other documents.



Dynamic Simulation Model

Modelling Name	Modelling Area
Hotel	3,817

Commercial Modelling Areas

BASELINE RESULTS

Overview

A Baseline carbon footprint has been calculated in accordance with Part L 2021 of the Building Regulations. From this compliance of the development can be established at each stage of the energy hierarchy.

To determine the Baseline CO_2 emissions, the Target Emission Rate (TER) from the final proposed building specification, i.e. the rate from the modelling results of the Low Zero Carbon Technologies stage of the energy hierarchy has been used.

In some cases the TER may include low carbon or renewable energy generation. The carbon emissions reporting 'spreadsheet' enables the CO_2 emission savings over the baseline to be accounted for at each stage of the energy hierarchy.

The TER has been multiplied by its floor area to provide the regulated CO_2 emissions.

Summing the CO_2 emissions for each non-residential building provides the total regulated emissions for the development.

Results

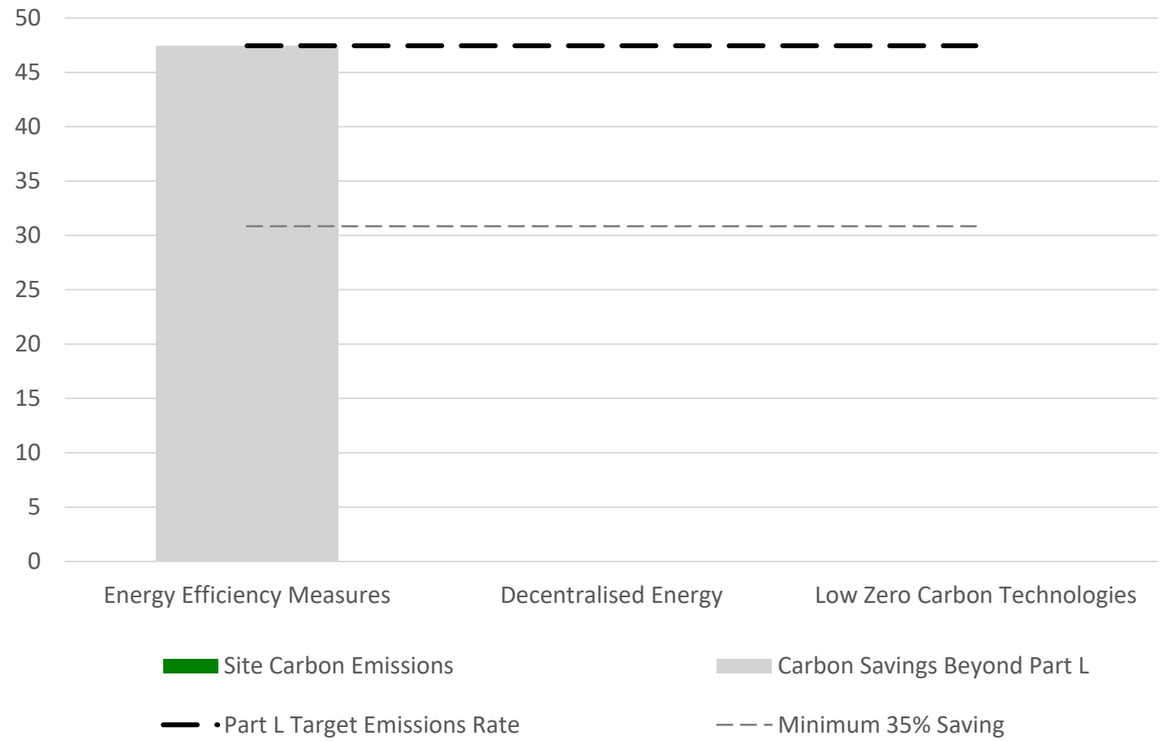
The emissions rates of the proposed development compliant with Part L 2021 of the Building Regulations are shown below.

Unregulated Emissions

The unregulated emissions from have been extracted from the dynamic simulation calculations. However, since the developer has no control over this aspect of energy use, no energy saving measures can be proposed. Therefore, no change to the unregulated emissions will occur.

Building Use	Model Area (m2)	Baseline TER CO_2 Emissions (tCO_2/yr)
Hotel	3,817	47.4

Commercial Predicted Regulated CO_2 Emissions For A Compliant Development - 'Baseline' Stage



Emissions Chart - Baseline

ENERGY EFFICIENCY MEASURES

Introduction

The primary design objective is to reduce energy demand through energy efficiency measures and good practice sustainable building services. By doing so, it results in an improvement in the building's energy performance over and above the minimum levels stipulated within Part L of the Building Regulations.

Building Fabric Performance

The proposed development will be built with area weighted U-values exceeding those proposed in the latest Building Regulations Part L for the opaque building fabric and glazing elements.

U-Values (W/m²K)	Limiting	Proposed
External Walls	0.18 (0.26)	0.15
Flat Roof	0.15 (0.18)	0.1
Pitched Roof	0.15 (0.16)	0.1
Floor	0.15 (0.18)	0.12
Floor Exposed	0.15 (0.18)	0.15
Curtain Walling ()	N/A (1.6)	0.93
Pedestrian Door	1.9 (1.6)	1.4
High-usage Entrance Door	1.9 (3.0)	1.6
Vehicle Door	1.3 (1.3)	1.2
Air Permeability (m³/h/m² @ 50Pa)	8	3

Proposed and Baseline 2021 Non-Domestic L2A Values

SYSTEM EFFICIENCY MEASURES

Air Tightness

New buildings are required to be pressure tested under Building Regulations Part L (2021) with the maximum permissible air leakage set at 8m³/(h.m²)@50Pa.

It is proposed that all endeavours will be taken to improve the air leakage performance of the building to further improve the energy efficiency.

Efficient Lighting

It is proposed that LED lighting will be used with automatic and/or manual switching facilities. The use of photocells (daylight sensors) to control the external lighting will be provided. PIR (Passive Infrared) detectors to control lighting in low occupancy back of house areas and corridors will also be installed to assist in reducing energy wastage. The lighting design throughout the building will incorporate high efficacy lamps to ensure compliance with Building Regulations whilst providing the required lighting levels and ambience.

Services Distribution

All services pipework, valves, fittings and ductwork will be insulated to minimise unwanted heat loss or heat gain.

In order to minimising internal heat gains, heat distribution infrastructure within the development will be designed to minimise pipe lengths, particularly lateral pipework in corridors of living areas, and adopting pipe configurations which minimise heat loss e.g. twin pipes."

It is proposed that new ventilation systems for the guestrooms and public areas will incorporate heat recovery between the supply and extract ventilation paths.

Building Energy Management System

It is proposed that a Building Energy Management System (BEMS) is installed to monitor, control and sequence key mechanical and electrical plant together with sub metering of key systems in accordance with CIBSE TM39 to help operational staff exploit energy savings through effective management and control strategies.

An energy saving key card switch will be installed within each guestroom to control the lighting circuit and ensure that energy is not being wasted when rooms are unoccupied

Reducing Solar Gains

Carefully design and incorporated shading measures such as louvres, internal or external blinds, trees and vegetation.

Thermal Mass

Increase the amount of exposed thermal mass to assist in absorbing excess heat within the building.

Mechanical Ventilation

Employing mechanical ventilation to make use of 'free cooling' where the outside air temperature is below that in the building during summer months. In addition, using a by-pass on the heat recovery system for operation in summer months.

Water Consumption

In order to minimise the impact of the development on the local water infrastructure, water saving techniques will be incorporated to help reduce site consumption.

Below is a list of proposed water saving measures:

- WC total effect flush volume of 4.5l/min;
- Showers with a nominal flow rate of 8l/min (at 1.5 bar pressure)
- Taps with a maximum of 5l/min

Rainwater Harvesting/ Grey Water Recycling

Water harvesting and reuse has been considered to reduce consumption of wholesome water across the development site and for possible integration with the surface water drainage system.

Rainwater harvesting has been investigated but due to the spatial constraints of the site and limited plant space, any system that could be installed would be small and would provide minimal contribution to offsetting the demands on the towns mains. Therefore other water savings measures have been included to reduce water usage (e.g. lower flow sanitary ware, water efficient kitchen equipment, etc) in lieu of rainwater harvesting.

Investigations have been undertaken with regards to the potential for energy flexibility for the

ASHP for Domestic Hot Water Generation

The use of ASHP and large hot water storage capacity has been used to reduce the amount of capacity required and the peak demand.

ENERGY EFFICIENCY MEASURES RESULTS

Overview

The development has been modelled using the demand reduction and energy efficiency measures detailed above.

Whilst energy consumption, and hence opportunity for energy saving, is spread across a number of systems/uses, including; heating, cooling, lighting, domestic hot water and auxiliary (fans, pumps etc.).

Demand reduction can be seen in the table below:

Non-Residential Development Note

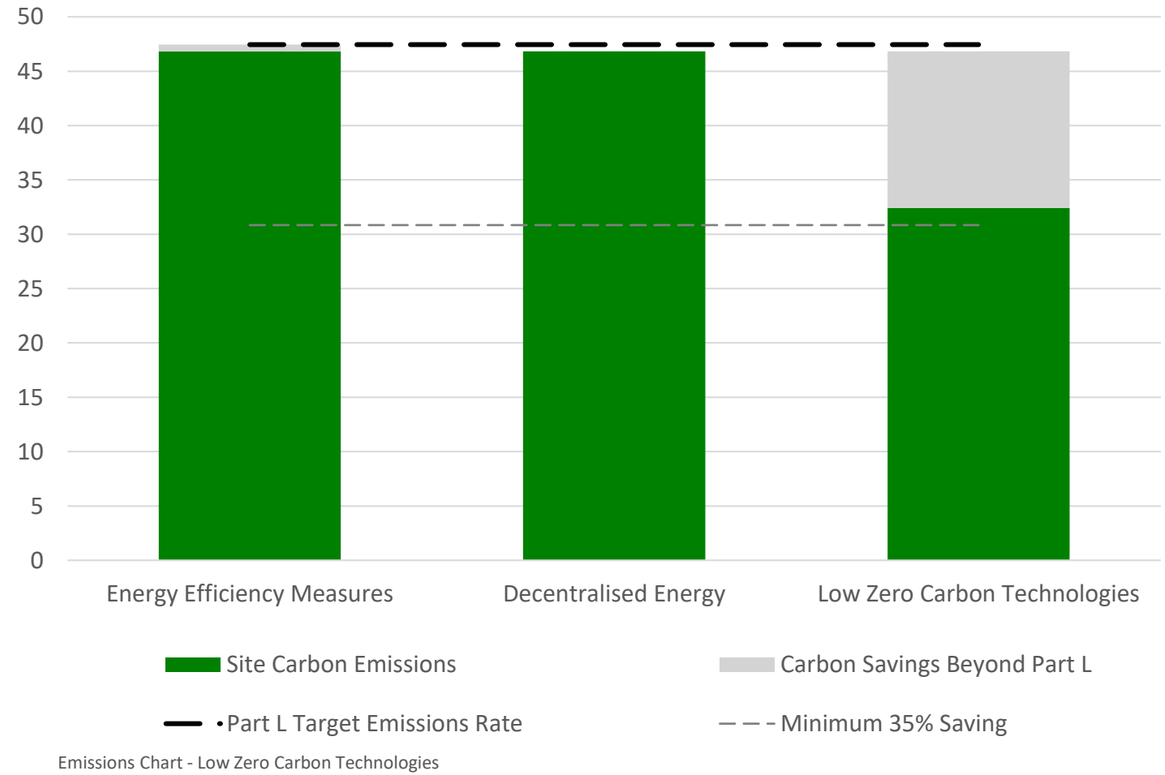
As detailed in the "Part L 2021 and the Energy Assessment Guidance 2022 - cover note", it is understood that initially non-residential developments may find it more challenging to achieve significant on-site carbon reductions beyond Part L 2021 to meet the energy efficiency target.

The figure below demonstrates the resultant energy consumption based on the demand reduction and energy efficient measures.

Complete calculations available in the appendices.

Part L Notional Building

An improvement beyond Part L 2021 has been demonstrated at the Energy Efficiency Measures stage however, it is important to recognise that the Part L 2021 Notional Building incorporates technologies such as lighting with occupancy sensing and photoelectric dimming and demand control of ventilation systems through varying fan speed based on CO_2 sensors. These systems and control strategies are more focused and generally better suited for office type buildings with large open plan floors areas.



Emissions Chart - Low Zero Carbon Technologies

Building Use	Model Area (m2)	Baseline TER CO_2 Emissions (tCO_2/yr)	Energy Efficiency Measures BER CO_2 Emissions (tCO_2/yr)	CO_2 Saved in Stage (tCO_2/yr)	Percentage Reduction in Stage
Hotel	3,817	47.4	46.8	0.6	1.3%

Commercial Predicted Regulated CO_2 Emissions Saved in Demand Reduction - 'Energy Efficiency Measures' Stage

MODELLING BUILDINGS WITH SIGNIFICANT HOT WATER LOADS

Typically, for hotel applications, energy use is disproportionately weighted towards domestic hot water. For this scheme it can be seen hot water accounts for a significant amount of the total energy demand.

This has a significant impact for schemes of this type as the hot water consumption parameters are predefined for Part L calculations by the NCM.

For Part L calculations, the hot water energy demand cannot be reduced and there are no options to provide more effective controls and/or reduce water usage through low flow appliances.

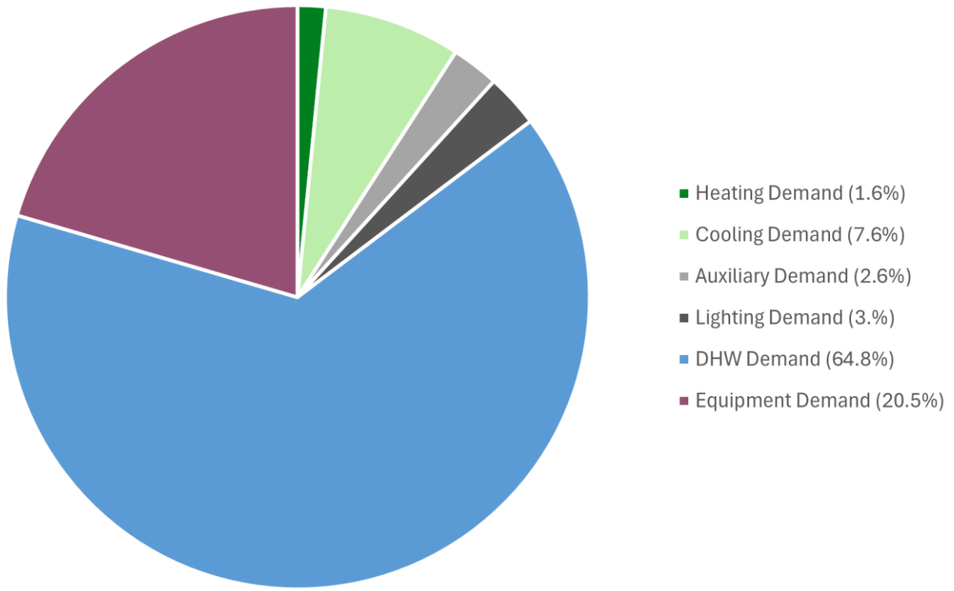
Also, given that the final stage of this energy strategy will seek to utilise ASHPs to meet the DHW demand the boiler efficiency is prescribed to remain in line with Part L2.

In order to usefully demonstrate the improvements achieved through energy efficiency measures and an efficient thermal envelope alone, DHW has been excluded from the calculation.

Under this scenario the percentage improvement in heating, cooling, auxiliary and lighting, at this stage is more representative of how the building is performing against the notional model at the Energy Efficiency Measures stage.

Building Use	Model Area (m2)	Baseline TER CO_2 Emissions Excluding DHW (tCO_2/yr)	Energy Efficiency Measures BER CO_2 Emissions Excluding DHW (tCO_2/yr)	CO_2 Saved in Total (tCO_2/yr)	Percentage Reduction in Stage
Hotel	3,817	12.6	11.9	0.7	5.4%

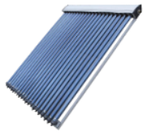
Commercial Predicted Regulated CO_2 Emissions Saved in Demand Reduction - 'Energy Efficiency Measures' Stage



Percentage Weighting of CO_2 Emissions by End Use

RENEWABLE ENERGY

This section reviews the potential on-site renewable technologies available and assesses their viability for this development.

Technology		Comment	Verdict
	Solar PV	Anticipated electrical patterns are likely to lend themselves to the inclusion of solar PV, which provide a good source of on-site renewable energy generation and carbon reduction. A PV array is proposed on the main roof of the building to maximise onsite energy generation.	✓
	Solar Thermal	The use of solar thermal would conflict with the proposed hot water generation from ASHP, reducing the efficiencies of both systems and impacting the potential carbon savings.	✗
	Ground Source Heat Pump	In order to provide the anticipated loads for the development a large number of bore holes would be required which this site cannot provide given its limited footprint and surrounding area. GSHP also have large capital cost and offer minimal carbon savings compared to air source heat pumps.	✗
	Wind	Issues associated with wind turbines are stroboscopic light, topple distance and noise which can all be deemed detrimental to neighbours.	✗
	Air to Water Heat Pumps (DHW)	Electrically driven air to water heat pumps provide an energy efficiency way to heat hot water. With the update of the CO_2 carbon emission factors in line with SAP 10, this technology becomes highly suited to this scheme. Air to Water Heat Pumps are therefore proposed for this scheme.	✓
	Air Source Heat Pumps (Space Heating)	Electric driven air source heat pumps provide an energy efficient way to heat and cool the building. VRF systems allow simultaneous heating and cooling of different spaces and the inclusion of heat recovery improves the energy efficiency and carbon reductions even further. It is therefore proposed that ASHP are installed for the scheme.	✓

Renewable Energy Technologies

PHOTOVOLTAIC ARRAY

Overview

It is proposed that solar photovoltaic (PV) panels will be installed on the available flat roof areas of the building to generate electricity and offset the energy that would have been taken from the grid.

Preliminary analysis has been carried out and shows that a solar PV array of approximately 426m2 (147 panels) with 62.475 kWp could be incorporated onto the roof space.

Location

The number of PVs has been maximised and balanced against the requirement for plant and amenity space, access for the PV and access for façade maintenance.

Indicative layouts have been provided for the PV panels however this is subject to final agreement and approval with the planning authority as part of the overall aesthetics of the scheme.

PV Calculations

High efficiency PV panels that are able to achieve generation efficiencies of 425Wp has been used for the calculations along with appropriate shading factors as well as the PV angle pitch, minor overshading, etc. Detailed calculations will be undertaken as part of the next stage of design to confirm exact values.

Data has been entered to the European Commission Photovoltaic Geographical Information System to estimate the amount of energy that is likely to be delivered. The results are 72,136kWH/year.

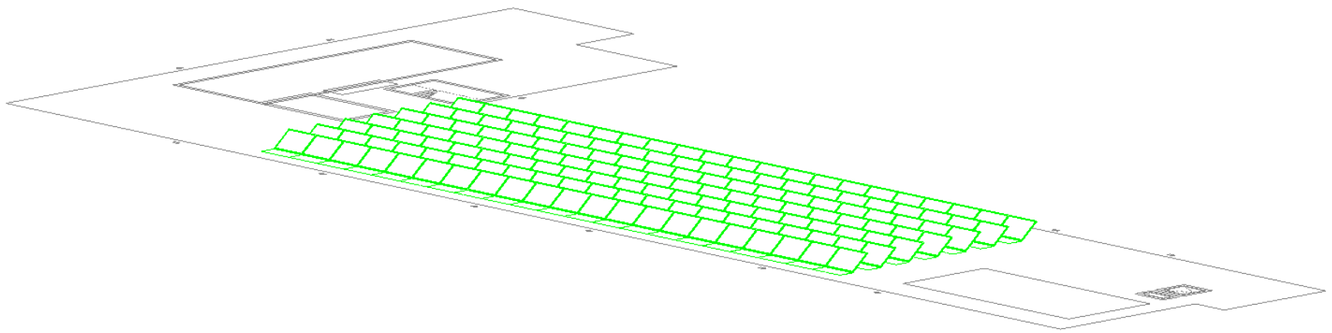
Further information on the PV panels that have been assumed for this assessment are provided in the appendices.

Building Integrated Photovoltaic

The proposals for use of additional Building Integrated Photovoltaic (BIPV) panels to the facades of the building have been assessed but disallowed with regards to Fire Engineering as photovoltaics contain an interlayer which is deemed combustible and therefore not in line with new facade fire regulations.

Heading	System 1
System Name	Site PV
Number of Panels	147
PV Panel Generation Area (m2)	287.1
PV Panel Installation Area (m2)	426.0
PV Panel Output Rate(W/m2)	217.6
PV Peak Generation Per Panel (W)	425.00
PV Module Type	Monocrystalline
PV Module Efficiency	21.80%
PV Calculation Method	Specify Values
PV Efficiency Method	Standard Test Conditions
PV Level of Overshading	None or very little (less than 20%)
PV Ventilation Strategy	Strongly ventilated or forced ventilated modules
PV Inclination	39
PV Orientation (Where Sourth is 180)	199

PV Equipment Details



Indicative PV 3D

PV LIFECYCLE COSTING AND ROI

PV Grants

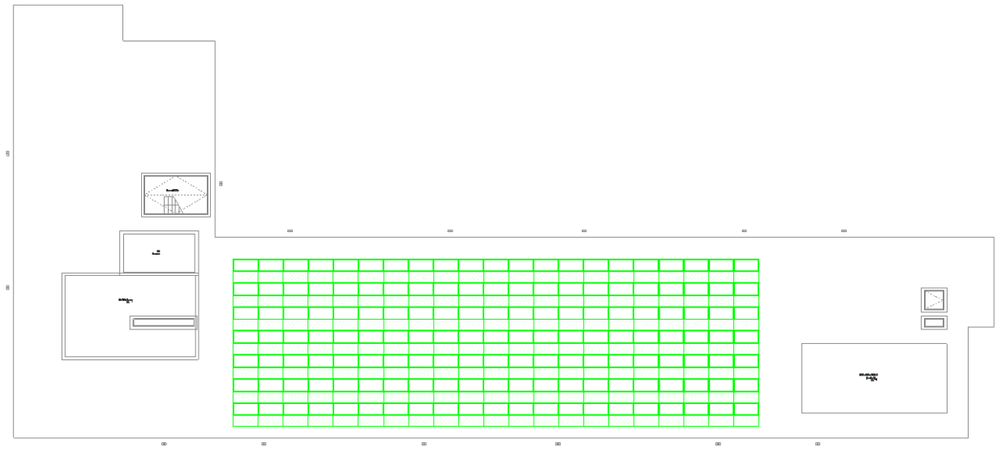
As of September 2019, the Smart Export Guarantee has been brought in by the department for Business, Energy and Industrial Strategy (BEIS) as a replacement for the Feedin Tariff (FiT) as a financial incentive scheme for solar PV and other technologies

The Smart Export Guarantee (SEG) is a financial incentive scheme for owners of small scale renewable generation technologies in the UK including solar PV systems and is available for technologies up to a capacity of 5MW.

Under the SEG, energy suppliers in the UK with over 150,000 customers are legally obliged to pay their customers for each unit of electricity generated by their solar panels (as long as the system is 5MW or below). Suppliers with fewer than 150,000 customers can choose to take part in the scheme but are not obliged to.

The table below gives the payback and return on investment for the proposed solar PV system:

The proposed solar PV system is expected to generate in excess of 10% of the sites electricity needs.



Indicative PV Roof Plan

System Info	Unit	Site Wide
System Cost (estimated)	£/kW	5,000
kWp of System	kWp	62
Cost of System	£	312,375
Size of Roof Needed	m2	287
Annual Output of System	kWh	72,136
Savings/Income	£	21,460
Annual CO2 Emission Savings	kgCO2	9,811
Payback Period	Years	14.6
Export Tariff	p/kWh	5
Percentage Exported (estimated)	%	1.0%
Exported	kWh	721
Annual Income from Smart Export Guarantee	£	36.07
Unit Cost Day Rate (estimated)	p/kWh	30
Percentage Avoided (estimated)	%	99.0%
Avoided Import	kWh	71,415
Avoided Import Cost	£	21,424

PV ROI

LOW ZERO CARBON TECHNOLOGIES RESULTS

Overview

The modelling has been updated to include Photovolatic Panels, Air Source Heat Pump to show the carbon savings to the scheme at this stage.

Results

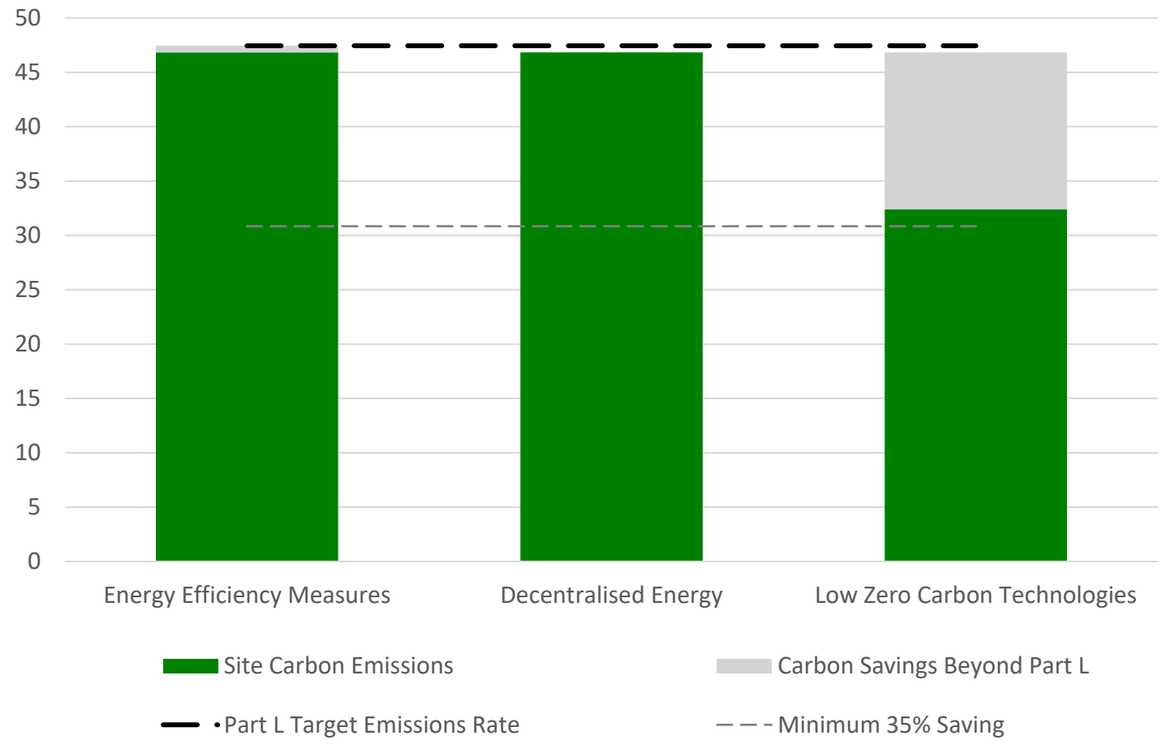
The figures demonstrates the resultant energy consumption based on the demand reduction, energy efficient measures and renewables:

Building Use	Model Area (m2)	Energy Efficiency Measures BER CO_2 Emissions (tCO_2/yr)	Low Zero Carbon Technologies BER CO_2 Emissions (tCO_2/yr)	CO_2 Saved in Stage (tCO_2/yr)	Percentage Reduction in Stage
Hotel	3,817	46.8	32.4	14.4	30.8%

Commercial Predicted Regulated CO_2 Emissions Saved in Low Zero Carbon Technologies Stage

Building Use	Model Area (m2)	Baseline TER CO_2 Emissions (tCO_2/yr)	Low Zero Carbon Technologies BER CO_2 Emissions (tCO_2/yr)	CO_2 Saved in Total (tCO_2/yr)	Percentage Reduction in Total
Hotel	3,817	47.4	32.4	15.0	31.7%

Commercial Predicted Regulated CO_2 Emissions Saved, Baseline to Low Zero Carbon Technologies Stage



Emissions Chart - Low Zero Carbon Technologies

CONCLUSIONS & RECOMMENDATIONS

Overview

Many conclusions and recommendations have been made in the previous sections of this Energy Strategy Report. In this section the main conclusions and recommendations are summarised.

The investigation of CO_2 emissions savings involved the analysis and simulation of:

- Energy Efficiency Measures
- Heating via ASHP
- Hot water via ASHPs
- Photovoltaics

Energy Efficiency Measures

At the Energy Efficiency Measures stage, it is proposed that the following energy efficiency measures are provided to reduce energy demand for the development:

- Improved fabric and glazing efficiencies
- Energy efficient LED lighting
- Heat recovery ventilation
- Water saving technologies

Low Zero Carbon Technologies

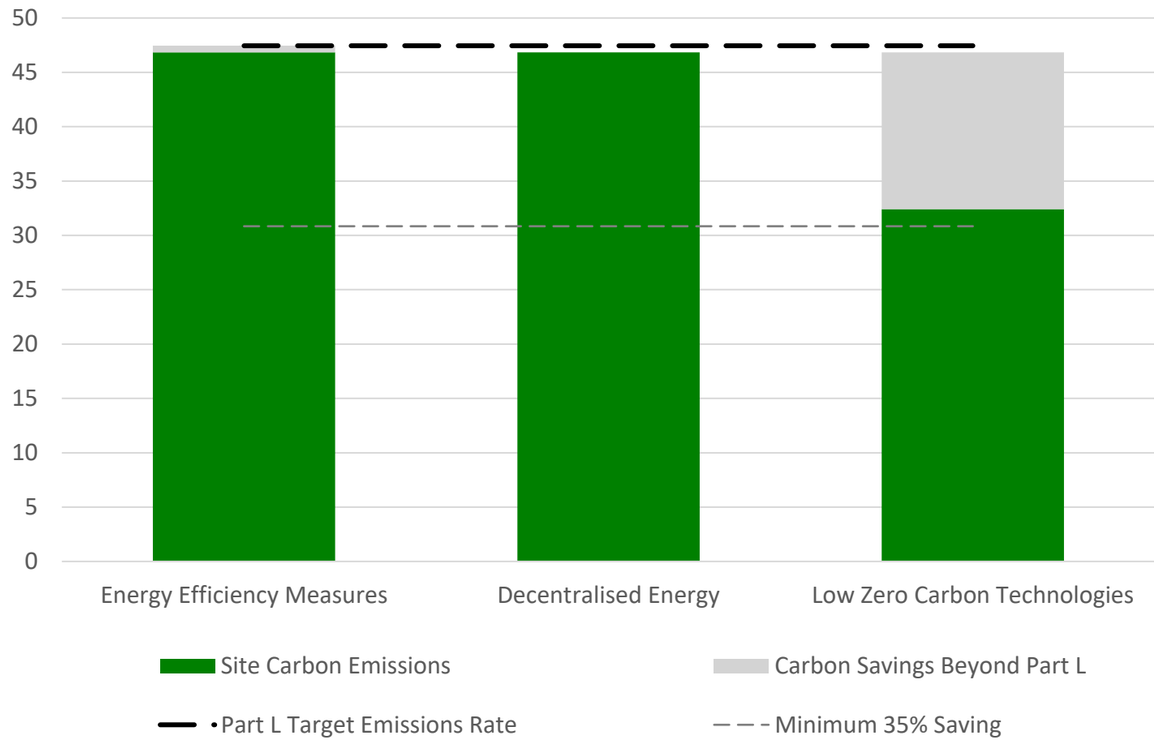
At the Low Zero Carbon Technologies stage, the inclusion of Photovolatic Panels, Air Source Heat Pump was deemed a suitable mix of technologies for the development.

After incorporation of the above technologies, the targeted reduction in CO_2 emissions, when compared to the Notional Building of the 2021 Building Regulations, can be seen below.

The inclusion of low and zero carbon technologies has provided a 32% reduction in carbon emissions with over 10% generated from solar PV panels. With the use of Air Source Heat Pumps (ASHPs) to generate all the sites heating, cooling and domestic hot water needs, as well as the on-site generation of electricity via solar PVs, the site significantly surpasses the 10% energy demand required to be generated from renewables and low zero carbon technologies.

Energy Hierarchy Stage	Commercial Total Regulated Emissions (tonnes CO2 pa)	Commercial Total Savings (%)
Baseline	47.4	0.0%
Energy Efficiency Measures	46.8	1.3%
Decentralised Energy	46.8	1.3%
Low Zero Carbon Technologies	32.4	31.7%

Commercial CO_2 Emissions after each stage of the Energy Hierarchy



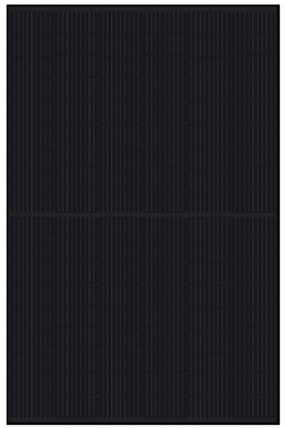
Emissions Chart - Low Zero Carbon Technologies

APPENDIX A: PV MANUFACTURER INFORMATION

Technical datasheet
SOLARWATT Panel vision AM 4.5 black

SOLARWATT®

PRODUCT



SOLARWATT Panel
vision AM 4.5 black

Glass-Glass-Module

Solid quality with high performance

Thanks to their design Solarwatt glass-glass modules deliver the highest long-term yields. They are robust and resilient. Bifacial TOPCon half-cut-cells enable modules that are optimized for maximum performance.

The solar cells are embedded almost indestructibly in the glass-glass composite and thus optimally protected against all weather effects and mechanical stress. Solarwatt can therefore offer a 30-year warranty on performance and product quality.

The Solarwatt FullCoverage insurance is included for 5 years and free of charge. It insures almost all risks and takes effect even if the modules do not produce electricity or deliver less than expected in the event of damage.

CE

PRODUCT QUALITY

- ammonia resistant
- intensive hailstorm resistant
- salt mist resistant
- LeTID tested
- PID protected
- 100 % plus-sorting
- snow-load warranty
- bifacial TOPCon half-cut-cells

SERVICE

FullCoverage insurance
included (up to 1,000 kWp)*

simple returns policy
as per „Delivery terms for Solarwatt solar modules"

30 year product warranty
as per „Warranty conditions for SOLARWATT Panel vision"

30 year performance warranty
on 90 % of nominal power as per „Warranty conditions for SOLARWATT Panel vision"

* country-specific deviations apply

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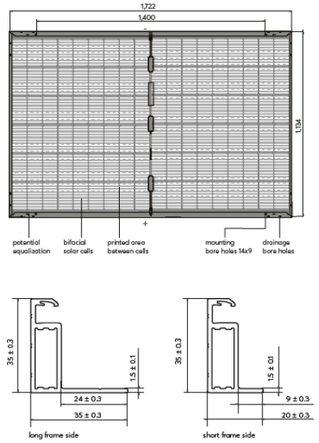
Subject to change | Errors excepted.
This datasheet fulfills the requirements listed in IEC 61215-1-1 | EN

Solarwatt GmbH | Maria-Reiche-Str. 2a | 01109 Dresden | Germany
T +49-351-8895-555 | F +49-351-8895-100 | solarwatt.com
Certified acc. to DIN EN ISO 9001, 14001, 45001, 50001

Technical datasheet
SOLARWATT Panel vision AM 4.5 black

30 YEARS SINCE 1993

DIMENSIONS



GENERAL DATA

Module technology	Glass-glass laminate; aluminum frame, black
Covering material Encapsulation Backing material	Tempered solar glass with anti-reflective finish, 2 mm Solar cells in POE encapsulation Tempered glass, partially printed in black (spaces between the cells), 2 mm
Solar cells	108 monocrystalline, bifacial, high power TOPCon-solar cells
Cell dimensions	182 x 91 mm
L x W x H / Weight	$1{,}722^{\pm 2}$ x $1{,}134^{\pm 2}$ x $35^{\pm 0.3}$ mm / 25.4 kg
Connection technology	Cables 2x 1.2 m / 4 mm², Stäubli Electrical MC4-Evo 2
Bypass diodes	3
Max. system voltage	1,500 V
IP rating	IP68
Protection class	II (acc. to IEC 61140)
Fire class	A (acc. to IEC 61730/UL 790)
Certified mechanical ratings as per IEC 61215	Pressure load up to 5,400 Pa (test load 8,100 Pa) Suction load up to 2,400 Pa (test load 3,600 Pa)
Qualifications	IEC 61215 (incl. LeTID)	IEC 61730 in preparation: PID IEC TS 62804	IEC 61701	IEC 62716 | Hail resistance class HW4	MCS 005

ELECTRICAL DATA (STC)

STC (Standard Test Conditions): Irradiation intensity 1,000 W/m², spectral distribution AM 1.5 | Temperature 25 ±2 °C, in accordance to EN 60904-3

Please check specific power class availability with your Solarwatt sales team

Nominal power P_{mpp}	420 Wp	425 Wp
Nominal voltage V_{mp}	32,0 V	32,2 V
Nominal current I_{mp}	13,1 A	13,2 A
Open circuit voltage V_{OC}	38,4 V	38,6 V
Short circuit current I_{SC}	13,8 A	13,8 A
Module efficiency	21,5 %	21,8 %

Measurement tolerances: Pmax ±5 %; VOC ±3 %; ISC ±3 %, IMP ±10 %

Reverse-current power rating IR: 30 A, operating modules with an external power source is only permissible if using a phase fuse with a tripping current of ≤ 30 A.

ELECTRICAL DATA (WEAK LIGHT AND BNPI)

Weak light conditions: Irradiation intensity 200 W/m², Temperature 25 °C, Wind speed 1 m/s, load operation
BNPI: Bifacial Nameplate Irradiance G = 1000 W/m² + φ * 135 W/m²
φ = MIN (φ_{ISC}, φ_{Pmax}), φ_{ISC} = 80 %, φ_{VOC} = 100 %, φ_{Pmax} = 80 %

Nominal power $P_{mpp@STC}$	420 Wp	425 Wp
Nominal power $P_{mpp\ @200\ W/m^2}$	82,3 W	83,5 W
Nominal power $P_{mpp@BNPI}$	462 Wp	468 Wp
Open circuit voltage $V_{OC@BNPI}$	38,5 V	38,7 V
Short circuit current $I_{SC@BNPI}$	15,2 A	15,2 A

Reduction of module efficiency when irradiance is reduced from 1,000 W/m² to 200 W/m² (at 25 °C): ±±2 % (relative) / −0.6±0.3 % (absolute).

THERMAL FEATURES

Operating temperature range	-40 … +85 °C
Ambient temperature range	-40 … +45 °C
Temperature coefficient P_{mpp}	-0,29 %/K
Temperature coefficient Voc	-0,25 %/K
Temperature coefficient Isc	0,04 %/K
NMOT	42 °C

TRANSPORT AND PACKAGING

Modules per pallet	31
Modules per container	806
Pallets per truck	14 / 28
Modules per truck	434 / 868
Gross weight per pallet	814 kg
Gross weight per stacked pallet (max. 2)	1,628 kg
Pallet dimensions (packing size)	1,770 x 1,140 x 1,250 mm

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APPENDIX B: COMMERCIAL ENERGY EFFICIENCY MEASURES BRUKL

See following pages for details.

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

PI Littlehampton

As designed

Date: Wed Apr 02 16:08:10 2025

Administrative information

Building Details

Address:

Certifier details

Name:

Telephone number:

Address: , ,

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.6"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.6

BRUKL compliance module version: v6.1.e.0

Foundation area [m^2]: 936.79

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	12.43	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	12.27	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	135.44	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	133.78	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.15	0.15	External Wall (450)
Floors	0.18	0.12	0.15	Exposed Floor
Pitched roofs	0.16	-	-	No pitched roofs in project
Flat roofs	0.18	0.1	0.1	Roof
Windows** and roof windows	1.6	1.29	1.42	W-T02-DG-FX
Rooflights***	2.2	-	-	No rooflights in project
Personnel doors^	1.6	1.36	1.57	D-T02-DG-OP
Vehicle access & similar large doors	1.3	-	-	No vehicle access or similar large doors in project
High usage entrance doors	3	-	-	No high usage entrance doors in project

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]

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

** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m^2K

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

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

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	>0.95

1- NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
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.					

2- MVHR VRF - BED (130 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	5	-	-	0.87
Standard value	2.5*	5	N/A	N/A	N/A
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.					

3- MVHR VRF - FOH (6 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	5	-	0.96	0.87
Standard value	2.5*	5	N/A	1.5^	N/A
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. ^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

4- MVHR - EN (130 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	-	-	-	0.93
Standard value	2.5*	N/A	N/A	N/A	N/A
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.					

5- EX (00_Refuse 1)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
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.					

6- NV - ST

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
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.					

7- MVHR - LN (5 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0	-	-	0.69	0.93
Standard value	N/A	N/A	N/A	1.5^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

8- MVHR (9 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	-	-	0.96	0.87
Standard value	2.5*	N/A	N/A	1.5^	N/A
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. ^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

9- S+E (4 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0	-	-	1.8	-
Standard value	N/A	N/A	N/A	1.5^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

10- NV - CM (00_Comms Room 1)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0	5	-	-	-
Standard value	N/A	3	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- ASHP-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	2.86	0
Standard value	2*	N/A
* Standard shown is for all types except absorption and gas engine heat pumps.		

Zone-level mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	**Zone**	**Standard**
00_Refuse 1	-	-	0.6	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
00_Kitchen 1	-	-	-	-	-	-	-	-	1.8	-	N/A
00_Kitchen 2	-	-	-	-	-	-	-	-	1.8	-	N/A
00_Kitchen 3	-	-	-	-	-	-	-	-	1.8	-	N/A
00_Kitchen 4	-	-	-	-	-	-	-	-	1.8	-	N/A

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
00_Stair 1	100	-	-
00_Stair 2	100	-	-
00_Stair 3	100	-	-
00_Circulation 1	110	-	-
00_Circulation 2	110	-	-
00_Circulation 3	110	-	-
00_Circulation 4	100	-	-
00_Circulation 5	100	-	-
00_Linen 1	110	-	-
00_Linen 2	110	-	-
00_Refuse 1	95	-	-
00_Cycle Store 1	110	-	-
00_Plantroom 1	110	-	-
00_Plantroom 2	110	-	-
00_Plantroom 3	110	-	-
00_Plantroom 4	110	-	-
00_Kitchen 1	110	-	-
00_Kitchen 2	110	-	-
00_Kitchen 3	110	-	-
00_Kitchen 4	110	-	-
00_WC 1	100	-	-
00_WC 2	100	-	-
00_WC 3	100	-	-
00_WC 4	100	-	-
00_WC 5	100	-	-
00_WC 6	100	-	-
00_WC 7	100	-	-
00_WC 8	100	-	-
00_WC 9	100	-	-
00_Store 1	110	-	-
00_Store 2	110	-	-
00_Store 3	110	-	-
00_Store 4	110	-	-
00_Store 5	110	-	-
00_Store 6	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
00_Restaurant 1	95	95	-
00_Restaurant 2	95	95	-
00_Reception 1	95	95	-
00_Reception 2	95	95	-
00_Beer Store 1	110	-	-
00_Team Room 1	95	-	-
00_Staff Office 1	95	-	-
01_Bedroom 1	100	-	-
01_Bedroom 2	100	-	-
01_Bedroom 3	100	-	-
01_Bedroom 4	100	-	-
01_Bedroom 5	100	-	-
01_Bedroom 6	100	-	-
01_Bedroom 7	100	-	-
01_Bedroom 8	100	-	-
01_Bedroom 9	100	-	-
01_Bedroom 10	100	-	-
01_Bedroom 11	100	-	-
01_Bedroom 12	100	-	-
01_Bedroom 13	100	-	-
01_Bedroom 14	100	-	-
01_Bedroom 15	100	-	-
01_Bedroom 16	100	-	-
01_Bedroom 17	100	-	-
01_Bedroom 18	100	-	-
01_Bedroom 19	100	-	-
01_Bedroom 20	100	-	-
01_Bedroom 21	100	-	-
01_Bedroom 22	100	-	-
01_Bedroom 23	100	-	-
01_Bedroom 24	100	-	-
01_Bedroom 25	100	-	-
01_Bedroom 26	100	-	-
01_Bedroom 27	100	-	-
01_Bedroom 28	100	-	-
01_Bedroom 29	100	-	-
01_Bedroom 30	100	-	-
01_Bedroom 31	100	-	-
01_Bedroom 32	100	-	-
01_Bedroom 33	100	-	-
01_Bedroom 34	100	-	-
01_Bedroom 35	100	-	-
01_Bedroom 36	100	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
01_Bedroom 37	100	-	-
01_Bedroom 38	100	-	-
01_Bedroom 39	100	-	-
01_Bedroom 40	100	-	-
01_Bedroom 41	100	-	-
01_Bedroom 42	100	-	-
01_Bedroom 43	100	-	-
01_Bedroom 44	100	-	-
01_Ensuite 1	110	-	-
01_Ensuite 2	110	-	-
01_Ensuite 3	110	-	-
01_Ensuite 4	110	-	-
01_Ensuite 5	110	-	-
01_Ensuite 6	110	-	-
01_Ensuite 7	110	-	-
01_Ensuite 8	110	-	-
01_Ensuite 9	110	-	-
01_Ensuite 10	110	-	-
01_Ensuite 11	110	-	-
01_Ensuite 12	110	-	-
01_Ensuite 13	110	-	-
01_Ensuite 14	110	-	-
01_Ensuite 15	110	-	-
01_Ensuite 16	110	-	-
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01_Ensuite 18	110	-	-
01_Ensuite 19	110	-	-
01_Ensuite 20	110	-	-
01_Ensuite 21	110	-	-
01_Ensuite 22	110	-	-
01_Ensuite 23	110	-	-
01_Ensuite 24	110	-	-
01_Ensuite 25	110	-	-
01_Ensuite 26	110	-	-
01_Ensuite 27	110	-	-
01_Ensuite 28	110	-	-
01_Ensuite 29	110	-	-
01_Ensuite 30	110	-	-
01_Ensuite 31	110	-	-
01_Ensuite 32	110	-	-
01_Ensuite 33	110	-	-
01_Ensuite 34	110	-	-
01_Ensuite 35	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
01_Ensuite 36	110	-	-
01_Ensuite 37	110	-	-
01_Ensuite 38	110	-	-
01_Ensuite 39	110	-	-
01_Ensuite 40	110	-	-
01_Ensuite 41	110	-	-
01_Ensuite 42	110	-	-
01_Ensuite 43	110	-	-
01_Ensuite 44	110	-	-
01_Stair 1	100	-	-
01_Stair 2	100	-	-
01_Circulation 1	100	-	-
01_Circulation 2	100	-	-
01_Circulation 3	100	-	-
01_Circulation 4	100	-	-
01_Circulation 5	100	-	-
01_Circulation 6	100	-	-
01_Circulation 7	100	-	-
01_Circulation 8	100	-	-
01_Linen 1	110	-	-
02_Bedroom 1	100	-	-
02_Bedroom 2	100	-	-
02_Bedroom 3	100	-	-
02_Bedroom 4	100	-	-
02_Bedroom 5	100	-	-
02_Bedroom 6	100	-	-
02_Bedroom 7	100	-	-
02_Bedroom 8	100	-	-
02_Bedroom 9	100	-	-
02_Bedroom 10	100	-	-
02_Bedroom 11	100	-	-
02_Bedroom 12	100	-	-
02_Bedroom 13	100	-	-
02_Bedroom 14	100	-	-
02_Bedroom 15	100	-	-
02_Bedroom 16	100	-	-
02_Bedroom 17	100	-	-
02_Bedroom 18	100	-	-
02_Bedroom 19	100	-	-
02_Bedroom 20	100	-	-
02_Bedroom 21	100	-	-
02_Bedroom 22	100	-	-
02_Bedroom 23	100	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
02_Bedroom 24	100	-	-
02_Bedroom 25	100	-	-
02_Bedroom 26	100	-	-
02_Bedroom 27	100	-	-
02_Bedroom 28	100	-	-
02_Bedroom 29	100	-	-
02_Bedroom 30	100	-	-
02_Bedroom 31	100	-	-
02_Bedroom 32	100	-	-
02_Bedroom 33	100	-	-
02_Bedroom 34	100	-	-
02_Bedroom 35	100	-	-
02_Bedroom 36	100	-	-
02_Bedroom 37	100	-	-
02_Bedroom 38	100	-	-
02_Bedroom 39	100	-	-
02_Bedroom 40	100	-	-
02_Bedroom 41	100	-	-
02_Bedroom 42	100	-	-
02_Bedroom 43	100	-	-
02_Ensuite 1	110	-	-
02_Ensuite 2	110	-	-
02_Ensuite 3	110	-	-
02_Ensuite 4	110	-	-
02_Ensuite 5	110	-	-
02_Ensuite 6	110	-	-
02_Ensuite 7	110	-	-
02_Ensuite 8	110	-	-
02_Ensuite 9	110	-	-
02_Ensuite 10	110	-	-
02_Ensuite 11	110	-	-
02_Ensuite 12	110	-	-
02_Ensuite 13	110	-	-
02_Ensuite 14	110	-	-
02_Ensuite 15	110	-	-
02_Ensuite 16	110	-	-
02_Ensuite 17	110	-	-
02_Ensuite 18	110	-	-
02_Ensuite 19	110	-	-
02_Ensuite 20	110	-	-
02_Ensuite 21	110	-	-
02_Ensuite 22	110	-	-
02_Ensuite 23	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
02_Ensuite 24	110	-	-
02_Ensuite 25	110	-	-
02_Ensuite 26	110	-	-
02_Ensuite 27	110	-	-
02_Ensuite 28	110	-	-
02_Ensuite 29	110	-	-
02_Ensuite 30	110	-	-
02_Ensuite 31	110	-	-
02_Ensuite 32	110	-	-
02_Ensuite 33	110	-	-
02_Ensuite 34	110	-	-
02_Ensuite 35	110	-	-
02_Ensuite 36	110	-	-
02_Ensuite 37	110	-	-
02_Ensuite 38	110	-	-
02_Ensuite 39	110	-	-
02_Ensuite 40	110	-	-
02_Ensuite 41	110	-	-
02_Ensuite 42	110	-	-
02_Ensuite 43	110	-	-
02_Stair 1	100	-	-
02_Stair 2	100	-	-
02_Circulation 1	100	-	-
02_Circulation 2	100	-	-
02_Circulation 3	100	-	-
02_Circulation 4	100	-	-
02_Circulation 5	100	-	-
02_Circulation 6	100	-	-
02_Linen 1	110	-	-
03_Bedroom 1	100	-	-
03_Bedroom 2	100	-	-
03_Bedroom 3	100	-	-
03_Bedroom 4	100	-	-
03_Bedroom 5	100	-	-
03_Bedroom 6	100	-	-
03_Bedroom 7	100	-	-
03_Bedroom 8	100	-	-
03_Bedroom 9	100	-	-
03_Bedroom 10	100	-	-
03_Bedroom 11	100	-	-
03_Bedroom 12	100	-	-
03_Bedroom 13	100	-	-
03_Bedroom 14	100	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
03_Bedroom 15	100	-	-
03_Bedroom 16	100	-	-
03_Bedroom 17	100	-	-
03_Bedroom 18	100	-	-
03_Bedroom 19	100	-	-
03_Bedroom 20	100	-	-
03_Bedroom 21	100	-	-
03_Bedroom 22	100	-	-
03_Bedroom 23	100	-	-
03_Bedroom 24	100	-	-
03_Bedroom 25	100	-	-
03_Bedroom 26	100	-	-
03_Bedroom 27	100	-	-
03_Bedroom 28	100	-	-
03_Bedroom 29	100	-	-
03_Bedroom 30	100	-	-
03_Bedroom 31	100	-	-
03_Bedroom 32	100	-	-
03_Bedroom 33	100	-	-
03_Bedroom 34	100	-	-
03_Bedroom 35	100	-	-
03_Bedroom 36	100	-	-
03_Bedroom 37	100	-	-
03_Bedroom 38	100	-	-
03_Bedroom 39	100	-	-
03_Bedroom 40	100	-	-
03_Bedroom 41	100	-	-
03_Bedroom 42	100	-	-
03_Bedroom 43	100	-	-
03_Ensuite 1	110	-	-
03_Ensuite 2	110	-	-
03_Ensuite 3	110	-	-
03_Ensuite 4	110	-	-
03_Ensuite 5	110	-	-
03_Ensuite 6	110	-	-
03_Ensuite 7	110	-	-
03_Ensuite 8	110	-	-
03_Ensuite 9	110	-	-
03_Ensuite 10	110	-	-
03_Ensuite 11	110	-	-
03_Ensuite 12	110	-	-
03_Ensuite 13	110	-	-
03_Ensuite 14	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
03_Ensuite 15	110	-	-
03_Ensuite 16	110	-	-
03_Ensuite 17	110	-	-
03_Ensuite 18	110	-	-
03_Ensuite 19	110	-	-
03_Ensuite 20	110	-	-
03_Ensuite 21	110	-	-
03_Ensuite 22	110	-	-
03_Ensuite 23	110	-	-
03_Ensuite 24	110	-	-
03_Ensuite 25	110	-	-
03_Ensuite 26	110	-	-
03_Ensuite 27	110	-	-
03_Ensuite 28	110	-	-
03_Ensuite 29	110	-	-
03_Ensuite 30	110	-	-
03_Ensuite 31	110	-	-
03_Ensuite 32	110	-	-
03_Ensuite 33	110	-	-
03_Ensuite 34	110	-	-
03_Ensuite 35	110	-	-
03_Ensuite 36	110	-	-
03_Ensuite 37	110	-	-
03_Ensuite 38	110	-	-
03_Ensuite 39	110	-	-
03_Ensuite 40	110	-	-
03_Ensuite 41	110	-	-
03_Ensuite 42	110	-	-
03_Ensuite 43	110	-	-
03_Stair 1	100	-	-
03_Stair 2	100	-	-
03_Circulation 1	100	-	-
03_Circulation 2	100	-	-
03_Circulation 3	100	-	-
03_Circulation 4	100	-	-
03_Circulation 5	100	-	-
03_Circulation 6	100	-	-
03_Linen 1	110	-	-
00_Comms Room 1	110	-	-

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00_Restaurant 1	YES (+157%)	NO
00_Restaurant 2	NO (-4%)	NO
00_Reception 1	NO (-80%)	NO
00_Reception 2	NO (-90%)	NO
00_Team Room 1	NO (-68%)	NO
00_Staff Office 1	YES (+44%)	NO
01_Bedroom 1	NO (-81%)	NO
01_Bedroom 2	NO (-55%)	NO
01_Bedroom 3	NO (-56%)	NO
01_Bedroom 4	NO (-52%)	NO
01_Bedroom 5	NO (-72%)	NO
01_Bedroom 6	NO (-76%)	NO
01_Bedroom 7	NO (-76%)	NO
01_Bedroom 8	NO (-76%)	NO
01_Bedroom 9	NO (-72%)	NO
01_Bedroom 10	NO (-72%)	NO
01_Bedroom 11	NO (-72%)	NO
01_Bedroom 12	NO (-76%)	NO
01_Bedroom 13	NO (-76%)	NO
01_Bedroom 14	NO (-76%)	NO
01_Bedroom 15	NO (-76%)	NO
01_Bedroom 16	NO (-76%)	NO
01_Bedroom 17	NO (-76%)	NO
01_Bedroom 18	NO (-89%)	NO
01_Bedroom 19	NO (-85%)	NO
01_Bedroom 20	NO (-67%)	NO
01_Bedroom 21	NO (-67%)	NO
01_Bedroom 22	NO (-61%)	NO
01_Bedroom 23	NO (-61%)	NO
01_Bedroom 24	NO (-67%)	NO
01_Bedroom 25	NO (-67%)	NO
01_Bedroom 26	NO (-67%)	NO
01_Bedroom 27	NO (-61%)	NO
01_Bedroom 28	NO (-61%)	NO
01_Bedroom 29	NO (-61%)	NO
01_Bedroom 30	NO (-67%)	NO
01_Bedroom 31	NO (-67%)	NO
01_Bedroom 32	NO (-67%)	NO
01_Bedroom 33	NO (-61%)	NO
01_Bedroom 34	NO (-61%)	NO
01_Bedroom 35	NO (-67%)	NO
01_Bedroom 36	NO (-73%)	NO
01_Bedroom 37	NO (-60%)	NO
01_Bedroom 38	NO (-60%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
01_Bedroom 39	NO (-60%)	NO
01_Bedroom 40	NO (-60%)	NO
01_Bedroom 41	NO (-60%)	NO
01_Bedroom 42	NO (-60%)	NO
01_Bedroom 43	NO (-60%)	NO
01_Bedroom 44	NO (-77%)	NO
02_Bedroom 1	NO (-81%)	NO
02_Bedroom 2	NO (-55%)	NO
02_Bedroom 3	NO (-55%)	NO
02_Bedroom 4	NO (-66%)	NO
02_Bedroom 5	NO (-76%)	NO
02_Bedroom 6	NO (-76%)	NO
02_Bedroom 7	NO (-76%)	NO
02_Bedroom 8	NO (-72%)	NO
02_Bedroom 9	NO (-72%)	NO
02_Bedroom 10	NO (-72%)	NO
02_Bedroom 11	NO (-76%)	NO
02_Bedroom 12	NO (-76%)	NO
02_Bedroom 13	NO (-76%)	NO
02_Bedroom 14	NO (-76%)	NO
02_Bedroom 15	NO (-76%)	NO
02_Bedroom 16	NO (-76%)	NO
02_Bedroom 17	NO (-89%)	NO
02_Bedroom 18	NO (-85%)	NO
02_Bedroom 19	NO (-67%)	NO
02_Bedroom 20	NO (-67%)	NO
02_Bedroom 21	NO (-61%)	NO
02_Bedroom 22	NO (-61%)	NO
02_Bedroom 23	NO (-67%)	NO
02_Bedroom 24	NO (-67%)	NO
02_Bedroom 25	NO (-67%)	NO
02_Bedroom 26	NO (-61%)	NO
02_Bedroom 27	NO (-61%)	NO
02_Bedroom 28	NO (-61%)	NO
02_Bedroom 29	NO (-67%)	NO
02_Bedroom 30	NO (-67%)	NO
02_Bedroom 31	NO (-67%)	NO
02_Bedroom 32	NO (-61%)	NO
02_Bedroom 33	NO (-61%)	NO
02_Bedroom 34	NO (-67%)	NO
02_Bedroom 35	NO (-73%)	NO
02_Bedroom 36	NO (-60%)	NO
02_Bedroom 37	NO (-60%)	NO
02_Bedroom 38	NO (-60%)	NO
02_Bedroom 39	NO (-60%)	NO
02_Bedroom 40	NO (-60%)	NO
02_Bedroom 41	NO (-60%)	NO
02_Bedroom 42	NO (-60%)	NO
02_Bedroom 43	NO (-77%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
03_Bedroom 1	NO (-81%)	NO
03_Bedroom 2	NO (-55%)	NO
03_Bedroom 3	NO (-55%)	NO
03_Bedroom 4	NO (-66%)	NO
03_Bedroom 5	NO (-76%)	NO
03_Bedroom 6	NO (-76%)	NO
03_Bedroom 7	NO (-76%)	NO
03_Bedroom 8	NO (-72%)	NO
03_Bedroom 9	NO (-72%)	NO
03_Bedroom 10	NO (-72%)	NO
03_Bedroom 11	NO (-76%)	NO
03_Bedroom 12	NO (-76%)	NO
03_Bedroom 13	NO (-76%)	NO
03_Bedroom 14	NO (-76%)	NO
03_Bedroom 15	NO (-76%)	NO
03_Bedroom 16	NO (-76%)	NO
03_Bedroom 17	NO (-89%)	NO
03_Bedroom 18	NO (-85%)	NO
03_Bedroom 19	NO (-67%)	NO
03_Bedroom 20	NO (-67%)	NO
03_Bedroom 21	NO (-61%)	NO
03_Bedroom 22	NO (-61%)	NO
03_Bedroom 23	NO (-67%)	NO
03_Bedroom 24	NO (-67%)	NO
03_Bedroom 25	NO (-67%)	NO
03_Bedroom 26	NO (-61%)	NO
03_Bedroom 27	NO (-61%)	NO
03_Bedroom 28	NO (-61%)	NO
03_Bedroom 29	NO (-67%)	NO
03_Bedroom 30	NO (-67%)	NO
03_Bedroom 31	NO (-67%)	NO
03_Bedroom 32	NO (-61%)	NO
03_Bedroom 33	NO (-61%)	NO
03_Bedroom 34	NO (-67%)	NO
03_Bedroom 35	NO (-73%)	NO
03_Bedroom 36	NO (-60%)	NO
03_Bedroom 37	NO (-60%)	NO
03_Bedroom 38	NO (-60%)	NO
03_Bedroom 39	NO (-60%)	NO
03_Bedroom 40	NO (-60%)	NO
03_Bedroom 41	NO (-60%)	NO
03_Bedroom 42	NO (-60%)	NO
03_Bedroom 43	NO (-77%)	NO
00_Comms Room 1	N/A	N/A

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	3817	3817
External area [m^2]	4542	4542
Weather	SOU	SOU
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	1105	1550
Average U-value [W/m^2K]	0.24	0.34
Alpha value* [%]	37.8	22.8

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
100	**Hotels**
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	1.76	3.02
Cooling	4.36	4.56
Auxiliary	7.96	8.05
Lighting	8.97	8.64
Hot water	67.64	67.49
Equipment*	62.2	62.2
TOTAL**	**90.69**	**91.77**

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

Energy Production by Technology [kWh/m^2]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	99.79	106.34
Primary energy [kWh_{PE}/m^2]	133.78	135.44
Total emissions [kg/m^2]	12.27	12.43

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] No Heating or Cooling										
	Actual	26.1	0	2.8	0	0	2.56	0	2.64	0
	Notional	23.5	0	2.5	0	0	2.64	0	----	----
[ST] Fan coil systems, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	8.7	47.1	0.9	2.6	20	2.56	5	2.64	5
	Notional	5.7	43.3	0.6	2.7	10.9	2.64	4.4	----	----
[ST] Fan coil systems, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	4.3	637.2	0.5	35.4	22	2.56	5	2.64	5
	Notional	3.6	584.2	0.4	36.9	13.2	2.64	4.4	----	----
[ST] Fan coil systems, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	40.9	0	4.4	0	26.6	2.56	0	2.64	0
	Notional	153.8	0	16.2	0	34.7	2.64	0	----	----
[ST] No Heating or Cooling										
	Actual	106.5	0	11.6	0	76.9	2.56	0	2.64	0
	Notional	128	0	13.5	0	51.1	2.64	0	----	----
[ST] No Heating or Cooling										
	Actual	116	0	12.6	0	0	2.56	0	2.64	0
	Notional	103.2	0	10.9	0	0	2.64	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	4.4	0	0	0	0
	Notional	0	0	0	0	11.5	0	0	----	----
[ST] No Heating or Cooling										
	Actual	0.3	0	0	0	7.9	2.56	0	2.64	0
	Notional	15.1	0	1.6	0	17.4	2.64	0	----	----
[ST] Fan coil systems, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	0	0	0	0	42.1	0	0	0	0
	Notional	0	0	0	0	20.1	0	0	----	----
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	0	1271.6	0	70.7	0	0	5	0	5
	Notional	0	1256.2	0	79.3	0	0	4.4	----	----

Key to terms

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

APPENDIX C: COMMERCIAL LOW ZERO CARBON TECHNOLOGIES BRUKL

See following pages for details.

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

PI Littlehampton

As designed

Date: Wed Apr 02 16:31:05 2025

Administrative information

Building Details

Address:

Certifier details

Name:

Telephone number:

Address: , ,

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.6"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.6

BRUKL compliance module version: v6.1.e.0

Foundation area [m^2]: 936.79

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	12.43	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	8.49	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	135.44	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	91.86	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.15	0.15	External Wall (450)
Floors	0.18	0.12	0.15	Exposed Floor
Pitched roofs	0.16	-	-	No pitched roofs in project
Flat roofs	0.18	0.1	0.1	Roof
Windows** and roof windows	1.6	1.29	1.42	W-T02-DG-FX
Rooflights***	2.2	-	-	No rooflights in project
Personnel doors^	1.6	1.36	1.57	D-T02-DG-OP
Vehicle access & similar large doors	1.3	-	-	No vehicle access or similar large doors in project
High usage entrance doors	3	-	-	No high usage entrance doors in project

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]

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

** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m^2K

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

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

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	>0.95

1- NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
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.					

2- MVHR VRF - BED (130 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	7.05	-	-	0.87
Standard value	2.5*	5	N/A	N/A	N/A
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.					

3- MVHR VRF - FOH (6 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	7.05	-	0.96	0.87
Standard value	2.5*	5	N/A	1.5^	N/A
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. ^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

4- MVHR - EN (130 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	-	-	-	0.93
Standard value	2.5*	N/A	N/A	N/A	N/A
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.					

5- EX (00_Refuse 1)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
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.					

6- NV - ST

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
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.					

7- MVHR - LN (5 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0	-	-	0.69	0.93
Standard value	N/A	N/A	N/A	1.5^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

8- MVHR (9 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	-	-	0.96	0.87
Standard value	2.5*	N/A	N/A	1.5^	N/A
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. ^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

9- S+E (4 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0	-	-	1.8	-
Standard value	N/A	N/A	N/A	1.5^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

10- NV - CM (00_Comms Room 1)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0	4.4	-	-	-
Standard value	N/A	3	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- ASHP-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	3.56	0
Standard value	2*	N/A
* Standard shown is for all types except absorption and gas engine heat pumps.		

Zone-level mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
00_Refuse 1	-	-	0.6	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
00_Kitchen 1	-	-	-	-	-	-	-	-	1.8	-	N/A
00_Kitchen 2	-	-	-	-	-	-	-	-	1.8	-	N/A
00_Kitchen 3	-	-	-	-	-	-	-	-	1.8	-	N/A
00_Kitchen 4	-	-	-	-	-	-	-	-	1.8	-	N/A

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
00_Stair 1	100	-	-
00_Stair 2	100	-	-
00_Stair 3	100	-	-
00_Circulation 1	110	-	-
00_Circulation 2	110	-	-
00_Circulation 3	110	-	-
00_Circulation 4	100	-	-
00_Circulation 5	100	-	-
00_Linen 1	110	-	-
00_Linen 2	110	-	-
00_Refuse 1	95	-	-
00_Cycle Store 1	110	-	-
00_Plantroom 1	110	-	-
00_Plantroom 2	110	-	-
00_Plantroom 3	110	-	-
00_Plantroom 4	110	-	-
00_Kitchen 1	110	-	-
00_Kitchen 2	110	-	-
00_Kitchen 3	110	-	-
00_Kitchen 4	110	-	-
00_WC 1	100	-	-
00_WC 2	100	-	-
00_WC 3	100	-	-
00_WC 4	100	-	-
00_WC 5	100	-	-
00_WC 6	100	-	-
00_WC 7	100	-	-
00_WC 8	100	-	-
00_WC 9	100	-	-
00_Store 1	110	-	-
00_Store 2	110	-	-
00_Store 3	110	-	-
00_Store 4	110	-	-
00_Store 5	110	-	-
00_Store 6	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
00_Restaurant 1	95	95	-
00_Restaurant 2	95	95	-
00_Reception 1	95	95	-
00_Reception 2	95	95	-
00_Beer Store 1	110	-	-
00_Team Room 1	95	-	-
00_Staff Office 1	95	-	-
01_Bedroom 1	100	-	-
01_Bedroom 2	100	-	-
01_Bedroom 3	100	-	-
01_Bedroom 4	100	-	-
01_Bedroom 5	100	-	-
01_Bedroom 6	100	-	-
01_Bedroom 7	100	-	-
01_Bedroom 8	100	-	-
01_Bedroom 9	100	-	-
01_Bedroom 10	100	-	-
01_Bedroom 11	100	-	-
01_Bedroom 12	100	-	-
01_Bedroom 13	100	-	-
01_Bedroom 14	100	-	-
01_Bedroom 15	100	-	-
01_Bedroom 16	100	-	-
01_Bedroom 17	100	-	-
01_Bedroom 18	100	-	-
01_Bedroom 19	100	-	-
01_Bedroom 20	100	-	-
01_Bedroom 21	100	-	-
01_Bedroom 22	100	-	-
01_Bedroom 23	100	-	-
01_Bedroom 24	100	-	-
01_Bedroom 25	100	-	-
01_Bedroom 26	100	-	-
01_Bedroom 27	100	-	-
01_Bedroom 28	100	-	-
01_Bedroom 29	100	-	-
01_Bedroom 30	100	-	-
01_Bedroom 31	100	-	-
01_Bedroom 32	100	-	-
01_Bedroom 33	100	-	-
01_Bedroom 34	100	-	-
01_Bedroom 35	100	-	-
01_Bedroom 36	100	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
01_Bedroom 37	100	-	-
01_Bedroom 38	100	-	-
01_Bedroom 39	100	-	-
01_Bedroom 40	100	-	-
01_Bedroom 41	100	-	-
01_Bedroom 42	100	-	-
01_Bedroom 43	100	-	-
01_Bedroom 44	100	-	-
01_Ensuite 1	110	-	-
01_Ensuite 2	110	-	-
01_Ensuite 3	110	-	-
01_Ensuite 4	110	-	-
01_Ensuite 5	110	-	-
01_Ensuite 6	110	-	-
01_Ensuite 7	110	-	-
01_Ensuite 8	110	-	-
01_Ensuite 9	110	-	-
01_Ensuite 10	110	-	-
01_Ensuite 11	110	-	-
01_Ensuite 12	110	-	-
01_Ensuite 13	110	-	-
01_Ensuite 14	110	-	-
01_Ensuite 15	110	-	-
01_Ensuite 16	110	-	-
01_Ensuite 17	110	-	-
01_Ensuite 18	110	-	-
01_Ensuite 19	110	-	-
01_Ensuite 20	110	-	-
01_Ensuite 21	110	-	-
01_Ensuite 22	110	-	-
01_Ensuite 23	110	-	-
01_Ensuite 24	110	-	-
01_Ensuite 25	110	-	-
01_Ensuite 26	110	-	-
01_Ensuite 27	110	-	-
01_Ensuite 28	110	-	-
01_Ensuite 29	110	-	-
01_Ensuite 30	110	-	-
01_Ensuite 31	110	-	-
01_Ensuite 32	110	-	-
01_Ensuite 33	110	-	-
01_Ensuite 34	110	-	-
01_Ensuite 35	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
01_Ensuite 36	110	-	-
01_Ensuite 37	110	-	-
01_Ensuite 38	110	-	-
01_Ensuite 39	110	-	-
01_Ensuite 40	110	-	-
01_Ensuite 41	110	-	-
01_Ensuite 42	110	-	-
01_Ensuite 43	110	-	-
01_Ensuite 44	110	-	-
01_Stair 1	100	-	-
01_Stair 2	100	-	-
01_Circulation 1	100	-	-
01_Circulation 2	100	-	-
01_Circulation 3	100	-	-
01_Circulation 4	100	-	-
01_Circulation 5	100	-	-
01_Circulation 6	100	-	-
01_Circulation 7	100	-	-
01_Circulation 8	100	-	-
01_Linen 1	110	-	-
02_Bedroom 1	100	-	-
02_Bedroom 2	100	-	-
02_Bedroom 3	100	-	-
02_Bedroom 4	100	-	-
02_Bedroom 5	100	-	-
02_Bedroom 6	100	-	-
02_Bedroom 7	100	-	-
02_Bedroom 8	100	-	-
02_Bedroom 9	100	-	-
02_Bedroom 10	100	-	-
02_Bedroom 11	100	-	-
02_Bedroom 12	100	-	-
02_Bedroom 13	100	-	-
02_Bedroom 14	100	-	-
02_Bedroom 15	100	-	-
02_Bedroom 16	100	-	-
02_Bedroom 17	100	-	-
02_Bedroom 18	100	-	-
02_Bedroom 19	100	-	-
02_Bedroom 20	100	-	-
02_Bedroom 21	100	-	-
02_Bedroom 22	100	-	-
02_Bedroom 23	100	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
02_Bedroom 24	100	-	-
02_Bedroom 25	100	-	-
02_Bedroom 26	100	-	-
02_Bedroom 27	100	-	-
02_Bedroom 28	100	-	-
02_Bedroom 29	100	-	-
02_Bedroom 30	100	-	-
02_Bedroom 31	100	-	-
02_Bedroom 32	100	-	-
02_Bedroom 33	100	-	-
02_Bedroom 34	100	-	-
02_Bedroom 35	100	-	-
02_Bedroom 36	100	-	-
02_Bedroom 37	100	-	-
02_Bedroom 38	100	-	-
02_Bedroom 39	100	-	-
02_Bedroom 40	100	-	-
02_Bedroom 41	100	-	-
02_Bedroom 42	100	-	-
02_Bedroom 43	100	-	-
02_Ensuite 1	110	-	-
02_Ensuite 2	110	-	-
02_Ensuite 3	110	-	-
02_Ensuite 4	110	-	-
02_Ensuite 5	110	-	-
02_Ensuite 6	110	-	-
02_Ensuite 7	110	-	-
02_Ensuite 8	110	-	-
02_Ensuite 9	110	-	-
02_Ensuite 10	110	-	-
02_Ensuite 11	110	-	-
02_Ensuite 12	110	-	-
02_Ensuite 13	110	-	-
02_Ensuite 14	110	-	-
02_Ensuite 15	110	-	-
02_Ensuite 16	110	-	-
02_Ensuite 17	110	-	-
02_Ensuite 18	110	-	-
02_Ensuite 19	110	-	-
02_Ensuite 20	110	-	-
02_Ensuite 21	110	-	-
02_Ensuite 22	110	-	-
02_Ensuite 23	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
02_Ensuite 24	110	-	-
02_Ensuite 25	110	-	-
02_Ensuite 26	110	-	-
02_Ensuite 27	110	-	-
02_Ensuite 28	110	-	-
02_Ensuite 29	110	-	-
02_Ensuite 30	110	-	-
02_Ensuite 31	110	-	-
02_Ensuite 32	110	-	-
02_Ensuite 33	110	-	-
02_Ensuite 34	110	-	-
02_Ensuite 35	110	-	-
02_Ensuite 36	110	-	-
02_Ensuite 37	110	-	-
02_Ensuite 38	110	-	-
02_Ensuite 39	110	-	-
02_Ensuite 40	110	-	-
02_Ensuite 41	110	-	-
02_Ensuite 42	110	-	-
02_Ensuite 43	110	-	-
02_Stair 1	100	-	-
02_Stair 2	100	-	-
02_Circulation 1	100	-	-
02_Circulation 2	100	-	-
02_Circulation 3	100	-	-
02_Circulation 4	100	-	-
02_Circulation 5	100	-	-
02_Circulation 6	100	-	-
02_Linen 1	110	-	-
03_Bedroom 1	100	-	-
03_Bedroom 2	100	-	-
03_Bedroom 3	100	-	-
03_Bedroom 4	100	-	-
03_Bedroom 5	100	-	-
03_Bedroom 6	100	-	-
03_Bedroom 7	100	-	-
03_Bedroom 8	100	-	-
03_Bedroom 9	100	-	-
03_Bedroom 10	100	-	-
03_Bedroom 11	100	-	-
03_Bedroom 12	100	-	-
03_Bedroom 13	100	-	-
03_Bedroom 14	100	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
03_Bedroom 15	100	-	-
03_Bedroom 16	100	-	-
03_Bedroom 17	100	-	-
03_Bedroom 18	100	-	-
03_Bedroom 19	100	-	-
03_Bedroom 20	100	-	-
03_Bedroom 21	100	-	-
03_Bedroom 22	100	-	-
03_Bedroom 23	100	-	-
03_Bedroom 24	100	-	-
03_Bedroom 25	100	-	-
03_Bedroom 26	100	-	-
03_Bedroom 27	100	-	-
03_Bedroom 28	100	-	-
03_Bedroom 29	100	-	-
03_Bedroom 30	100	-	-
03_Bedroom 31	100	-	-
03_Bedroom 32	100	-	-
03_Bedroom 33	100	-	-
03_Bedroom 34	100	-	-
03_Bedroom 35	100	-	-
03_Bedroom 36	100	-	-
03_Bedroom 37	100	-	-
03_Bedroom 38	100	-	-
03_Bedroom 39	100	-	-
03_Bedroom 40	100	-	-
03_Bedroom 41	100	-	-
03_Bedroom 42	100	-	-
03_Bedroom 43	100	-	-
03_Ensuite 1	110	-	-
03_Ensuite 2	110	-	-
03_Ensuite 3	110	-	-
03_Ensuite 4	110	-	-
03_Ensuite 5	110	-	-
03_Ensuite 6	110	-	-
03_Ensuite 7	110	-	-
03_Ensuite 8	110	-	-
03_Ensuite 9	110	-	-
03_Ensuite 10	110	-	-
03_Ensuite 11	110	-	-
03_Ensuite 12	110	-	-
03_Ensuite 13	110	-	-
03_Ensuite 14	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
03_Ensuite 15	110	-	-
03_Ensuite 16	110	-	-
03_Ensuite 17	110	-	-
03_Ensuite 18	110	-	-
03_Ensuite 19	110	-	-
03_Ensuite 20	110	-	-
03_Ensuite 21	110	-	-
03_Ensuite 22	110	-	-
03_Ensuite 23	110	-	-
03_Ensuite 24	110	-	-
03_Ensuite 25	110	-	-
03_Ensuite 26	110	-	-
03_Ensuite 27	110	-	-
03_Ensuite 28	110	-	-
03_Ensuite 29	110	-	-
03_Ensuite 30	110	-	-
03_Ensuite 31	110	-	-
03_Ensuite 32	110	-	-
03_Ensuite 33	110	-	-
03_Ensuite 34	110	-	-
03_Ensuite 35	110	-	-
03_Ensuite 36	110	-	-
03_Ensuite 37	110	-	-
03_Ensuite 38	110	-	-
03_Ensuite 39	110	-	-
03_Ensuite 40	110	-	-
03_Ensuite 41	110	-	-
03_Ensuite 42	110	-	-
03_Ensuite 43	110	-	-
03_Stair 1	100	-	-
03_Stair 2	100	-	-
03_Circulation 1	100	-	-
03_Circulation 2	100	-	-
03_Circulation 3	100	-	-
03_Circulation 4	100	-	-
03_Circulation 5	100	-	-
03_Circulation 6	100	-	-
03_Linen 1	110	-	-
00_Comms Room 1	110	-	-

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00_Restaurant 1	YES (+157%)	NO
00_Restaurant 2	NO (-4%)	NO
00_Reception 1	NO (-80%)	NO
00_Reception 2	NO (-90%)	NO
00_Team Room 1	NO (-68%)	NO
00_Staff Office 1	YES (+44%)	NO
01_Bedroom 1	NO (-81%)	NO
01_Bedroom 2	NO (-55%)	NO
01_Bedroom 3	NO (-56%)	NO
01_Bedroom 4	NO (-52%)	NO
01_Bedroom 5	NO (-72%)	NO
01_Bedroom 6	NO (-76%)	NO
01_Bedroom 7	NO (-76%)	NO
01_Bedroom 8	NO (-76%)	NO
01_Bedroom 9	NO (-72%)	NO
01_Bedroom 10	NO (-72%)	NO
01_Bedroom 11	NO (-72%)	NO
01_Bedroom 12	NO (-76%)	NO
01_Bedroom 13	NO (-76%)	NO
01_Bedroom 14	NO (-76%)	NO
01_Bedroom 15	NO (-76%)	NO
01_Bedroom 16	NO (-76%)	NO
01_Bedroom 17	NO (-76%)	NO
01_Bedroom 18	NO (-89%)	NO
01_Bedroom 19	NO (-85%)	NO
01_Bedroom 20	NO (-67%)	NO
01_Bedroom 21	NO (-67%)	NO
01_Bedroom 22	NO (-61%)	NO
01_Bedroom 23	NO (-61%)	NO
01_Bedroom 24	NO (-67%)	NO
01_Bedroom 25	NO (-67%)	NO
01_Bedroom 26	NO (-67%)	NO
01_Bedroom 27	NO (-61%)	NO
01_Bedroom 28	NO (-61%)	NO
01_Bedroom 29	NO (-61%)	NO
01_Bedroom 30	NO (-67%)	NO
01_Bedroom 31	NO (-67%)	NO
01_Bedroom 32	NO (-67%)	NO
01_Bedroom 33	NO (-61%)	NO
01_Bedroom 34	NO (-61%)	NO
01_Bedroom 35	NO (-67%)	NO
01_Bedroom 36	NO (-73%)	NO
01_Bedroom 37	NO (-60%)	NO
01_Bedroom 38	NO (-60%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
01_Bedroom 39	NO (-60%)	NO
01_Bedroom 40	NO (-60%)	NO
01_Bedroom 41	NO (-60%)	NO
01_Bedroom 42	NO (-60%)	NO
01_Bedroom 43	NO (-60%)	NO
01_Bedroom 44	NO (-77%)	NO
02_Bedroom 1	NO (-81%)	NO
02_Bedroom 2	NO (-55%)	NO
02_Bedroom 3	NO (-55%)	NO
02_Bedroom 4	NO (-66%)	NO
02_Bedroom 5	NO (-76%)	NO
02_Bedroom 6	NO (-76%)	NO
02_Bedroom 7	NO (-76%)	NO
02_Bedroom 8	NO (-72%)	NO
02_Bedroom 9	NO (-72%)	NO
02_Bedroom 10	NO (-72%)	NO
02_Bedroom 11	NO (-76%)	NO
02_Bedroom 12	NO (-76%)	NO
02_Bedroom 13	NO (-76%)	NO
02_Bedroom 14	NO (-76%)	NO
02_Bedroom 15	NO (-76%)	NO
02_Bedroom 16	NO (-76%)	NO
02_Bedroom 17	NO (-89%)	NO
02_Bedroom 18	NO (-85%)	NO
02_Bedroom 19	NO (-67%)	NO
02_Bedroom 20	NO (-67%)	NO
02_Bedroom 21	NO (-61%)	NO
02_Bedroom 22	NO (-61%)	NO
02_Bedroom 23	NO (-67%)	NO
02_Bedroom 24	NO (-67%)	NO
02_Bedroom 25	NO (-67%)	NO
02_Bedroom 26	NO (-61%)	NO
02_Bedroom 27	NO (-61%)	NO
02_Bedroom 28	NO (-61%)	NO
02_Bedroom 29	NO (-67%)	NO
02_Bedroom 30	NO (-67%)	NO
02_Bedroom 31	NO (-67%)	NO
02_Bedroom 32	NO (-61%)	NO
02_Bedroom 33	NO (-61%)	NO
02_Bedroom 34	NO (-67%)	NO
02_Bedroom 35	NO (-73%)	NO
02_Bedroom 36	NO (-60%)	NO
02_Bedroom 37	NO (-60%)	NO
02_Bedroom 38	NO (-60%)	NO
02_Bedroom 39	NO (-60%)	NO
02_Bedroom 40	NO (-60%)	NO
02_Bedroom 41	NO (-60%)	NO
02_Bedroom 42	NO (-60%)	NO
02_Bedroom 43	NO (-77%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
03_Bedroom 1	NO (-81%)	NO
03_Bedroom 2	NO (-55%)	NO
03_Bedroom 3	NO (-55%)	NO
03_Bedroom 4	NO (-66%)	NO
03_Bedroom 5	NO (-76%)	NO
03_Bedroom 6	NO (-76%)	NO
03_Bedroom 7	NO (-76%)	NO
03_Bedroom 8	NO (-72%)	NO
03_Bedroom 9	NO (-72%)	NO
03_Bedroom 10	NO (-72%)	NO
03_Bedroom 11	NO (-76%)	NO
03_Bedroom 12	NO (-76%)	NO
03_Bedroom 13	NO (-76%)	NO
03_Bedroom 14	NO (-76%)	NO
03_Bedroom 15	NO (-76%)	NO
03_Bedroom 16	NO (-76%)	NO
03_Bedroom 17	NO (-89%)	NO
03_Bedroom 18	NO (-85%)	NO
03_Bedroom 19	NO (-67%)	NO
03_Bedroom 20	NO (-67%)	NO
03_Bedroom 21	NO (-61%)	NO
03_Bedroom 22	NO (-61%)	NO
03_Bedroom 23	NO (-67%)	NO
03_Bedroom 24	NO (-67%)	NO
03_Bedroom 25	NO (-67%)	NO
03_Bedroom 26	NO (-61%)	NO
03_Bedroom 27	NO (-61%)	NO
03_Bedroom 28	NO (-61%)	NO
03_Bedroom 29	NO (-67%)	NO
03_Bedroom 30	NO (-67%)	NO
03_Bedroom 31	NO (-67%)	NO
03_Bedroom 32	NO (-61%)	NO
03_Bedroom 33	NO (-61%)	NO
03_Bedroom 34	NO (-67%)	NO
03_Bedroom 35	NO (-73%)	NO
03_Bedroom 36	NO (-60%)	NO
03_Bedroom 37	NO (-60%)	NO
03_Bedroom 38	NO (-60%)	NO
03_Bedroom 39	NO (-60%)	NO
03_Bedroom 40	NO (-60%)	NO
03_Bedroom 41	NO (-60%)	NO
03_Bedroom 42	NO (-60%)	NO
03_Bedroom 43	NO (-77%)	NO
00_Comms Room 1	N/A	N/A

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	3817	3817
External area [m^2]	4542	4542
Weather	SOU	SOU
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	1105	1550
Average U-value [W/m^2K]	0.24	0.34
Alpha value* [%]	37.8	22.8

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
100	**Hotels**
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	1.29	3.02
Cooling	3.15	4.56
Auxiliary	7.96	8.05
Lighting	8.97	8.64
Hot water	54.34	67.49
Equipment*	62.2	62.2
TOTAL**	**75.71**	**91.77**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	13.38	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*13.38*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	99.79	106.34
Primary energy [kWh_{PE}/m^2]	91.86	135.44
Total emissions [kg/m^2]	8.49	12.43

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] No Heating or Cooling										
	Actual	26.1	0	2.1	0	0	3.5	0	3.5	0
	Notional	23.5	0	2.5	0	0	2.64	0	----	----
[ST] Fan coil systems, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	8.7	47.1	0.7	1.9	20	3.5	7.05	3.5	7.05
	Notional	5.7	43.3	0.6	2.7	10.9	2.64	4.4	----	----
[ST] Fan coil systems, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	4.3	637.2	0.3	25.1	22	3.5	7.05	3.5	7.05
	Notional	3.6	584.2	0.4	36.9	13.2	2.64	4.4	----	----
[ST] Fan coil systems, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	40.9	0	3.2	0	26.6	3.5	0	3.5	0
	Notional	153.8	0	16.2	0	34.7	2.64	0	----	----
[ST] No Heating or Cooling										
	Actual	106.5	0	8.5	0	76.9	3.5	0	3.5	0
	Notional	128	0	13.5	0	51.1	2.64	0	----	----
[ST] No Heating or Cooling										
	Actual	116	0	9.2	0	0	3.5	0	3.5	0
	Notional	103.2	0	10.9	0	0	2.64	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	4.4	0	0	0	0
	Notional	0	0	0	0	11.5	0	0	----	----
[ST] No Heating or Cooling										
	Actual	0.3	0	0	0	7.9	3.5	0	3.5	0
	Notional	15.1	0	1.6	0	17.4	2.64	0	----	----
[ST] Fan coil systems, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	0	0	0	0	42.1	0	0	0	0
	Notional	0	0	0	0	20.1	0	0	----	----
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	0	1271.6	0	80.3	0	0	4.4	0	4.4
	Notional	0	1256.2	0	79.3	0	0	4.4	----	----

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