LOW ZERO CARBON REPORT &

SUSTAINABILITY STATEMENT

FOR

THE PROPOSED DEVELOPMENT

AT LAND AT NORWAY LANE

LITTLEHAMPTON

BN17 6LS

FOR

HALLWAY PROPERTIES LTD

ITD Consultants Limited
5 Acorn Business Park
Northarbour Road
Portsmouth
PO6 3TH

[redacted]

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Rev: B

Schedule of Revisions and Amendments

Revision	By	Date	Checked	Details / Description
A	TP	12.03.2025	KM	Issue for Comment
B	TP	02.04.25	KM	Comments incorporated. SBEM calculations revised to suit revised layout.

1.0. INTRODUCTION

This sustainable energy statement has been prepared to demonstrate compliance with Arun District Council's adopted planning policy in relation to energy/sustainability matters and relates to proposed development at Land at Norway Lane, Littlehampton.

Special attention has been paid to Policy ECC SP2 with regards to the incorporation of energy efficient measures and requirement for 10% of the predicted energy usage to be produced on site, from a renewable or low carbon source.

The proposed development comprises 9 retail units, 7 of which are formed within existing buildings to be refurbished, with the remaining 2 proposed to be constructed as part of the project. Further details are provided in section 2.0.

This report provides a general description of the proposed building services strategy for the building, as well as an analysis of potential low-zero carbon (LZC) technologies to be implemented on site.

The predicted energy usage of each of the proposed retail units has been assessed using the NCM approved calculation tool (iSBEM).

2.0. BUILDING DESCRIPTION & DESIGN

2.1. Description

The project comprises 9 new retail units with a combined total floor area of approx. 12,000m^2. The retail units at this stage are proposed to be shell only, with only statutory incoming services provided.

It is anticipated that the larger retail units will be occupied by a range of different tenants, from supermarkets to garden centres.

Due to the buildings being speculative at this stage, the larger units have been modelled as both general retail and chilled retail warehouse sales areas, to assess the energy usage in different scenarios.

Unit A9 has also been modelled as a gym, as this has been proposed as one of the potential uses.

The smallest unit (A3) has been modelled as a combination of "Food Preparation Area" and "Eating & Drinking Area", as this is the anticipated usage of the building.

2.2. Building Elements

The fabric of the buildings is to be upgraded, so that a high level of energy efficiency can be achieved; this will ensure that minimal energy is required for space heating and cooling. The performance of building elements is considered in terms of 'heat transfer coefficients'; otherwise referred to as 'U-values'.

These values are a measure of the rate of heat transfer through a building element over a given area, under standardised conditions. The U-values used for this project are demonstrated in the table below shown in green:

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	0.26	0.26	Room 1/2 - Wall
Floors	0.18	0.18	0.18	Room 1/5 - Ext.Floor
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.16	0.16	Room 1/6 - Roof
Windows** and roof windows	1.6	1.6	1.6	Room 1/2 - Wall/Window 1
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.6	1.6	Room 1/3 - Wall/Door 1
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	1.6	1.6	Room 1/2 - Wall/Door 1

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

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.
^ For fire doors, limiting U-value is 1.8 W/m²K

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

The U-values of the proposed building elements equal or improve on current Building Regulations requirements. The buildings include a significant amount of glazing on the southern side which will reduce the energy usage of artificial lighting and allow some solar gain.

Some solar gain will be beneficial during most parts of the year and will reduce space heating requirements, but will produce some requirement for a comfort cooling solution during the summer.

2.3. Air Tightness

Air tightness will be to a high standard with a target rate of 5m^3/h/m^2.

2.4. Lighting

Lighting throughout the property will be based on high efficiency LED luminaires. Control systems will be provided and will include daylight-compensating automatic controls and PIRs where applicable.

The lighting included in the models has been given a luminous efficacy of 120 lumens / circuit watt. This is considered to be very achievable for prospective Cat-B fit out tenants.

2.5. Anticipated Heating Ventilation & Air Conditioning (HVAC) Systems

The HVAC systems anticipated to be serving the buildings will typically be a combination of variable refrigerant flow (VRF) heating and cooling, with a centralised ventilation system with heat recovery via a thermal wheel.

The seasonal coefficient of performance (SCOP) of the VRF systems has been set at 3. This value is considered to be very conservative, with most comparable systems being capable of operating in excess of this SCOP.

The energy efficiency ratio (EER) and seasonal energy efficiency ratio (SEER) of the VRF systems has been set at 3 and 6, respectively. These are also considered conservative values, and easily achievable at Cat-B fit out stage.

The ventilation system serving the building has been modelled with a heat recovery efficiency of 75% and a specific fan power (SFP) of 2W/l/s. Again, these values are considered achievable.

Domestic hot water production is by a standalone electric water heater with a storage volume of 200 litres, and 50mm of factory fitted insulation.

3.0. ARUN PLANNING POLICY REQUIREMENTS

The primary requirement of the Arun Planning Policy with regards to this sustainability statement is Policy ECC SP2. This is shown below.

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[(40)] 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.

In addition to the integration of low carbon HVAC systems to improve the energy efficiency of the property, a minimum of 10% of the development's predicted energy requirements must be produced on site by low carbon energy generation.

Arun District Design Guide Section K on "Climate Change & Sustainability" outlines design choices that should be considered during the design stage of a development. These are identified in an "Energy Hierarchy" (Figure 230, Arun District Design Guide, Section K.01 – shown adjacent).

Figure 230: The Energy Hierarchy

Each of the items within this hierarchy are addressed below:

1. Site Location – Due to the majority of the project being a refurbishment of existing buildings, the first item is not applicable.

2. Form and Orientation – Item 2 has limited applicability due to much of the building being existing. The orientation of glazing to improve natural light to the front of the building has been considered by the architect during the preliminary design stage. This orientation is also considered to reduce the heating requirements for the building by increasing solar gains.

3. High Efficiency Building Fabric – Item 3 has been addressed by proposing the improvement of the building fabrics in accordance with Building Regulations Part L 2021. As the building is existing, significant improvements are proposed to the building fabrics to improve their efficiency.

4. High Efficiency Building Services – Item 4 is addressed within this document, where proposed HVAC systems for the units are based on VRF heating and cooling, which typically has a coefficient of performance in excess of 3, meaning that 3kW of heating are provided for every 1kW of energy utilised. In addition to this, mechanical ventilation with heat recovery has been proposed, both improving the energy efficiency of the building and allowing for the improvement of indoor air quality by means of filtration.

5. Renewable Technology – Item 5 is addressed by the incorporation of solar PV systems to provide renewable, low carbon energy to the development. In accordance with Arun Plan Policy ECC SP2, the size of the required solar systems has been calculated within this report to provide a minimum of 10% of the development's energy usage.

6. Energy Monitoring – At this stage of the development the buildings will only be provided with statutory services, as a "shell". For this reason, the energy monitoring item has limited relevance, however it is proposed that all incoming tenants install dedicated energy monitoring for HVAC, general power, and lighting.

4.0. METHODOLOGY & ENERGY DEMAND

The buildings were modelled using Integrated Environmental Solutions IESVE 2025 software and assessed for Building Regulations Part L 2021 compliance via the Standardised Building Energy Model (SBEM) method using the Architect's thermal property details and mechanical and electrical services as described in Section 2.0.

The results of the SBEM Compliance Reports are shown within Appendix 1 of this document

The larger units (all units except A3 & A9) have been modelled as both "Retail Warehouse Sales Area – Chilled" and a "Retail Warehouse Sales Area – General" to assess the anticipated energy consumption and the PV system required to provide 10% of each building's energy, in accordance with Arun Planning Policy ECC SP2.

Unit A9 has been modelled as a gym, as this is the proposed use of the space.

Unit A3 has been modelled as partly food preparation space and partly eating/drink space to simulate its use as a small restaurant/café establishment.

The outputs from the SBEM calculations are shown in tables on the **next page**.

As these results indicate, the energy demand of a retail warehouse building with significant chilled area is much higher than a building that is mostly "general use".

The energy demand for unit A3 is significantly higher than the others due to its anticipated usage as an eating/drinking establishment. Despite this, the PV system required to comply with Par L of the building regulations is relatively small due to the small size of the unit.

Retail Warehouse Sales Area – Chilled

Unit	Target CO2 Emission Rate (TER) kgCO2/m2.Annum	Building CO2 Emission Rate (BER) kgCO2/m2.Annum	Target Primary energy rate (TPER) kWh/m2.Annum	Building Primary energy rate (BPER) kWh/m2.Annum	Energy Consumption by End Use kWh/m2.Annum	Equipment Energy Consumption kWh/m2.Annum	Total Energy Comsumption kWh/m2.Annum	PV Array Kilo-Watt Peak Output kWp	Energy Production from Photovoltaic Systems kWh/m2	Percentage of Energy Consumption Produced by PV Array
A1	8.34	6.09	91.67	66.09	72.14	199.69	271.83	85	28.65	11%
A2	7.19	5.64	78.94	61.05	62.25	151.17	213.42	100	22.12	10%
A4	8.96	5.76	98.47	62.44	73.3	219	292.3	50	32.25	11%
A5	6.7	5.23	73.63	56.67	56.66	130.71	187.37	85	19.38	10%
A6	7.95	5.74	87.07	61.21	60.26	119.63	179.89	70	20.33	11%
A7	8.98	6.28	98.84	68.14	76.42	219	295.42	50	31.61	11%
A8	10.59	6.24	116.31	67.38	74.31	219	293.31	50	30.09	10%

Retail Warehouse Sales Area – General

Unit	Target CO2 Emission Rate (TER) kgCO2/m2.Annum	Building CO2 Emission Rate (BER) kgCO2/m2.Annum	Target Primary energy rate (TPER) kWh/m2.Annum	Building Primary energy rate (BPER) kWh/m2.Annum	Energy Consumption by End Use kWh/m2.Annum	Equipment Energy Consumption kWh/m2.Annum	Total Energy Consumption kWh/m2.Annum	PV Array Kilo-Watt Peak Output kWp	Energy Production from Photovoltaic Systems kWh/m2	Percentage of Energy Consumption Produced by PV Array
A1	5.03	4.9	54.37	52.71	42.57	23.35	65.92	25	8	12%
A2	4.67	4.6	50.68	49.4	39.73	21.51	61.24	35	7.36	12%
A4	5.41	5.25	58.85	55.86	46.1	20.26	66.36	15	9.68	15%
A5	4.71	4.56	51.43	49.14	39.08	23.51	62.59	30	6.84	11%
A6	4.96	4.2	54.39	45.55	35.81	20.26	56.07	20	5.81	10%
A7	5.24	4.86	57.2	51.98	43.48	20.26	63.74	15	9.48	15%
A8	5.09	4.21	55.73	45.37	35.8	20.26	56.06	10	6.02	11%

Restaurant and Cafes/Drinking Establishments and Hot Drinks Takeaway

Unit	Target CO2 Emission Rate (TER) kgCO2/m2.Annum	Building CO2 Emission Rate (BER) kgCO2/m2.Annum	Target Primary energy rate (TPER) kWh/m2.Annum	Building Primary energy rate (BPER) kWh/m2.Annum	Energy Consumption by End Use kWh/m2.Annum	Equipment Energy Consumption kWh/m2.Annum	Total Energy Consumption kWh/m2.Annum	PV Array Kilo-Watt Peak Output kWp	Energy Production from Photovoltaic Systems kWh/m2	Percentage of Energy Consumption Produced by PV Array
A3	22.28	22.02	243.1	235.3	194.18	157.67	351.85	10	40.45	11%

General Assembly and Leasure - Fitness Suite / Gym

Unit	Target CO2 Emission Rate (TER) kgCO2/m2.Annum	Building CO2 Emission Rate (BER) kgCO2/m2.Annum	Target Primary energy rate (TPER) kWh/m2.Annum	Building Primary energy rate (BPER) kWh/m2.Annum	Energy Consumption by End Use kWh/m2.Annum	Equipment Energy Consumption kWh/m2.Annum	Total Energy Consumption kWh/m2.Annum	PV Array Kilo-Watt Peak Output kWp	Energy Production from Photovoltaic Systems kWh/m2	Percentage of Energy Consumption Produced by PV Array
A9	10.72	9.79	116.82	105.53	87.33	84.6	171.93	15	18.06	11%

5.0. LZC / RENEWABLE FEASIBILITY

Low-Zero carbon technologies are systems that emit significantly lower levels of carbon dioxide than conventional systems. Renewable technologies are those which take their energy from sources which are considered to be inexhaustible (e.g. sunlight, wind etc.). Emissions associated with renewables are generally considered to be negligible and the technologies are frequently referred to as 'zero carbon'.

Whilst the capital cost of installing these technologies is typically higher than conventional technologies, their use can significantly reduce a building's CO2 emissions. This section discusses the LZC and renewable technologies that are proposed to be incorporated in this development.

Air Source Heat Pumps / Variable Refrigerant Flow (VRF)

A VRF or split heating and cooling system is considered to be a viable option for reducing the emissions and energy use of the development. This is because these systems have high coefficients of performance (COPs), providing in excess of 3kW of heating per kW of electricity used. In addition to this the systems are typically capable of providing cooling, which is beneficial for both occupant comfort and health and safety.

Heating and cooling is accomplished by moving a refrigerant through the systems outdoor and indoor units via distribution pipework. Compressors, condensers, expansion valves and evaporators are used to change the state of the refrigerant to provide space heating and cooling.

The system is appropriate for this development because it provides significant improvement in efficient use of energy compared to a traditional gas fired or direct electric system whilst also providing comfort cooling for the summer months. In addition to this, the systems do not use fossil fuels so emissions at the point of use are 0.

Solar Energy

Photovoltaic (PV) panels are considered the only viable option for generating low carbon/renewable power at the site. This is done by converting solar radiation into direct current electricity using semi-conductors that exhibit the photovoltaic effect.

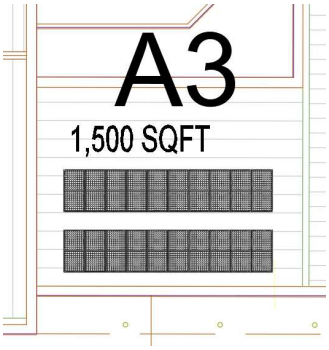
There is negligible over-shading of the development and installation of PV panels is proposed to be incorporated into the development.

The proposed PV system for the development will provide a minimum of 10% of the anticipated energy usage of the site. If the buildings are utilised as general retail spaces, the required PV array for the site will be a minimum of 175kWp. If the buildings are utilised as chilled retail spaces, the required PV array for the site will be a minimum of 515kWp.

It is anticipated that that some of the buildings may be used partially for chilled retail space, whilst others may be used fully for general retail space, therefore at Cat-B fit out stage, the PV requirement will be assessed and the PV

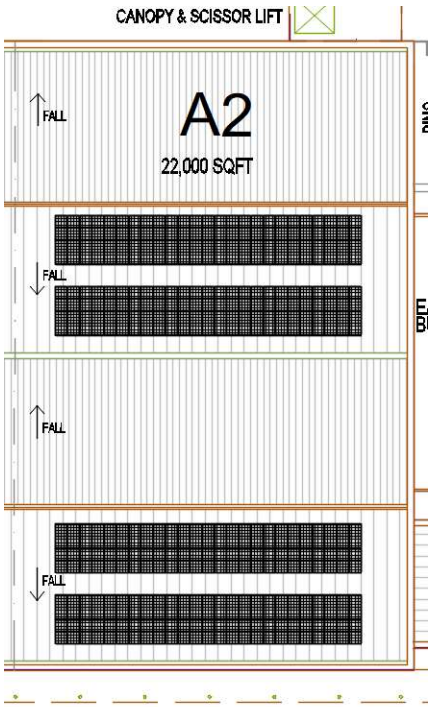
installations expanded as required to comply with Arun Planning Policy ECC SP2.

The minimum anticipated PV array required is 10kWp for unit A3. Depending on the output of the panels, this array would likely consist of approximately 20 panels, with an inverter located within the building. The roof area of the unit is more than capable of accommodating the PV system, as shown on a roof plan below.



Unit A3 Anticipated PV Array - NTS

The largest potential PV array required is 100kW for unit A2, based on a largely refrigerated sales area. Depending on the output of the panels, this array would likely consist of approximately 200 panels, with possibly multiple inverters located within the building. It is considered unlikely a system of this size will be required. The roof area of the unit is more than capable of accommodating the PV system, as shown on a roof plan below.



Unit A2 Anticipated Maximum 100kWp PV Array – NTS

It is worth noting at this stage that structural analysis of the roof should be undertaken to ensure that it is capable of supporting the required PV systems, especially in the scenario where larger PV systems are required.

Renewable Technology		**Applicability**	**Conclusion**
Solar Water Heating		Solar water heating requires extensive distribution pipe-works with buffer vessels. The hot water demand for this application is minimum and therefore the use of solar thermal technology is impractical	Not applicable
Ground Source Heat Pump (GSHP)		Vertical boreholes are considered to be a significant unnecessary expense in this case when compared to the cost effectiveness of an ASHP solution.	Considered but rejected due to excessive cost
Air Source Heat Pump (ASHP)		The outdoor units for the proposed VRF systems could be located externally to the rear of the buildings.	Applicable
Photovoltaic		The available roof area can support a significant amount of Photovoltaic panels, to produce renewable electricity.	Applicable
Biomass boiler		On the basis of concerns over air quality issues from flue discharge; regular deliveries of biomass; fuel storage; and relatively high maintenance, this technology is not considered appropriate for the development.	Not applicable
CHP		The effective use of CHP requires a consistent and significant application for the rejected heat generated. The retail site is not considered to present such an application.	Not applicable

6.0. CONCLUSION

The development will include a significant refurbishment of both the fabric of the buildings, improving the thermal properties of the development, and the mechanical and electrical services provided to the units.

The proposed method of heating and cooling the units will be VRF systems, which are highly efficient ASHP based systems, powered by a combination of on-site generated and grid-supplied electricity, to limit carbon emissions. These are intended to be reflective of the most likely heating and cooling system to be installed by incoming tenants.

Each of the units will be provided with a new independent photovoltaic (PV) generation system, which will be suitably sized both to comply with Part L of the Building Regulations, based on the incoming tenant's Cat-B fit out, and also to provide a minimum of 10% of the total energy demand of the building, in accordance with Arun Local Planning Policy ECC SP2.

Arun District Design Guide Section K on "Climate Change & Sustainability" has been considered throughout the report with specific attention to the energy efficiency of the buildings.

Alternative LZC systems have been considered at this stage however the VRF (ASHP) space heating & comfort cooling system is considered the most efficient and suitable method for delivery of heating and cooling within this development.

Appendix 1

Units A1, A2, A4, A5, A6, A7 & A8

SBEM BRUKL Report – General Retail Area

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Unit A1

As designed

Date: Wed Apr 02 11:22:24 2025

Administrative information

Building Details

Address: Watersmead Retail Park, Littlehampton, BN17 6LS

Certifier details

Name: Tim Pearce

Telephone number: 023 9243 5050

Address: 5 Acorn Business Park, Portsmouth, PO6 3TH

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.28

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

Foundation area [m²]: 1958.51

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	5.03	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	4.9	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	54.37	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	52.71	
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	0.26	0.26	NT000019_W-1
Floors	0.18	0.18	0.18	NT000019_F
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.16	0.16	NT000019_C
Windows** and roof windows	1.6	1.6	1.6	NT000019_W2_O0
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.6	1.6	NT000019_W-1_O0
Vehicle access & similar large doors	1.3	1.3	1.3	NT000019_W-1_O2
High usage entrance doors	3	1.6	1.6	NT000019_W2_O1

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

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]

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

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

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

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

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

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- Main system

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	6	-	2	0.75
Standard value	2.5*	5	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

1- SYST0001-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.015
Standard value	1	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

Shell and core configuration

Zone	Assumed shell?
Unit A1	YES
Unit A1 Mezz	YES

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
Unit A1	120	100	1.5
Unit A1 Mezz	120	-	-

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?
Unit A1	NO (-80.1%)	NO
Unit A1 Mezz	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?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	1958.5	1958.5
External area [m^2]	4389.7	4389.7
Weather	SOU	SOU
Infiltration [m^3/hm^2@ 50Pa]	5	5
Average conductance [W/K]	947.71	1476.1
Average U-value [W/m^2K]	0.22	0.34
Alpha value* [%]	44.71	23.72

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

Building Use

% Area	Building Type
100	**Retail/Financial and Professional Services**
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	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	6.56	8.57
Cooling	4.29	6.64
Auxiliary	16.17	11.27
Lighting	12.64	8.17
Hot water	2.92	2.04
Equipment*	23.35	23.35
TOTAL**	**42.57**	**36.69**

* 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	8	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*8*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	136.05	186.73
Primary energy [kWh_{PE}/m^2]	52.71	54.37
Total emissions [kg/m^2]	4.9	5.03

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] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	78.2	57.9	6.6	4.3	16.2	3.31	3.75	3.5	6
	Notional	81.5	105.3	8.6	6.6	11.3	2.64	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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Unit A2

As designed

Date: Wed Apr 02 16:03:46 2025

Administrative information

Building Details

Address: Watersmead Retail Park, Littlehampton, BN17 6LS

Certifier details

Name: Timothy Pearce

Telephone number: 023 9243 5050

Address: 5 Acorn Business Park, Portsmouth, P06 3TH

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.28

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

Foundation area [m²]: 1491.75

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	4.67	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	4.55	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	50.68	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	48.83	
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	0.26	0.26	NT00000A_W0
Floors	0.18	0.18	0.18	NT00000A_F
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.16	0.16	NT00001C_C
Windows** and roof windows	1.6	1.6	1.6	NT00001C_W1_O0
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.6	1.6	NT00000A_W0_O0
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	1.6	1.6	NT00001C_W1_O3

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

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]

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

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

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

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

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

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- Main VRF system

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3	6	-	2	0.75
Standard value	2.5*	5	N/A	2^	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.

1- SYST0001-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.015
Standard value	1	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

Shell and core configuration

Zone	Assumed shell?
Unit A2 Back Of House	NO
Unit A2	NO
Unit A2 Back Of House Mezz	NO

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
Unit A2 Back Of House	120	-	-
Unit A2	120	120	1.25
Unit A2 Back Of House Mezz	120	-	-

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?
Unit A2 Back Of House	N/A	N/A
Unit A2	NO (-78.8%)	NO
Unit A2 Back Of House Mezz	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]	2983.5	2983.5
External area [m^2]	5967.7	5967.7
Weather	SOU	SOU
Infiltration [m^3/hm^2@ 50Pa]	5	5
Average conductance [W/K]	1242.13	1909.12
Average U-value [W/m^2K]	0.21	0.32
Alpha value* [%]	40.62	18.03

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

Building Use

% Area	Building Type
100	**Retail/Financial and Professional Services**
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	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	6.37	6.9
Cooling	4.76	6.41
Auxiliary	12.69	11.17
Lighting	13.4	7.85
Hot water	2.5	1.93
Equipment*	21.51	21.51
TOTAL**	**39.73**	**34.26**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	7.74	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*7.74*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	136.18	167.12
Primary energy [kWh_{PE}/m^2]	48.83	50.68
Total emissions [kg/m^2]	4.55	4.67

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] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	68.5	67.7	6.4	4.8	12.7	2.99	3.95	3	6
	Notional	65.6	101.5	6.9	6.4	11.2	2.64	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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Unit A4

As designed

Date: Wed Apr 02 11:55:53 2025

Administrative information

Building Details

Address: Watersmead Retail Park, Littlehampton, BN17 6LS

Certifier details

Name: Timothy Pearce

Telephone number: 023 9243 5050

Address: 5 Acorn Business Park, Portsmouth, PO6 3TH

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.28

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

Foundation area [m²]: 972

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	5.41	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	5.25	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	58.85	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	55.86	
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	0.26	0.26	NT000009_W-1
Floors	0.18	0.18	0.18	NT000009_F
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.16	0.16	NT000009_C
Windows** and roof windows	1.6	1.6	1.6	NT000009_W-1_O0
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.6	1.6	NT000009_W3_O0
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	1.6	1.6	NT000009_W-1_O1

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

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]

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

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

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

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

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

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- Main VRF system

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3	6	-	2	0.75
Standard value	2.5*	5	N/A	2^	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.

1- SYST0001-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.015
Standard value	1	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

Shell and core configuration

Zone	Assumed shell?
Unit A4 Gym	NO

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
Unit A4 Gym	120	120	1.25

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?
Unit A4 Gym	NO (-64.3%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	972	972
External area [m^2]	2573.7	2573.7
Weather	SOU	SOU
Infiltration [m^3/hm^2@ 50Pa]	5	3
Average conductance [W/K]	565.18	567.86
Average U-value [W/m^2K]	0.22	0.22
Alpha value* [%]	53.86	9.64

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

Building Use

% Area	Building Type
100	**Retail/Financial and Professional Services**
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	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	10.2	4.63
Cooling	3.51	5.55
Auxiliary	14.12	10.14
Lighting	15.37	17.81
Hot water	2.91	1.7
Equipment*	20.26	20.26
TOTAL**	**46.1**	**39.83**

* 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	9.68	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*9.68*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	159.54	131.89
Primary energy [kWh_{PE}/m^2]	55.86	58.85
Total emissions [kg/m^2]	5.25	5.41

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] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	109.7	49.8	10.2	3.5	14.1	2.99	3.95	3	6
	Notional	44	87.9	4.6	5.5	10.1	2.64	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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Unit A5

As designed

Date: Wed Apr 02 13:02:52 2025

Administrative information

Building Details

Address: Watersmead Retail Park, Littlehampton, BN17 6LS

Certifier details

Name: Timothy Pearce

Telephone number: 023 9243 5050

Address: 5 Acorn Business Park, Portsmouth, PO6 3TH

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.28

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

Foundation area [m²]: 1375.22

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	4.71	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	4.56	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	51.43	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	49.14	
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	0.26	0.26	NT000002_W0
Floors	0.18	0.18	0.18	NT000002_F
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.16	0.16	NT000002_C
Windows** and roof windows	1.6	1.6	1.6	NT000002_W0_O0
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.6	1.6	NT000002_W1_O0
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	1.6	1.6	NT000008_W1_O2

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

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]

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

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

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

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

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

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- Main VRF system

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3	6	-	2	0.75
Standard value	2.5*	5	N/A	2^	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.

1- SYST0001-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.015
Standard value	1	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

Shell and core configuration

Zone	Assumed shell?
Unit A5 Retail	NO
Unit A5 Office First	NO
Unit A5 Back of House	NO
Unit A5 Entrance Lobby	NO
Unit A5 Ground Offices	NO
Unit A5 Circulation	NO
Unit A5 WCs	NO

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
Unit A5 Retail	120	120	1.25
Unit A5 Office First	120	-	-
Unit A5 Back of House	120	-	-
Unit A5 Entrance Lobby	120	-	-
Unit A5 Ground Offices	120	-	-
Unit A5 Circulation	120	-	-
Unit A5 WCs	120	-	-

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?
Unit A5 Retail	NO (-21.1%)	NO
Unit A5 Office First	N/A	N/A
Unit A5 Back of House	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Unit A5 Entrance Lobby	YES (+84.7%)	NO
Unit A5 Ground Offices	N/A	N/A
Unit A5 Circulation	N/A	N/A
Unit A5 WCs	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?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	2750.5	2750.5
External area [m^2]	4984.8	4984.8
Weather	SOU	SOU
Infiltration [m^3/hm^2@ 50Pa]	5	3
Average conductance [W/K]	1077.68	991.65
Average U-value [W/m^2K]	0.22	0.2
Alpha value* [%]	41.98	7.15

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

Building Use

% Area	Building Type
100	**Retail/Financial and Professional Services**
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	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	5.71	2.34
Cooling	5.84	5.65
Auxiliary	12.21	9.87
Lighting	12.6	14.89
Hot water	2.73	2.12
Equipment*	23.51	23.51
TOTAL**	**39.08**	**34.88**

* 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	6.84	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*6.84*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	144.35	111.81
Primary energy [kWh_{PE}/m^2]	49.14	51.43
Total emissions [kg/m^2]	4.56	4.71

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] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	61.4	82.9	5.7	5.8	12.2	2.99	3.95	3	6
	Notional	22.3	89.5	2.3	5.7	9.9	2.64	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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Unit A6

As designed

Date: Wed Apr 02 13:13:01 2025

Administrative information

Building Details

Address: Watersmead Retail Park, Littlehampton, BN17 6LS

Certifier details

Name: Timothy Pearce

Telephone number: 023 9243 5050

Address: 5 Acorn Business Park, Portsmouth, PO6 3TH

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.28

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

Foundation area [m²]: 1044

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	4.96	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	4.2	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	54.39	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	45.55	
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	0.26	0.26	NT000017_W0
Floors	0.18	0.18	0.18	NT000017_F
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.16	0.16	NT00000C_C
Windows** and roof windows	1.6	1.6	1.6	NT000017_W0_O0
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.6	1.6	NT000017_W2_O0
Vehicle access & similar large doors	1.3	1.3	1.3	NT000017_W2_O1
High usage entrance doors	3	1.6	1.6	NT000017_W0_O2

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

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]

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

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

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

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

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

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- Main VRF system

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3	6	-	2	0.75
Standard value	2.5*	5	N/A	2^	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.

1- SYST0001-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.015
Standard value	1	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

Shell and core configuration

Zone	Assumed shell?
Unit A6 Ground	NO
Unit A6 First	NO

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
Unit A6 Ground	120	120	1.25
Unit A6 First	120	120	1.25

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?
Unit A6 Ground	NO (-6%)	NO
Unit A6 First	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?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	2088	2088
External area [m^2]	2358.8	2358.8
Weather	SOU	SOU
Infiltration [m^3/hm^2@ 50Pa]	5	3
Average conductance [W/K]	507.75	489.42
Average U-value [W/m^2K]	0.22	0.21
Alpha value* [%]	45.15	8.25

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

Building Use

% Area	Building Type
100	**Retail/Financial and Professional Services**
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	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	1.92	0.36
Cooling	5.77	6.22
Auxiliary	10.79	9.3
Lighting	14.91	19.39
Hot water	2.42	1.7
Equipment*	20.26	20.26
TOTAL**	**35.81**	**36.96**

* 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	5.81	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*5.81*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	102.67	101.87
Primary energy [kWh_{PE}/m^2]	45.55	54.39
Total emissions [kg/m^2]	4.2	4.96

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] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	20.7	82	1.9	5.8	10.8	2.99	3.95	3	6
	Notional	3.4	98.5	0.4	6.2	9.3	2.64	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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Unit A7

As designed

Date: Wed Apr 02 16:07:42 2025

Administrative information

Building Details

Address: Watersmead Retail Park, Littlehampton, BN17 6LS

Certifier details

Name: Timothy Pearce

Telephone number: 023 9243 5050

Address: 5 Acorn Business Park, Portsmouth, PO6 3TH

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.28

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

Foundation area [m²]: 1044

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	5.24	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	4.92	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	57.2	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	52.68	
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	0.26	0.26	NT000006_W0
Floors	0.18	0.18	0.18	NT000006_F
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.16	0.16	NT000006_C
Windows** and roof windows	1.6	1.6	1.6	NT000006_W0_O0
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.6	1.6	NT000006_W2_O0
Vehicle access & similar large doors	1.3	1.3	1.3	NT000006_W2_O1
High usage entrance doors	3	1.6	1.6	NT000006_W0_O2

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

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]

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

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

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

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

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

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- Main VRF system

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3	6	-	2	0.75
Standard value	2.5*	5	N/A	2^	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.

1- SYST0001-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.015
Standard value	1	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

Shell and core configuration

Zone	Assumed shell?
Unit A7	NO

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
Unit A7	120	120	1.25

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?
Unit A7	NO (-6%)	NO

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]	1044	1044
External area [m^2]	2358.8	2358.8
Weather	SOU	SOU
Infiltration [m^3/hm^2@ 50Pa]	5	3
Average conductance [W/K]	507.75	431.45
Average U-value [W/m^2K]	0.22	0.18
Alpha value* [%]	43.87	5.89

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

Building Use

% Area	Building Type
100	**Retail/Financial and Professional Services**
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	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	7.21	2.42
Cooling	4.16	5.24
Auxiliary	14.12	9.28
Lighting	15.13	20.16
Hot water	2.85	1.7
Equipment*	20.26	20.26
TOTAL**	**43.48**	**38.8**

* 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	9.01	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*9.01*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	136.7	106.04
Primary energy [kWh_{PE}/m^2]	52.68	57.2
Total emissions [kg/m^2]	4.92	5.24

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] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	77.6	59.1	7.2	4.2	14.1	2.99	3.95	3	6
	Notional	23	83	2.4	5.2	9.3	2.64	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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Unit A8

As designed

Date: Mon Mar 31 16:25:54 2025

Administrative information

Building Details

Address: Watersmead Retail Park, Littlehampton, BN17 6LS

Certifier details

Name: Timothy Pearce

Telephone number: 023 9243 5050

Address: 5 Acorn Business Park, Portsmouth, PO6 3TH

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.28

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

Foundation area [m²]: 520.88

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	5.09	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	4.21	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	55.73	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	45.37	
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	0.26	0.26	NT000018_W0
Floors	0.18	0.18	0.18	NT000018_F
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.16	0.16	NT00000D_C
Windows** and roof windows	1.6	1.6	1.6	NT000018_W0_O0
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.6	1.6	NT000018_W0_O4
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	1.6	1.6	NT000018_W0_O2

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

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]

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

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

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

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

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

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- Main VRF system

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3	6	-	2	0.75
Standard value	2.5*	5	N/A	2^	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.

1- SYST0001-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.015
Standard value	1	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

Shell and core configuration

Zone	Assumed shell?
Unit A8 Ground	NO
Unit A8 First	NO

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
Unit A8 Ground	120	120	1.25
Unit A8 First	120	120	1.25

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?
Unit A8 Ground	YES (+31.1%)	NO
Unit A8 First	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?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	1041.8	1041.8
External area [m^2]	1408.6	1408.6
Weather	SOU	SOU
Infiltration [m^3/hm^2@ 50Pa]	5	3
Average conductance [W/K]	385.36	392.05
Average U-value [W/m^2K]	0.27	0.28
Alpha value* [%]	73.64	13.12

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

Building Use

% Area	Building Type
100	**Retail/Financial and Professional Services**
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	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	5	1.29
Cooling	5.1	6.73
Auxiliary	10.79	10.77
Lighting	12.06	17.38
Hot water	2.85	1.7
Equipment*	20.26	20.26
TOTAL**	**35.8**	**37.87**

* 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	6.02	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*6.02*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	126.21	118.83
Primary energy [kWh_{PE}/m^2]	45.37	55.73
Total emissions [kg/m^2]	4.21	5.09

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] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	53.8	72.4	5	5.1	10.8	2.99	3.95	3	6
	Notional	12.2	106.6	1.3	6.7	10.8	2.64	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 2

Units A1, A2, A4, A5, A6, A7 & A8

SBEM BRUKL Report – Chilled Retail Area

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Unit A1

As designed

Date: Wed Apr 02 11:33:33 2025

Administrative information

Building Details

Address: Watersmead Retail Park, Littlehampton, BN17 6LS

Certifier details

Name: Tim Pearce

Telephone number: 023 9243 5050

Address: 5 Acorn Business Park, Portsmouth, PO6 3TH

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.28

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

Foundation area [m²]: 1958.51

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	8.34	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	6.09	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	91.67	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	66.09	
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	0.26	0.26	NT000019_W-1
Floors	0.18	0.18	0.18	NT000019_F
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.16	0.16	NT000019_C
Windows** and roof windows	1.6	1.6	1.6	NT000019_W2_O0
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.6	1.6	NT000019_W-1_O0
Vehicle access & similar large doors	1.3	1.3	1.3	NT000019_W-1_O2
High usage entrance doors	3	1.6	1.6	NT000019_W2_O1

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

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]

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

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

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

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

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

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- Main system

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	6	-	2	0.75
Standard value	2.5*	5	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

1- SYST0001-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.015
Standard value	1	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

Shell and core configuration

Zone	Assumed shell?
Unit A1	YES
Unit A1 Mezz	YES

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
Unit A1	120	100	1.5
Unit A1 Mezz	120	-	-

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?
Unit A1	NO (-80.1%)	NO
Unit A1 Mezz	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?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	1958.5	1958.5
External area [m^2]	4389.7	4389.7
Weather	SOU	SOU
Infiltration [m^3/hm^2@ 50Pa]	5	5
Average conductance [W/K]	947.71	1476.1
Average U-value [W/m^2K]	0.22	0.34
Alpha value* [%]	44.71	23.72

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

Building Use

% Area	Building Type
100	**Retail/Financial and Professional Services**
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	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	0.56	2.53
Cooling	39.86	36.36
Auxiliary	16.17	13.32
Lighting	12.64	8.17
Hot water	2.92	2.04
Equipment*	199.69	199.69
TOTAL**	**72.14**	**62.42**

* 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	28.65	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*28.65*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	544.63	599.91
Primary energy [kWh_{PE}/m^2]	66.09	91.67
Total emissions [kg/m^2]	6.09	8.34

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] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	6.6	538	0.6	39.9	16.2	3.31	3.75	3.5	6
	Notional	24	575.9	2.5	36.4	13.3	2.64	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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Unit A2

As designed

Date: Wed Apr 02 16:05:06 2025

Administrative information

Building Details

Address: Watersmead Retail Park, Littlehampton, BN17 6LS

Certifier details

Name: Timothy Pearce

Telephone number: 023 9243 5050

Address: 5 Acorn Business Park, Portsmouth, P06 3TH

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.28

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

Foundation area [m²]: 1491.75

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	7.19	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	5.64	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	78.94	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	61.05	
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	0.26	0.26	NT00000A_W0
Floors	0.18	0.18	0.18	NT00000A_F
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.16	0.16	NT00001C_C
Windows** and roof windows	1.6	1.6	1.6	NT00001C_W1_O0
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.6	1.6	NT00000A_W0_O0
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	1.6	1.6	NT00001C_W1_O3

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

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]

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

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

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

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

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

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- Main VRF system

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3	6	-	2	0.75
Standard value	2.5*	5	N/A	2^	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.

1- SYST0001-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.015
Standard value	1	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

Shell and core configuration

Zone	Assumed shell?
Unit A2 Back Of House	NO
Unit A2	NO
Unit A2 Back Of House Mezz	NO

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
Unit A2 Back Of House	120	-	-
Unit A2	120	120	1.25
Unit A2 Back Of House Mezz	120	-	-

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?
Unit A2 Back Of House	N/A	N/A
Unit A2	NO (-78.8%)	NO
Unit A2 Back Of House Mezz	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]	2983.5	2983.5
External area [m^2]	5967.7	5967.7
Weather	SOU	SOU
Infiltration [m^3/hm^2@ 50Pa]	5	5
Average conductance [W/K]	1242.13	1909.12
Average U-value [W/m^2K]	0.21	0.32
Alpha value* [%]	40.62	18.03

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

Building Use

% Area	Building Type
100	**Retail/Financial and Professional Services**
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	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	2.34	2.63
Cooling	31.31	28.64
Auxiliary	12.69	12.68
Lighting	13.4	7.85
Hot water	2.5	1.93
Equipment*	151.17	151.17
TOTAL**	**62.25**	**53.73**

* 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	22.12	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*22.12*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	469.92	478.63
Primary energy [kWh_{PE}/m^2]	61.05	78.94
Total emissions [kg/m^2]	5.64	7.19

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] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	25.2	444.7	2.3	31.3	12.7	2.99	3.95	3	6
	Notional	25	453.7	2.6	28.6	12.7	2.64	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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Unit A4

As designed

Date: Wed Apr 02 11:58:33 2025

Administrative information

Building Details

Address: Watersmead Retail Park, Littlehampton, BN17 6LS

Certifier details

Name: Timothy Pearce

Telephone number: 023 9243 5050

Address: 5 Acorn Business Park, Portsmouth, PO6 3TH

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.28

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

Foundation area [m²]: 972

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	8.96	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	5.76	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	98.47	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	62.44	
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	0.26	0.26	NT000009_W-1
Floors	0.18	0.18	0.18	NT000009_F
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.16	0.16	NT000009_C
Windows** and roof windows	1.6	1.6	1.6	NT000009_W-1_O0
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.6	1.6	NT000009_W3_O0
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	1.6	1.6	NT000009_W-1_O1

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

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]

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

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

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

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

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

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- Main VRF system

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3	6	-	2	0.75
Standard value	2.5*	5	N/A	2^	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.

1- SYST0001-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.015
Standard value	1	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

Shell and core configuration

Zone	Assumed shell?
Unit A4	NO

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
Unit A4	120	120	1.25

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?
Unit A4	NO (-77.7%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	972	972
External area [m^2]	2573.7	2573.7
Weather	SOU	SOU
Infiltration [m^3/hm^2@ 50Pa]	5	5
Average conductance [W/K]	565.18	876.08
Average U-value [W/m^2K]	0.22	0.34
Alpha value* [%]	53.86	26.43

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

Building Use

% Area	Building Type
100	**Retail/Financial and Professional Services**
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	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	0.94	3.83
Cooling	39.96	39.67
Auxiliary	14.12	13.92
Lighting	15.37	7.93
Hot water	2.91	1.7
Equipment*	219	219
TOTAL**	**73.3**	**67.04**

* 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	32.25	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*32.25*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	577.81	664.77
Primary energy [kWh_{PE}/m^2]	62.44	98.47
Total emissions [kg/m^2]	5.76	8.96

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] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	10.1	567.7	0.9	40	14.1	2.99	3.95	3	6
	Notional	36.4	628.3	3.8	39.7	13.9	2.64	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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Unit A5

As designed

Date: Wed Apr 02 13:10:36 2025

Administrative information

Building Details

Address: Watersmead Retail Park, Littlehampton, BN17 6LS

Certifier details

Name: Timothy Pearce

Telephone number: 023 9243 5050

Address: 5 Acorn Business Park, Portsmouth, PO6 3TH

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.28

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

Foundation area [m²]: 1375.22

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	6.7	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	5.23	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	73.63	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	56.67	
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	0.26	0.26	NT000002_W0
Floors	0.18	0.18	0.18	NT000002_F
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.16	0.16	NT000002_C
Windows** and roof windows	1.6	1.6	1.6	NT000002_W0_O0
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.6	1.6	NT000002_W1_O0
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	1.6	1.6	NT000008_W1_O2

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

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]

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

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

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

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

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

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- Main VRF system

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3	6	-	2	0.75
Standard value	2.5*	5	N/A	2^	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.

1- SYST0001-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.015
Standard value	1	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

Shell and core configuration

Zone	Assumed shell?
Unit A5 Retail	NO
Unit A5 Office First	NO
Unit A5 Back of House	NO
Unit A5 Entrance Lobby	NO
Unit A5 Ground Offices	NO
Unit A5 Circulation	NO
Unit A5 WCs	NO

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
Unit A5 Retail	120	120	1.25
Unit A5 Office First	120	-	-
Unit A5 Back of House	120	-	-
Unit A5 Entrance Lobby	120	-	-
Unit A5 Ground Offices	120	-	-
Unit A5 Circulation	120	-	-
Unit A5 WCs	120	-	-

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?
Unit A5 Retail	NO (-69.8%)	NO
Unit A5 Office First	N/A	N/A
Unit A5 Back of House	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Unit A5 Entrance Lobby	YES (+84.7%)	NO
Unit A5 Ground Offices	N/A	N/A
Unit A5 Circulation	N/A	N/A
Unit A5 WCs	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?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	2750.5	2750.5
External area [m^2]	4984.8	4984.8
Weather	SOU	SOU
Infiltration [m^3/hm^2@ 50Pa]	5	4
Average conductance [W/K]	1077.68	1508.4
Average U-value [W/m^2K]	0.22	0.3
Alpha value* [%]	41.98	18.4

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

Building Use

% Area	Building Type
100	**Retail/Financial and Professional Services**
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	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	1.97	2.12
Cooling	27.16	24.75
Auxiliary	12.21	12.13
Lighting	12.6	8.98
Hot water	2.73	2.12
Equipment*	130.71	130.71
TOTAL**	**56.66**	**50.1**

* 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	19.38	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*19.38*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	406.97	412.18
Primary energy [kWh_{PE}/m^2]	56.67	73.63
Total emissions [kg/m^2]	5.23	6.7

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] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	21.2	385.8	2	27.2	12.2	2.99	3.95	3	6
	Notional	20.2	392	2.1	24.7	12.1	2.64	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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Unit A6

As designed

Date: Wed Apr 02 13:48:25 2025

Administrative information

Building Details

Address: Watersmead Retail Park, Littlehampton, BN17 6LS

Certifier details

Name: Timothy Pearce

Telephone number: 023 9243 5050

Address: 5 Acorn Business Park, Portsmouth, PO6 3TH

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.28

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

Foundation area [m²]: 1044

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	7.95	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	5.74	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	87.07	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	61.21	
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	0.26	0.26	NT000017_W0
Floors	0.18	0.18	0.18	NT000017_F
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.16	0.16	NT00000C_C
Windows** and roof windows	1.6	1.6	1.6	NT000017_W0_O0
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.6	1.6	NT000017_W2_O0
Vehicle access & similar large doors	1.3	1.3	1.3	NT000017_W2_O1
High usage entrance doors	3	1.6	1.6	NT000017_W0_O2

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

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]

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

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

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

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

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

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- Main VRF system

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3	6	-	2	0.75
Standard value	2.5*	5	N/A	2^	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.

1- SYST0001-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.015
Standard value	1	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

Shell and core configuration

Zone	Assumed shell?
Unit A6 Ground	NO
Unit A6 First	NO

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
Unit A6 Ground	120	120	1.25
Unit A6 First	120	120	1.25

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?
Unit A6 Ground	NO (-6%)	NO
Unit A6 First	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?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	2088	2088
External area [m^2]	2358.8	2358.8
Weather	SOU	SOU
Infiltration [m^3/hm^2@ 50Pa]	5	3
Average conductance [W/K]	507.75	489.42
Average U-value [W/m^2K]	0.22	0.21
Alpha value* [%]	45.15	8.25

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

Building Use

% Area	Building Type
100	**Retail/Financial and Professional Services**
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	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	1.61	0.22
Cooling	30.53	27.4
Auxiliary	10.79	10.46
Lighting	14.91	19.39
Hot water	2.42	1.7
Equipment*	119.63	119.63
TOTAL**	**60.26**	**59.16**

* 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	20.33	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*20.33*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	450.96	436.06
Primary energy [kWh_{PE}/m^2]	61.21	87.07
Total emissions [kg/m^2]	5.74	7.95

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] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	17.3	433.7	1.6	30.5	10.8	2.99	3.95	3	6
	Notional	2.1	433.9	0.2	27.4	10.5	2.64	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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Unit A7

As designed

Date: Wed Apr 02 16:08:18 2025

Administrative information

Building Details

Address: Watersmead Retail Park, Littlehampton, BN17 6LS

Certifier details

Name: Timothy Pearce

Telephone number: 023 9243 5050

Address: 5 Acorn Business Park, Portsmouth, PO6 3TH

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.28

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

Foundation area [m²]: 1044

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	8.98	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	6.28	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	98.84	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	68.14	
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	0.26	0.26	NT000006_W0
Floors	0.18	0.18	0.18	NT000006_F
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.16	0.16	NT000006_C
Windows** and roof windows	1.6	1.6	1.6	NT000006_W0_O0
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.6	1.6	NT000006_W2_O0
Vehicle access & similar large doors	1.3	1.3	1.3	NT000006_W2_O1
High usage entrance doors	3	1.6	1.6	NT000006_W0_O2

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

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]

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

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

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

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

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

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- Main VRF system

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3	6	-	2	0.75
Standard value	2.5*	5	N/A	2^	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.

1- SYST0001-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.015
Standard value	1	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

Shell and core configuration

Zone	Assumed shell?
Unit A7	NO

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
Unit A7	120	120	1.25

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?
Unit A7	NO (-76.9%)	NO

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]	1044	1044
External area [m^2]	2358.8	2358.8
Weather	SOU	SOU
Infiltration [m^3/hm^2@ 50Pa]	5	5
Average conductance [W/K]	507.75	838.37
Average U-value [W/m^2K]	0.22	0.36
Alpha value* [%]	43.87	19.48

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

Building Use

% Area	Building Type
100	**Retail/Financial and Professional Services**
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	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	0.38	2.4
Cooling	43.94	41.23
Auxiliary	14.12	13.93
Lighting	15.13	8.08
Hot water	2.85	1.7
Equipment*	219	219
TOTAL**	**76.42**	**67.32**

* 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	31.61	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*31.61*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	628.24	675.81
Primary energy [kWh_{PE}/m^2]	68.14	98.84
Total emissions [kg/m^2]	6.28	8.98

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] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	4.1	624.1	0.4	43.9	14.1	2.99	3.95	3	6
	Notional	22.8	653	2.4	41.2	13.9	2.64	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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Unit A8

As designed

Date: Wed Apr 02 13:38:44 2025

Administrative information

Building Details

Address: Watersmead Retail Park, Littlehampton, BN17 6LS

Certifier details

Name: Timothy Pearce

Telephone number: 023 9243 5050

Address: 5 Acorn Business Park, Portsmouth, PO6 3TH

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.28

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

Foundation area [m²]: 520.88

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	10.59	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	6.24	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	116.31	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	67.38	
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	0.26	0.26	NT000018_W0
Floors	0.18	0.18	0.18	NT000018_F
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.16	0.16	NT00000D_C
Windows** and roof windows	1.6	1.6	1.6	NT000018_W0_O0
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.6	1.6	NT000018_W0_O4
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	1.6	1.6	NT000018_W0_O2

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

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]

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

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

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

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

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

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- Main VRF system

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3	6	-	2	0.75
Standard value	2.5*	5	N/A	2^	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.

1- SYST0001-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.015
Standard value	1	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

Shell and core configuration

Zone	Assumed shell?
Unit A8 Ground	NO
Unit A8 First	NO

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
Unit A8 Ground	120	120	1.25
Unit A8 First	120	120	1.25

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?
Unit A8 Ground	YES (+31.1%)	NO
Unit A8 First	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?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	1041.8	1041.8
External area [m^2]	1408.6	1408.6
Weather	SOU	SOU
Infiltration [m^3/hm^2@ 50Pa]	5	3
Average conductance [W/K]	385.36	392.05
Average U-value [W/m^2K]	0.27	0.28
Alpha value* [%]	73.64	13.12

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

Building Use

% Area	Building Type
100	**Retail/Financial and Professional Services**
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	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	0.4	0
Cooling	48.2	46.98
Auxiliary	10.79	13.09
Lighting	12.06	17.38
Hot water	2.85	1.7
Equipment*	219	219
TOTAL**	**74.31**	**79.14**

* 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	30.09	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*30.09*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	689.06	744.11
Primary energy [kWh_{PE}/m^2]	67.38	116.31
Total emissions [kg/m^2]	6.24	10.59

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] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	4.3	684.8	0.4	48.2	10.8	2.99	3.95	3	6
	Notional	0	744.1	0	47	13.1	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 3

Unit A3 – Café/Restaurant

SBEM BRUKL Report

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Unit A3

As designed

Date: Wed Apr 02 16:06:54 2025

Administrative information

Building Details

Address: Watersmead Retail Park, Littlehampton, BN17 6LS

Certifier details

Name: Timothy Pearce

Telephone number: 023 9243 5050

Address: 5 Acorn Business Park, Portsmouth, PO6 3TH

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.28

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

Foundation area [m²]: 155

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	22.28	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	22.02	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	243.1	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	235.3	
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	0.26	0.26	NT000001_W0
Floors	0.18	0.18	0.18	NT000001_F
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.16	0.16	NT000001_C
Windows** and roof windows	1.6	1.6	1.6	NT000005_W1_O0
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.6	1.6	NT000001_W0_O0
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	1.6	1.6	NT000005_W1_O2

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

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]

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

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

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

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

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

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- Main Split system

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3	6	-	-	-
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.

1- SYST0001-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.015
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter

NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
Unit A3 Back of House	-	-	0.5	-	0.3	-	-	-	-	-	N/A
Unit A3	0.5	-	-	-	0.3	-	-	-	-	0.75	N/A

Shell and core configuration

Zone	Assumed shell?
Unit A3 Back of House	NO
Unit A3	NO

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
Unit A3 Back of House	120	-	-
Unit A3	120	120	1.25

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?
Unit A3 Back of House	N/A	N/A
Unit A3	YES (+135.8%)	NO

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]	155	155
External area [m^2]	550.4	550.4
Weather	SOU	SOU
Infiltration [m^3/hm^2@ 50Pa]	5	3
Average conductance [W/K]	187.64	150.53
Average U-value [W/m^2K]	0.34	0.27
Alpha value* [%]	103.38	15.09

* 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
100	**Restaurants and Cafes/Drinking Establishments/Takeaways**
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	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	39.51	4.72
Cooling	20.18	24.07
Auxiliary	7.28	9.1
Lighting	36.55	40.44
Hot water	90.65	86.53
Equipment*	157.67	157.67
TOTAL**	**194.18**	**164.86**

* 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	40.45	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*40.45*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	744.41	426.07
Primary energy [kWh_{PE}/m^2]	235.3	243.1
Total emissions [kg/m^2]	22.02	22.28

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] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	418.6	325.8	39.5	20.2	7.3	2.94	4.48	3	6
	Notional	44.9	381.2	4.7	24.1	9.1	2.64	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 4

Unit A9 - Gym

SBEM BRUKL Report

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Unit A9

As designed

Date: Mon Mar 31 16:35:23 2025

Administrative information

Building Details

Address: Watersmead Business Park, Littlehampton, BN17 6LS

Certifier details

Name: Timothy Pearce

Telephone number: 023 9243 5050

Address: 5 Acorn Business Park, Portsmouth, PO6 3TH

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.28

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

Foundation area [m²]: 520.88

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	10.72	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	9.79	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	116.82	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	105.53	
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	0.26	0.26	NT00000F_W1
Floors	0.18	0.18	0.18	NT00000F_F
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.16	0.16	NT00000F_C
Windows** and roof windows	1.6	1.6	1.6	NT00000F_W1_O0
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.6	1.6	NT00000F_W2_O0
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	1.6	1.6	NT00000F_W1_O2

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

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]

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

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

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

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

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

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- Main VRF system

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3	6	-	2	0.75
Standard value	2.5*	5	N/A	2^	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.

1- SYST0001-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.015
Standard value	1	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

Shell and core configuration

Zone	Assumed shell?
Unit A9	NO

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
Unit A9	120	-	-

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?
Unit A9	NO (-43.5%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	520.9	520.9
External area [m^2]	1408.6	1408.6
Weather	SOU	SOU
Infiltration [m^3/hm^2@ 50Pa]	5	3
Average conductance [W/K]	334.39	314.17
Average U-value [W/m^2K]	0.24	0.22
Alpha value* [%]	67.97	10.29

* 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
	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
100	**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	8.49	3.96
Cooling	13.64	12.44
Auxiliary	49.51	43.28
Lighting	15.68	19.46
Hot water	0	0
Equipment*	84.6	84.6
TOTAL**	**87.33**	**79.15**

* 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	18.06	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*18.06*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	285.16	234.76
Primary energy [kWh_{PE}/m^2]	105.53	116.82
Total emissions [kg/m^2]	9.79	10.72

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] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	91.4	193.8	8.5	13.6	49.5	2.99	3.95	3	6
	Notional	37.6	197.1	4	12.4	43.3	2.64	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