

# BRUKL Output Document



HM Government

Compliance with England Building Regulations Part L 2021

Project name

As designed

Date: Thu Aug 11 10:26:05 2022

## Administrative information

### Building Details

Address:

### Certifier details

Name:

Telephone number:

Address: , ,

### Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.4"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.4

BRUKL compliance check version: v6.1.b.0

Foundation area [m<sup>2</sup>]: 6096.79

## The CO<sub>2</sub> emission and primary energy rates of the building must not exceed the targets

The building does not comply with England Building Regulations Part L 2021

Target CO <sub>2</sub> emission rate (TER), kgCO <sub>2</sub> /m <sup>2</sup> :annum	3.04
Building CO <sub>2</sub> emission rate (BER), kgCO <sub>2</sub> /m <sup>2</sup> :annum	9.12
Target primary energy rate (TPER), kWh/m <sup>2</sup> :annum	0
Building primary energy rate (BPER), kWh/m <sup>2</sup> :annum	55.53
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 <sub>a</sub> -Limit	U <sub>a</sub> -Calc	U <sub>i</sub> -Calc	First surface with maximum value
Walls*	0.26	0.26	0.26	External Wall
Floors	0.18	0.18	0.18	Ground Floor
Pitched roofs	0.16	-	-	No pitched roofs in project
Flat roofs	0.18	0.18	0.18	Roof
Windows** and roof windows	1.6	1.77	1.84	0.6*2.2
Rooflights***	2.2	2.23	2.23	Rooflight
Personnel doors <sup>^</sup>	1.6	1.85	1.85	Door solid
Vehicle access & similar large doors	1.3	1.31	1.32	Vechicle door mezzanine
High usage entrance doors	3	-	-	No high usage entrance doors in project

U<sub>a</sub>-Limit = Limiting area-weighted average U-values [W/(m<sup>2</sup>K)]

U<sub>i</sub>-Calc = Calculated maximum individual element U-values [W/(m<sup>2</sup>K)]

U<sub>a</sub>-Calc = Calculated area-weighted average U-values [W/(m<sup>2</sup>K)]

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

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

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

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

Air permeability	Limiting standard	This building
m <sup>3</sup> /(h.m <sup>2</sup> ) at 50 Pa	8	3.83

## Building services

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

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

### 1- ASHP (33 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
<b>This system</b>	0.89	-	-	1.5	0.7
<b>Standard value</b>	0.93*	N/A	N/A	2^	N/A
<b>Automatic monitoring &amp; targeting with alarms for out-of-range values for this HVAC system</b>					YES

\* Standard shown is for gas single boiler systems <=2 MW output and overall for multi-boiler systems. For single boiler systems >2 MW or any individual boiler in a multi-boiler system, limiting efficiency is 0.88.

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

### 2- ASHP (3 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
<b>This system</b>	0.89	-	-	1.5	0.7
<b>Standard value</b>	0.93*	N/A	N/A	2^	N/A
<b>Automatic monitoring &amp; targeting with alarms for out-of-range values for this HVAC system</b>					YES

\* Standard shown is for gas single boiler systems <=2 MW output and overall for multi-boiler systems. For single boiler systems >2 MW or any individual boiler in a multi-boiler system, limiting efficiency is 0.88.

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

### 3- Supply and extract (2 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
<b>This system</b>	0.89	-	-	1.5	0.7
<b>Standard value</b>	0.93*	N/A	N/A	1.9^	N/A
<b>Automatic monitoring &amp; targeting with alarms for out-of-range values for this HVAC system</b>					YES

\* Standard shown is for gas single boiler systems <=2 MW output and overall for multi-boiler systems. For single boiler systems >2 MW or any individual boiler in a multi-boiler system, limiting efficiency is 0.88.

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

### 4- Htg + NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
<b>This system</b>	0.89	-	-	-	-
<b>Standard value</b>	0.93*	N/A	N/A	N/A	N/A
<b>Automatic monitoring &amp; targeting with alarms for out-of-range values for this HVAC system</b>					YES

\* Standard shown is for gas single boiler systems <=2 MW output and overall for multi-boiler systems. For single boiler systems >2 MW or any individual boiler in a multi-boiler system, limiting efficiency is 0.88.

### 1- New HWS Circuit

	Water heating efficiency	Storage loss factor [kWh/litre per day]
<b>This building</b>	0.9	0
<b>Standard value</b>	0.91	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	ID of system type	SFP [W/(l/s)]									HR efficiency	
		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	
Block 1 Circ 1	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 Circ 2	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 Circ 3	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 Circ 4	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 Circ 5	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 Circ 6	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 Circ 7	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 Circ 8	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 Circ 9	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 Circ 10	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 Circ 11	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 Circ 12	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 Canteen 1	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 kitchen 1	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 Reception 1	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 meeting room 1	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 meeting room 2	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 meeting room 3	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 meeting room 4	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 meeting room 5	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 meeting room 6	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 meeting room 7	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 meeting room 8	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 meeting room 9	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 meeting room 10	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 meeting room 11	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 meeting room 12	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 Store Room 1	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 Store Room 2	-	-	-	-	-	-	-	0.3	-	-	N/A	
Block 1 Store Room 3	-	-	-	-	-	-	-	0.3	-	-	N/A	

Zone name	SFP [W/(l/s)]									HR efficiency		
	ID of system type		A	B	C	D	E	F	G	H	I	
	Standard value		0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone
Block 1 Store Room 4	-	-	-	-	-	-	-	-	0.3	-	-	N/A
Block 1 Office 1	-	-	-	-	-	-	-	-	0.3	-	-	N/A
Block 1 Office 2	-	-	-	-	-	-	-	-	0.3	-	-	N/A
Block 1 Office 3	-	-	-	-	-	-	-	-	0.3	-	-	N/A
Block 1 Office 4	-	-	-	-	-	-	-	-	0.3	-	-	N/A
Block 1 Office 5	-	-	-	-	-	-	-	-	0.3	-	-	N/A

General lighting and display lighting		General luminaire		Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m <sup>2</sup> ]		
Standard value	95	80	0.3		
Block 1 Circ 1	-	-	-		
Block 1 Circ 2	-	-	-		
Block 1 Circ 3	-	-	-		
Block 1 Circ 4	-	-	-		
Block 1 Circ 5	-	-	-		
Block 1 Circ 6	-	-	-		
Block 1 Circ 7	-	-	-		
Block 1 Circ 8	-	-	-		
Block 1 Circ 9	-	-	-		
Block 1 Circ 10	-	-	-		
Block 1 Circ 11	-	-	-		
Block 1 Circ 12	-	-	-		
Block 1 Canteen 1	-	-	-		
Block 1 kitchen 1	-	-	-		
Block 1 WC 1	-	-	-		
Block 1 WC 2	-	-	-		
Block 1 Reception 1	-	95	-		
Block 1 meeting room 1	140	-	-		
Block 1 meeting room 2	140	-	-		
Block 1 meeting room 3	140	-	-		
Block 1 meeting room 4	140	-	-		
Block 1 meeting room 5	140	-	-		
Block 1 meeting room 6	140	-	-		
Block 1 meeting room 7	140	-	-		
Block 1 meeting room 8	140	-	-		
Block 1 meeting room 9	140	-	-		
Block 1 meeting room 10	140	-	-		
Block 1 meeting room 11	140	-	-		
Block 1 meeting room 12	140	-	-		
Block 1 Store Room 1	140	-	-		
Block 1 Store Room 2	140	-	-		
Block 1 Store Room 3	140	-	-		
Block 1 Store Room 4	140	-	-		

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m <sup>2</sup> ]
Standard value	95	80	0.3
Block 1 Office 1	140	-	-
Block 1 Office 2	140	-	-
Block 1 Office 3	140	-	-
Block 1 Office 4	140	-	-
Block 1 Office 5	140	-	-
Block 3 00 1	140	-	-
Block 3 00 2	140	-	-
Block 3 00 3	140	-	-
Block 3 00 4	140	-	-
Block 3 01 1	140	-	-
Block 3 01 2	140	-	-
Block 4 00 1	140	-	-
Block 4 00 2	140	-	-
Block 4 00 3	140	-	-
Block 4 00 4	140	-	-
Block 4 01 1	140	-	-
Block 4 01 2	140	-	-
Block 2 00 1	140	-	-
Block 2 00 2	140	-	-
Block 2 00 3	140	-	-
Block 2 00 4	140	-	-
Block 2 01 1	140	-	-
Block 2 01 2	140	-	-
Block 5 00 1	140	-	-
Block 5 00 2	140	-	-
Block 5 00 3	140	-	-

**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?
Block 1 Circ 1	NO (-67%)	NO
Block 1 Circ 2	YES (+130%)	NO
Block 1 Circ 3	NO (-27%)	NO
Block 1 Circ 4	NO (-45%)	NO
Block 1 Circ 5	NO (-71%)	NO
Block 1 Circ 6	NO (-4%)	NO
Block 1 Circ 7	NO (-20%)	NO
Block 1 Circ 8	NO (-70%)	NO
Block 1 Circ 9	NO (-83%)	NO
Block 1 Circ 10	NO (-52%)	NO
Block 1 Circ 11	NO (-73%)	NO
Block 1 Circ 12	NO (-14%)	NO
Block 1 Canteen 1	NO (-56%)	NO
Block 1 kitchen 1	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Block 1 Reception 1	YES (+80%)	NO
Block 1 meeting room 1	NO (-59%)	NO
Block 1 meeting room 2	NO (-58%)	NO
Block 1 meeting room 3	NO (-55%)	NO
Block 1 meeting room 4	NO (-90%)	NO
Block 1 meeting room 5	NO (-86%)	NO
Block 1 meeting room 6	NO (-84%)	NO
Block 1 meeting room 7	NO (-81%)	NO
Block 1 meeting room 8	NO (-83%)	NO
Block 1 meeting room 9	NO (-93%)	NO
Block 1 meeting room 10	NO (-93%)	NO
Block 1 meeting room 11	NO (-42%)	NO
Block 1 meeting room 12	NO (-41%)	NO
Block 1 Store Room 1	N/A	N/A
Block 1 Store Room 2	N/A	N/A
Block 1 Store Room 3	N/A	N/A
Block 1 Store Room 4	N/A	N/A
Block 1 Office 1	NO (-20%)	NO
Block 1 Office 2	YES (+18%)	NO
Block 1 Office 3	YES (+3%)	NO
Block 1 Office 4	NO (-61%)	NO
Block 1 Office 5	NO (-41%)	NO
Block 3 00 1	N/A	N/A
Block 3 00 2	NO (-98%)	NO
Block 3 00 3	NO (-76%)	NO
Block 3 00 4	NO (-57%)	NO
Block 3 01 1	YES (+12%)	NO
Block 3 01 2	NO (-14%)	NO
Block 4 00 1	N/A	N/A
Block 4 00 2	NO (-98%)	NO
Block 4 00 3	NO (-76%)	NO
Block 4 00 4	NO (-57%)	NO
Block 4 01 1	NO (-6%)	NO
Block 4 01 2	YES (+4%)	NO
Block 2 00 1	N/A	N/A
Block 2 00 2	NO (-98%)	NO
Block 2 00 3	NO (-75%)	NO
Block 2 00 4	NO (-56%)	NO
Block 2 01 1	NO (-12%)	NO
Block 2 01 2	YES (+10%)	NO
Block 5 00 1	NO (-35%)	NO
Block 5 00 2	NO (-46%)	NO
Block 5 00 3	NO (-34%)	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		Building Use		
	Actual	Notional	% Area	Building Type
Floor area [m <sup>2</sup> ]	6097	6097		Retail/Financial and Professional Services
External area [m <sup>2</sup> ]	12148	12148		Restaurants and Cafes/Drinking Establishments/Takeaways
Weather	LON	LON	24	<b>Offices and Workshop Businesses</b>
Infiltration [m <sup>3</sup> /hm <sup>2</sup> @ 50Pa]	4	5	76	General Industrial and Special Industrial Groups
Average conductance [W/K]	4034	4148		<b>Storage or Distribution</b>
Average U-value [W/m <sup>2</sup> K]	0.33	0.34		Hotels
Alpha value* [%]	19.57	4.57		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

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

## Energy Consumption by End Use [kWh/m<sup>2</sup>]

	Actual	Notional
Heating	31.71	39.57
Cooling	1.27	1.55
Auxiliary	2.89	2.17
Lighting	4.44	5.24
Hot water	6.11	5.91
Equipment*	30.61	30.61
<b>TOTAL**</b>	<b>46.41</b>	<b>54.45</b>

\* 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<sup>2</sup>]

	Actual	Notional
Photovoltaic systems	0	57.95
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>0</i>	<i>57.95</i>

## Energy & CO<sub>2</sub> Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m <sup>2</sup> ]	122.65	154.87
Primary energy [kWh/m <sup>2</sup> ]	55.53	-19.74
Total emissions [kg/m <sup>2</sup> ]	9.12	3.04

## HVAC Systems Performance

System Type	Heat dem MJ/m <sup>2</sup>	Cool dem MJ/m <sup>2</sup>	Heat con kWh/m <sup>2</sup>	Cool con kWh/m <sup>2</sup>	Aux con kWh/m <sup>2</sup>	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
<b>[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity</b>									
Actual	40.2	91.1	13.1	5.9	13	0.85	4.28	0.89	4.5
	Notional	12.4	115.1	4	7.3	9.3	0.86	4.4	----
<b>[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity</b>									
Actual	14.6	0	4.8	0	8.2	0.85	0	0.89	0
	Notional	4.1	0	1.3	0	4.6	0.86	0	----
<b>[ST] Multiburner radiant heaters, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity</b>									
Actual	122	0	39.9	0	0	0.85	0	0.89	0
	Notional	166	0	53.6	0	0	0.86	0	----

### Key to terms

Heat dem [MJ/m <sup>2</sup> ]	= Heating energy demand
Cool dem [MJ/m <sup>2</sup> ]	= Cooling energy demand
Heat con [kWh/m <sup>2</sup> ]	= Heating energy consumption
Cool con [kWh/m <sup>2</sup> ]	= Cooling energy consumption
Aux con [kWh/m <sup>2</sup> ]	= 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