BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

As designed

Date: Thu Feb 02 15:17:53 2023

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^2]: 6096.79

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	3.4	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	-1.85	
Target primary energy rate (TPER), $kWh/m^2.annum$	35.85	
Building primary energy rate (BPER), $kWh/m^2.annum$	-23.79	
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	0.12	0.12	External Wall
Floors	0.18	0.18	0.18	Ground Floor
Pitched roofs	0.16	-	-	No pitched roofs in project
Flat roofs	0.18	0.12	0.12	Roof
Windows** and roof windows	1.6	1.77	1.85	Door
Rooflights***	2.2	2.23	2.23	Rooflight
Personnel doors^	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

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

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

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

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

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

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
$m^3/(h.m^2)$ 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.

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

1- Nat vent Rad Panel

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- ASHP (33 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	-	-	1.5	0.7
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					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.					

3- ASHP (3 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	-	-	1.5	0.7
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. ^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

4- Supply and extract (2 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	-	-	1.5	0.7
Standard value	0.86	N/A	N/A	1.9^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

1- New HWS Circuit

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	2.5	0
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
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	Standard
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/m²]
Standard value	95	80	0.3
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	-	-
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	-	-	-

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
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	-	-
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	-	-

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 3 00 1	N/A	N/A
Block 3 00 2	NO (-98%)	NO
Block 3 00 3	NO (-80%)	NO
Block 3 00 4	NO (-65%)	NO
Block 3 01 1	NO (-8%)	NO
Block 3 01 2	NO (-29%)	NO
Block 4 00 1	N/A	N/A
Block 4 00 2	NO (-99%)	NO
Block 4 00 3	NO (-80%)	NO
Block 4 00 4	NO (-65%)	NO
Block 4 01 1	NO (-24%)	NO
Block 4 01 2	NO (-15%)	NO
Block 2 00 1	N/A	N/A
Block 2 00 2	NO (-98%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Block 2 00 3	NO (-79%)	NO
Block 2 00 4	NO (-64%)	NO
Block 2 01 1	NO (-28%)	NO
Block 2 01 2	NO (-10%)	NO
Block 5 00 1	NO (-47%)	NO
Block 5 00 2	NO (-56%)	NO
Block 5 00 3	NO (-46%)	NO
Block 1 Circ 1	NO (-72%)	NO
Block 1 Circ 2	YES (+60%)	NO
Block 1 Circ 3	NO (-29%)	NO
Block 1 Circ 4	NO (-47%)	NO
Block 1 Circ 5	NO (-73%)	NO
Block 1 Circ 6	NO (-12%)	NO
Block 1 Circ 7	NO (-31%)	NO
Block 1 Circ 8	NO (-70%)	NO
Block 1 Circ 9	NO (-81%)	NO
Block 1 Circ 10	NO (-56%)	NO
Block 1 Circ 11	NO (-73%)	NO
Block 1 Circ 12	NO (-16%)	NO
Block 1 Canteen 1	NO (-56%)	NO
Block 1 kitchen 1	NO (-99%)	NO
Block 1 Reception 1	YES (+73%)	NO
Block 1 meeting room 1	NO (-45%)	NO
Block 1 meeting room 2	NO (-57%)	NO
Block 1 meeting room 3	NO (-53%)	NO
Block 1 meeting room 4	NO (-90%)	NO
Block 1 meeting room 5	NO (-73%)	NO
Block 1 meeting room 6	NO (-83%)	NO
Block 1 meeting room 7	NO (-74%)	NO
Block 1 meeting room 8	NO (-85%)	NO
Block 1 meeting room 9	NO (-93%)	NO
Block 1 meeting room 10	NO (-90%)	NO
Block 1 meeting room 11	NO (-43%)	NO
Block 1 meeting room 12	NO (-45%)	NO
Block 1 Store Room 1	NO (-55%)	NO
Block 1 Store Room 2	NO (-95%)	NO
Block 1 Store Room 3	NO (-73%)	NO
Block 1 Store Room 4	NO (-85%)	NO
Block 1 Office 1	NO (-20%)	NO
Block 1 Office 2	YES (+17%)	NO
Block 1 Office 3	YES (+2%)	NO
Block 1 Office 4	NO (-65%)	NO
Block 1 Office 5	NO (-41%)	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]	6097	6097
External area [m^2]	12148	12148
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	4	5
Average conductance [W/K]	3286	4148
Average U-value [W/m^2K]	0.27	0.34
Alpha value* [%]	19.57	4.57

* 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
24	**Offices and Workshop Businesses**
	General Industrial and Special Industrial Groups
76	**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	7.09	12.89
Cooling	1.31	1.55
Auxiliary	2.86	2.17
Lighting	4.44	5.24
Hot water	2.31	2
Equipment*	30.61	30.61
TOTAL**	**18.01**	**23.86**

* 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	35.1	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*35.1*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	105.91	154.87
Primary energy [kWh/m^2]	-23.79	35.85
Total emissions [kg/m^2]	-1.85	3.4

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] Multiburner radiant heaters, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	101.3	0	8.9	0	0	3.15	0	3.5	0
	Notional	166	0	17.5	0	0	2.64	0	----	----
[ST] Fan coil systems, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	33	94.3	2.9	6.1	12.8	3.15	4.28	3.5	4.5
	Notional	12.4	115.1	1.3	7.3	9.3	2.64	4.4	----	----
[ST] Central heating using water: radiators, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	9.6	0	0.9	0	8.2	3.15	0	3.5	0
	Notional	4.1	0	0.4	0	4.6	2.64	0	----	----

Key to terms

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