BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Avalon House Refurb Baseline 2021

As designed

Date: Fri May 24 10:44:43 2024

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.25

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.25

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

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Foundation area [m²]: 940.34

The CO_2 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_2 emission rate (TER), $kgCO_2/m^2annum$	4.71	
Building CO_2 emission rate (BER), $kgCO_2/m^2annum$	8.61	
Target primary energy rate (TPER), kWh_{PE}/m^2annum	51.1	
Building primary energy rate (BPER), kWh_{PE}/m^2annum	92.86	
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	0.3	0.3	TP000013:Surf[1]
Floors	0.18	0.25	0.25	TP000013:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.1	0.1	L0000001:Surf[0]
Windows** and roof windows	1.6	1.4	1.4	TP000007:Surf[2]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.6	1.6	TP000015:Surf[1]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

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

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

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

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

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

*** Values for rooflights refer to the horizontal position.

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

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

Air permeability	Limiting standard	This building
$m^3/(h.m^2)$ at 50 Pa	8	15

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	>0.95

1- 03_GF01_FCU _ASHP_GF

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.5	3	0	2.6	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.

2- 04_Rad_Elec_MV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	0.3	-	0.7
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

3- 06_Rad_Elec_NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	0.3	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

4- 01_ AHU_ASHP_DV_Internal Offices_UF

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.5	3	0	2.6	0.7
Standard value	2.5*	4.5**	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.

** Standard shown is for air-cooled chillers >=400 kW. For chillers <400 kW, limiting SEER is 4.

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

5- 02_ TH_ASHP_Perimeter Offices_UF

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.5	3	0	2.6	0.7
Standard value	2.5*	4.5**	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.

** Standard shown is for air-cooled chillers >=400 kW. For chillers <400 kW, limiting SEER is 4.

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

6- 05_DX_Comms

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.5	5	-	-	0.7
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.					

"No HWS in project, or hot water is provided by HVAC system"

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
L00-Building Management	-	-	-	-	-	-	-	0.4	-	-	N/A
L00-Water Plant	-	-	-	2.6	-	-	-	-	-	-	N/A
L00-Lift Lobby	-	-	-	-	-	-	-	0.4	-	-	N/A
L00-LV Switch	-	-	-	2.6	-	-	-	-	-	-	N/A
L00-Office 2	-	-	-	-	-	-	-	0.4	-	-	N/A
L00-Reception	-	-	-	-	-	-	-	0.4	-	-	N/A
L00-WC	-	-	-	2.6	-	-	-	-	-	-	N/A
L01-Acc WC	-	-	-	2.6	-	-	-	-	-	-	N/A
L01-Lift Lobby	-	-	-	-	-	-	-	0.4	-	-	N/A
L01-WC	-	-	-	2.6	-	-	-	-	-	-	N/A
L01-WC Lobby 1	-	-	-	2.6	-	-	-	-	-	-	N/A
L01-WC Lobby 2	-	-	-	2.6	-	-	-	-	-	-	N/A
L02-Acc WC	-	-	-	2.6	-	-	-	-	-	-	N/A
L02-Lift Lobby	-	-	-	-	-	-	-	0.4	-	-	N/A
L02-Office PER3	-	-	-	-	-	-	-	0.4	-	-	N/A
L02-Office PER4	-	-	-	-	-	-	-	0.4	-	-	N/A
L02-WC	-	-	-	2.6	-	-	-	-	-	-	N/A
L02-WC Lobby 1	-	-	-	2.6	-	-	-	-	-	-	N/A
L02-WC Lobby 2	-	-	-	2.6	-	-	-	-	-	-	N/A
L00-Substation	-	-	-	2.6	-	-	-	-	-	-	N/A
L01-Office PER2	-	-	-	-	-	-	-	0.4	-	-	N/A
L01-Office PER1	-	-	-	-	-	-	-	0.4	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
L02-Office PER2	-	-	-	-	-	-	-	0.4	-	-	N/A
L02-Office PER1	-	-	-	-	-	-	-	0.4	-	-	N/A
L02-Office PER5	-	-	-	-	-	-	-	0.4	-	-	N/A
L00-Acc Shower	-	-	-	2.6	-	-	-	-	-	-	N/A
L00-Cleaners	-	-	-	2.6	-	-	-	-	-	-	N/A
L00-WC Lobby 1	-	-	-	2.6	-	-	-	-	-	-	N/A
L00-Changing 1	-	-	-	2.6	-	-	-	-	-	-	N/A
L00-Showers 1	-	-	-	2.6	-	-	-	-	-	-	N/A
L00-Showers 2	-	-	-	2.6	-	-	-	-	-	-	N/A
L00-Changing 2	-	-	-	2.6	-	-	-	-	-	-	N/A
L00-Comms	-	-	-	2.6	-	-	-	-	-	-	N/A
L00-AHU	-	-	-	2.6	-	-	-	-	-	-	N/A
L00-Cycle Store	-	-	-	-	-	-	-	0.4	-	-	N/A
L00-Office 1	-	-	-	-	-	-	-	0.4	-	-	N/A
L01-Office PER4	-	-	-	-	-	-	-	0.4	-	-	N/A
L01-Office PER4	-	-	-	-	-	-	-	0.4	-	-	N/A
L01-Office PER3	-	-	-	-	-	-	-	0.4	-	-	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
L00-Building Management	60	-	-
L00-Water Plant	60	-	-
L00-Lift Lobby	60	-	-
L00-LV Switch	60	-	-
L00-Office 2	60	-	-
L00-Reception	60	120	1.125
L00-Stairs 01	60	-	-
L00-Stairs 02	60	-	-
L00-Stairs 03	60	-	-
L00-WC	60	-	-
L01-Acc WC	60	-	-
L01-Lift Lobby	60	-	-
L01-Stairs 01	60	-	-
L01-Stairs 02	60	-	-
L01-Stairs 03	60	-	-
L01-WC	60	-	-
L01-WC Lobby 1	60	-	-
L01-WC Lobby 2	60	-	-
L02-Acc WC	60	-	-
L02-Lift Lobby	60	-	-
L02-Office CORE 2	60	-	-
L02-Office PER3	60	-	-

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
L02-Office PER4	60	-	-
L02-Stairs 01	60	-	-
L02-Stairs 02	60	-	-
L02-Stairs 03	60	-	-
L02-WC	60	-	-
L02-WC Lobby 1	60	-	-
L02-WC Lobby 2	60	-	-
L00-Substation	60	-	-
L01-Office PER2	60	-	-
L01-Office PER1	60	-	-
L02-Office PER2	60	-	-
L02-Office PER1	60	-	-
L02-Office PER5	60	-	-
L02-Office CORE 1	60	-	-
L00-Acc Shower	60	-	-
L00-Cleaners	60	-	-
L00-WC Lobby 1	60	-	-
L00-Changing 1	60	-	-
L00-Showers 1	60	-	-
L00-Showers 2	60	-	-
L00-Changing 2	60	-	-
L00-Comms	60	-	-
L00-AHU	60	-	-
L00-Cycle Store	60	-	-
L00-Office 1	60	-	-
L01-Office PER4	60	-	-
L01-Office CORE	60	-	-
L01-Office PER4	60	-	-
L01-Office PER3	60	-	-

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?
L00-Building Management	N/A	N/A
L00-Lift Lobby	YES (+110.5%)	NO
L00-Office 2	NO (-39.8%)	NO
L00-Reception	YES (+31.9%)	NO
L01-Lift Lobby	N/A	N/A
L02-Lift Lobby	N/A	N/A
L02-Office CORE 2	NO (-14.5%)	NO
L02-Office PER3	NO (-6.2%)	NO
L02-Office PER4	NO (-19.9%)	NO
L01-Office PER2	NO (-10.3%)	NO
L01-Office PER1	NO (-48.1%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L02-Office PER2	YES (+30.6%)	NO
L02-Office PER1	NO (-30.6%)	NO
L02-Office PER5	NO (-6.2%)	NO
L02-Office CORE 1	YES (+145.9%)	NO
L00-Comms	N/A	N/A
L00-Cycle Store	N/A	N/A
L00-Office 1	NO (-56.4%)	NO
L01-Office PER4	NO (-59.6%)	NO
L01-Office CORE	YES (+176.9%)	NO
L01-Office PER4	NO (-79%)	NO
L01-Office PER3	NO (-40.9%)	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]	2821	2821
External area [m^2]	3075.9	3075.9
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	15	3
Average conductance [W/K]	1424.41	1355.61
Average U-value [W/m^2K]	0.46	0.44
Alpha value* [%]	24.84	10

* 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
100	**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	15.3	3.75
Cooling	6.07	3.75
Auxiliary	15.27	7.75
Lighting	14.25	11.12
Hot water	11.71	10.57
Equipment*	46.66	46.66
TOTAL**	**62.6**	**36.94**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	2.34
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*2.34*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	142.31	90.7
Primary energy [kWh_{PE}/m^2]	92.86	51.1
Total emissions [kg/m^2]	8.61	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] Fan coil systems, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	118.5	42.1	13.4	5.3	12.1	2.45	2.23	2.5	3
	Notional	25	69.7	2.5	4.2	8.8	2.78	4.63	----	----
[ST] Constant volume system (variable fresh air rate), [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	53.4	67.6	4.5	11.6	39.1	3.27	1.62	2.5	3
	Notional	11.4	91.3	1.1	5.5	8.9	2.78	4.63	----	----
[ST] Fan coil systems, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	93	59.9	10.5	7.5	14.3	2.45	2.23	2.5	3
	Notional	25.4	76.8	2.5	4.6	10	2.78	4.63	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	238.1	0	78.5	0	0	0.84	0	1	0
	Notional	140.9	0	27.7	0	0	1.41	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	59.7	0	19.7	0	5.6	0.84	0	1	0
	Notional	15.1	0	3	0	0.7	1.41	0	----	----
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	0	0	0	0	0	2.45	3.74	2.5	5
	Notional	0	0	0	0	0	2.78	4.63	----	----

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