

Project name

W310

As built

Date: Thu May 23 15:29:15 2024

Administrative information

Building Details

Address: W310, University of Reading , Pepper Lane,
Reading, RG6 6PU

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.b.0

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.25

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Cory Skrzypkowski

Telephone number: 01623 573009

Address: K2, Mill 3, Pleasley Vale Business Park,
Mansfield, NG19 8RLCriterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	23.2
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	23.2
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	-1.8
Are emissions from the building less than or equal to the target?	BER <= TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.25	0.72	"L0000007_W3_A1"
Floor	0.25	0.17	0.25	"L0000017_F"
Roof	0.25	0.17	0.72	"L000001E_C_A0"
Windows***, roof windows, and rooflights	2.2	1.01	1.01	"L0000011_W-1_O0"
Personnel doors	2.2	1.4	1.4	"L0000011_W11_O0"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)] U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)] U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)]				
* There might be more than one surface where the maximum U-value occurs. ** 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. 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	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	5.31

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

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- RADS and MVHR (WC - LGH80RVS-E)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	-	-	-
Standard value	0.91*	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 gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

2- RADS and NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	-	-	-
Standard value	0.91*	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 gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

3- ACU and MVHR (AV Studio - LGH080RVX-E)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	6.97	11.9	-	1.51	0.79
Standard value	2.5*	N/A	N/A	1.9^	0.5
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. For types <=12 kW output, refer to EN 14825 for limiting standards.					
^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

4- ACU and MVHR (Ceramics Workshop - LGH100RVX-E)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	6.97	11.9	-	1.51	0.79
Standard value	2.5*	N/A	N/A	1.9^	0.5
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. For types <=12 kW output, refer to EN 14825 for limiting standards.					
^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

5- RADS and Extract

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	-	-	-
Standard value	0.91*	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 gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

6- UFH and NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	-	-	-
Standard value	0.91*	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 gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

7- ACU and MVHR (Metal Workshop - LGH15RVX-E)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	6.97	11.9	-	0.96	0.83
Standard value	2.5*	N/A	N/A	1.9^	0.5
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. For types <=12 kW output, refer to EN 14825 for limiting standards.					
^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

8- ACU and MVHR (Workshop 1 - LGH50RVX-E)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	6.97	11.9	-	1.19	0.78
Standard value	2.5*	N/A	N/A	1.9^	0.5
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. For types <=12 kW output, refer to EN 14825 for limiting standards.					
^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

9- ACU and MVHR (Workshop 2 - LGH50RVX-E)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	6.97	11.9	-	1.19	0.78
Standard value	2.5*	N/A	N/A	1.9^	0.5
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. For types <=12 kW output, refer to EN 14825 for limiting standards.					
^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

1- SYST0008-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.91	-
Standard value	0.8	N/A

1- CCHP Generator

	CHPQA quality index	CHP electrical efficiency
This building	105	0.39
Standard value	105	0.2

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
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 supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

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	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L00 - Acc. WC	-	-	0.3	1.5	-	-	-	-	-	0.81	0.5
L00 - Acc. WC/Shower	-	-	0.3	1.5	-	-	-	-	-	0.81	0.5
L00 - WC	-	-	0.3	1.5	-	-	-	-	-	0.81	0.5
L00 - PDRA	0.8	-	-	-	-	-	-	-	-	-	N/A
L00 - Shop	0.8	-	-	-	-	-	-	-	-	-	N/A
L00 - Welfare	0.8	-	-	-	-	-	-	-	-	-	N/A
L00 - Jet Wash	-	-	1.1	-	-	-	-	-	-	-	N/A
L00 - Dark Room	-	1.1	1.1	-	-	-	-	-	-	-	N/A
L00 - Spray Booth	-	-	1	-	-	-	-	-	-	-	N/A
L00 - Tech Office	-	-	0.3	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			General lighting [W]
Zone name	Luminaire	Lamp	Display lamp	
Standard value	60	60	22	
L00 - Acc. WC	-	94	-	23
L00 - Acc. WC/Shower	-	94	-	52
L00 - WC	-	117	-	196
L00 - AV Store	83	-	-	16
L00 - Circulation 1	-	120	-	118
L00 - Circulation 3	-	72	-	96
L00 - Circulation 2	-	72	-	101
L00 - Flexible space / Gallery	116	-	-	497
L00 - Group Studio	116	-	-	438
L00 - PDRA	-	87	-	62
L00 - Shop	87	-	-	12
L00 - Welfare	87	-	-	20
L00 - AV Studio	113	-	-	389
L00 - Ceramics	156	-	-	288
L00 - Jet Wash	156	-	-	107
L00 - Screen Printing	156	-	-	320

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
L00 - Dark Room	157	-	-	56
L00 - Spray Booth	155	-	-	60
L00 - Large Studio	156	-	-	982
L00 - Long Gallery	178	-	-	466
L00 - Studio	151	-	-	421
L00 - Metal Workshop	144	-	-	190
L00 - Tech Office	134	-	-	152
L00 - Wood Workshop 1	144	-	-	385
L00 - Wood Workshop 2	186	-	-	484

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L00 - Flexible space / Gallery	NO (-85%)	NO
L00 - Group Studio	NO (-77.1%)	NO
L00 - AV Studio	N/A	N/A
L00 - Ceramics	NO (-89%)	NO
L00 - Jet Wash	N/A	N/A
L00 - Screen Printing	N/A	N/A
L00 - Dark Room	N/A	N/A
L00 - Spray Booth	N/A	N/A
L00 - Large Studio	NO (-81%)	NO
L00 - Long Gallery	NO (-87.9%)	NO
L00 - Studio	NO (-77.8%)	NO
L00 - Metal Workshop	NO (-92.7%)	NO
L00 - Tech Office	N/A	N/A
L00 - Wood Workshop 1	NO (-82.1%)	NO
L00 - Wood Workshop 2	NO (-88.9%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of 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
Area [m ²]	1552.2	1552.2
External area [m ²]	4026	4026
Weather	SWI	SWI
Infiltration [m ³ /hm ² @ 50Pa]	5	3
Average conductance [W/K]	917.56	1302.85
Average U-value [W/m ² K]	0.23	0.32
Alpha value* [%]	20.22	14.8

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

Building Use

% Area Building Type

A1/A2 Retail/Financial and Professional services
A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
B1 Offices and Workshop businesses
B2 to B7 General Industrial and Special Industrial Groups
B8 Storage or Distribution
C1 Hotels
C2 Residential Institutions: Hospitals and Care Homes
C2 Residential Institutions: Residential schools
100 C2 Residential Institutions: Universities and colleges
C2A Secure Residential Institutions
Residential spaces
D1 Non-residential Institutions: Community/Day Centre
D1 Non-residential Institutions: Libraries, Museums, and Galleries
D1 Non-residential Institutions: Education
D1 Non-residential Institutions: Primary Health Care Building
D1 Non-residential Institutions: Crown and County Courts
D2 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/m²]

	Actual	Notional
Heating	62.74	39.27
Cooling	0.13	1.12
Auxiliary	8.01	6.54
Lighting	10.46	19.36
Hot water	2.36	2.5
Equipment*	15.54	15.54
TOTAL **	72.39	68.79

* 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/m²]

	Actual	Notional
Photovoltaic systems	38.57	0
Wind turbines	0	0
CHP generators	11.31	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	211.5	210.06
Primary energy* [kWh/m ²]	104.29	134.84
Total emissions [kg/m ²]	-1.8	23.2

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

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 SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
Actual	140.8	9.1	45.6	0	9.8	0.86	0	0.91	0	
Notional	94.1	33.4	31.9	0	7.8	0.82	0	----	----	
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
Actual	231.2	37	74.9	0	2.5	0.86	0	0.91	0	
Notional	195.6	100.7	66.3	0	1.9	0.82	0	----	----	
[ST] Active chilled beams, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
Actual	62.9	49.8	2.9	1.4	12.6	6.13	9.69	6.97	11.9	
Notional	13.6	81	1.6	6.2	11.2	2.43	3.6	----	----	
[ST] Active chilled beams, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
Actual	203.8	4.5	9.2	0.1	22.8	6.13	9.69	6.97	11.9	
Notional	48.6	40.7	5.6	3.1	15.7	2.43	3.6	----	----	
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
Actual	176.7	35	57.2	0	208.8	0.86	0	0.91	0	
Notional	36.7	115.8	12.4	0	128.5	0.82	0	----	----	
[ST] Central heating using water: floor heating, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
Actual	78	59	25.2	0	1	0.86	0	0.91	0	
Notional	135.9	99.6	46.1	0	1	0.82	0	----	----	
[ST] Active chilled beams, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
Actual	48.6	11	2.2	0.3	9.1	6.05	9.8	6.97	11.9	
Notional	56.2	85.6	6.4	6.6	17.7	2.43	3.6	----	----	
[ST] Active chilled beams, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
Actual	43.2	14	2	0.4	9.2	6.08	9.75	6.97	11.9	
Notional	37.7	28.1	4.3	2.2	9.8	2.43	3.6	----	----	
[ST] Active chilled beams, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
Actual	108.6	8	5	0.2	10.3	6.08	9.75	6.97	11.9	
Notional	105.1	49.1	12	3.8	13.1	2.43	3.6	----	----	

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

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.14	"L0000011_W-1"
Floor	0.2	0.12	"L0000011_F"
Roof	0.15	0.12	"L0000011_C"
Windows, roof windows, and rooflights	1.5	1.01	"L0000011_W-1_O0"
Personnel doors	1.5	1.4	"L0000011_W11_O0"
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U _{i-Typ} = Typical individual element U-values [W/(m²K)]		U _{i-Min} = Minimum individual element U-values [W/(m²K)]	
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5.31