BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Graftongate Hayes

As designed

Date: Thu May 18 11:18:32 2023

Administrative information

Building Details

Address: Bridgewater Retail Park, Hayes, London, N17 0RU

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.b.0

Interface to calculation engine: Energy Simulator

Interface to calculation engine version: 10.9.2.36

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

Certifier details

Name: Carlton Garratt

Telephone number: 01384 397777

Address: Briar, Capstan House, Brierley Hill, DY5 1XL

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	21.1
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	21.1
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	-1.6
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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.26	0.26	"Wall 1"
Floor	0.25	0.08	0.11	"Exposed Floor 1"
Roof	0.25	0.16	0.16	"Exposed Roof 1"
Windows***, roof windows, and rooflights	2.2	1.31	1.31	"Window 1"
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	1.5	1.5	"Door 1 (High Usage Entrance Door)"

$U_{a\text{-}Limit}$ = 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 [$W/(m^2K)$]

* 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	2.12

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	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- HVAC for zone Toilets

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
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					NO

2- HVAC for zone Circulation

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
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					NO

3- HVAC for zone Offices

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	4.5	4.5	-	-	-
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					NO
* 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.					

1- POU

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

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**
0.05 DO Shower	-	-	1.1	1.1	-	-	-	-	-	0.75	0.5
0.06 DO WC	-	-	1.1	1.1	-	-	-	-	-	0.75	0.5
0.07 DO Cleaners Store	-	-	1.1	-	-	-	-	-	-	-	N/A
0.08 Acc WC	-	-	1.1	1.1	-	-	-	-	-	0.75	0.5

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
0.15 Acc & Shower	-	-	1.1	1.1	-	-	-	-	-	0.75	0.5
1.04 DO Shower	-	-	1.1	1.1	-	-	-	-	-	0.75	0.5
1.05 DO WC	-	-	1.1	1.1	-	-	-	-	-	0.75	0.5
1.06 Cleaners Store	-	-	1.1	-	-	-	-	-	-	-	N/A
1.07 DO Acc WC	-	-	1.1	1.1	-	-	-	-	-	0.75	0.5
1.12 Unisex WC 1	-	-	1.1	1.1	-	-	-	-	-	0.75	0.5
1.13 Unisex WC 2	-	-	1.1	1.1	-	-	-	-	-	0.75	0.5
1.14 Unisex WC 3	-	-	1.1	1.1	-	-	-	-	-	0.75	0.5
1.15 Unisex WC 4	-	-	1.1	1.1	-	-	-	-	-	0.75	0.5
1.16 Unisex WC 5	-	-	1.1	1.1	-	-	-	-	-	0.75	0.5
1.17 Unisex WC 6	-	-	1.1	1.1	-	-	-	-	-	0.75	0.5
1.20 Acc WC	-	-	1.1	1.1	-	-	-	-	-	0.75	0.5
1.21 Cleaners Cupboard	-	-	1.1	-	-	-	-	-	-	-	N/A
2.12 Unisex WC 1 (1)	-	-	1.1	1.1	-	-	-	-	-	0.75	0.5
2.13 Unisex WC 2 (1)	-	-	1.1	1.1	-	-	-	-	-	0.75	0.5
2.14 Unisex WC 3 (1)	-	-	1.1	1.1	-	-	-	-	-	0.75	0.5
2.15 Unisex WC 4 (1)	-	-	1.1	1.1	-	-	-	-	-	0.75	0.5
2.16 Unisex WC 5 (1)	-	-	1.1	1.1	-	-	-	-	-	0.75	0.5
2.17 Unisex WC 6 (1)	-	-	1.1	1.1	-	-	-	-	-	0.75	0.5
2.20 Acc WC (1)	-	-	1.1	1.1	-	-	-	-	-	0.75	0.5
2.21 Cleaners Cupboard (1)	-	-	1.1	-	-	-	-	-	-	-	N/A
2.09 Open Plan Office (1)	1.1	-	-	1.1	-	-	-	-	-	0.75	0.5
0.04 DO Drivers Lounge	-	-	1.1	1.1	-	-	-	-	-	0.75	0.5
0.09 DO Open Plan Office	-	-	1.1	1.1	-	-	-	-	-	0.75	0.5
0.14 Reception	-	-	1.1	1.1	-	-	-	-	-	0.75	0.5
0.18 Office	-	-	1.1	1.1	-	-	-	-	-	0.75	0.5
1.03 DO Drivers Lounge	-	-	1.1	1.1	-	-	-	-	-	0.75	0.5
1.08 DO Office	-	-	1.1	1.1	-	-	-	-	-	0.75	0.5
1.09 Open Plan Office	1.1	-	-	1.1	-	-	-	-	-	0.75	0.5
1.19 Meeting Room	1.1	-	-	1.1	-	-	-	-	-	0.75	0.5
1.25 Open Plan Office	1.1	-	-	1.1	-	-	-	-	-	0.75	0.5
2.19 Meeting Room (1)	1.1	-	-	1.1	-	-	-	-	-	0.75	0.5
2.25 Open Plan Office (1)	1.1	-	-	1.1	-	-	-	-	-	0.75	0.5

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
0.05 DO Shower	194	-	-	35
0.06 DO WC	194	-	-	35
0.07 DO Cleaners Store	197	-	-	33
0.08 Acc WC	149	-	-	50
0.15 Acc & Shower	98	-	-	118
1.04 DO Shower	229	-	-	35

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
1.05 DO WC	229	-	-	35
1.06 Cleaners Store	231	-	-	33
1.07 DO Acc WC	194	-	-	50
1.12 Unisex WC 1	205	-	-	47
1.13 Unisex WC 2	204	-	-	47
1.14 Unisex WC 3	204	-	-	47
1.15 Unisex WC 4	204	-	-	47
1.16 Unisex WC 5	204	-	-	47
1.17 Unisex WC 6	204	-	-	47
1.20 Acc WC	201	-	-	46
1.21 Cleaners Cupboard	225	-	-	39
2.12 Unisex WC 1 (1)	205	-	-	47
2.13 Unisex WC 2 (1)	204	-	-	47
2.14 Unisex WC 3 (1)	204	-	-	47
2.15 Unisex WC 4 (1)	204	-	-	47
2.16 Unisex WC 5 (1)	204	-	-	47
2.17 Unisex WC 6 (1)	204	-	-	47
2.20 Acc WC (1)	201	-	-	46
2.21 Cleaners Cupboard (1)	225	-	-	39
0.03 DO Staircase	114	-	-	180
0.12 Staircase	122	-	-	127
0.17 Staircase	176	-	-	96
1.02 Staircase	133	-	-	180
1.11 Staircase	145	-	-	127
1.24 Corridor	196	-	-	109
2.11 Staircase (1)	145	-	-	127
2.22 Staircase (1)	226	-	-	96
2.24 Corridor (1)	196	-	-	109
2.09 Open Plan Office (1)	175	-	-	2316
0.04 DO Drivers Lounge	225	-	-	113
0.09 DO Open Plan Office	190	-	-	345
0.14 Reception	192	-	-	239
0.18 Office	173	-	-	720
1.03 DO Drivers Lounge	252	-	-	113
1.08 DO Office	203	-	-	345
1.09 Open Plan Office	175	-	-	2316
1.19 Meeting Room	223	-	-	169
1.25 Open Plan Office	178	-	-	746
2.19 Meeting Room (1)	223	-	-	169
2.25 Open Plan Office (1)	178	-	-	746
0.01 Warehouse	442	-	-	18164

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?
0.05 DO Shower	N/A	N/A
0.06 DO WC	N/A	N/A
0.07 DO Cleaners Store	N/A	N/A
0.08 Acc WC	N/A	N/A
0.15 Acc & Shower	N/A	N/A
1.04 DO Shower	N/A	N/A
1.05 DO WC	N/A	N/A
1.06 Cleaners Store	N/A	N/A
1.07 DO Acc WC	N/A	N/A
1.12 Unisex WC 1	N/A	N/A
1.13 Unisex WC 2	N/A	N/A
1.14 Unisex WC 3	N/A	N/A
1.15 Unisex WC 4	N/A	N/A
1.16 Unisex WC 5	N/A	N/A
1.17 Unisex WC 6	N/A	N/A
1.20 Acc WC	N/A	N/A
1.21 Cleaners Cupboard	N/A	N/A
2.12 Unisex WC 1 (1)	N/A	N/A
2.13 Unisex WC 2 (1)	N/A	N/A
2.14 Unisex WC 3 (1)	N/A	N/A
2.15 Unisex WC 4 (1)	N/A	N/A
2.16 Unisex WC 5 (1)	N/A	N/A
2.17 Unisex WC 6 (1)	N/A	N/A
2.20 Acc WC (1)	N/A	N/A
2.21 Cleaners Cupboard (1)	N/A	N/A
0.03 DO Staircase	N/A	N/A
0.12 Staircase	N/A	N/A
0.17 Staircase	YES (+137.1%)	NO
1.02 Staircase	YES (+0.7%)	NO
1.11 Staircase	N/A	N/A
1.24 Corridor	N/A	N/A
2.11 Staircase (1)	N/A	N/A
2.22 Staircase (1)	YES (+134.5%)	NO
2.24 Corridor (1)	N/A	N/A
2.09 Open Plan Office (1)	YES (+156.7%)	NO
0.04 DO Drivers Lounge	NO (-45.2%)	NO
0.09 DO Open Plan Office	YES (+68.9%)	NO
0.14 Reception	NO (-30.1%)	NO
0.18 Office	YES (+50.6%)	NO
1.03 DO Drivers Lounge	NO (-48.7%)	NO
1.08 DO Office	YES (+70%)	NO
1.09 Open Plan Office	YES (+156.7%)	NO
1.19 Meeting Room	YES (+158%)	NO
1.25 Open Plan Office	YES (+49.7%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
2.19 Meeting Room (1)	YES (+158%)	NO
2.25 Open Plan Office (1)	YES (+49.7%)	NO
0.01 Warehouse	YES (+449%)	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]	16080.9	16080.9
External area [m^2]	39470.5	39470.5
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	2	3
Average conductance [W/K]	10130.6	8530.7
Average U-value [W/m^2K]	0.26	0.22
Alpha value* [%]	7.41	34.53

* 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
100	**B8 Storage or Distribution**
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	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/m^2]

	Actual	Notional
Heating	0.52	2.07
Cooling	4.67	1.93
Auxiliary	2.04	1.11
Lighting	2.91	33.53
Hot water	4.63	5.35
Equipment*	47.08	47.08
TOTAL**	**14.77**	**43.99**

* 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	17.76	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	373.72	277.31
Primary energy* [kWh/m^2]	45.33	120.09
Total emissions [kg/m^2]	-1.6	21.1

* 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 SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Other local room heater - unfanned, [HS] Room heater, [HFT] Electricity, [CFT] Electricity										
	Actual	6.4	268	2.2	0	18.4	0.8	0	1	0
	Notional	46.1	385	15.6	0	11.1	0.82	0	----	----
[ST] Other local room heater - unfanned, [HS] Room heater, [HFT] Electricity, [CFT] Electricity										
	Actual	58.1	271	20.2	0	0	0.8	0	1	0
	Notional	179.4	191.3	60.9	0	0	0.82	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	33.3	405.5	2.2	35.3	14.2	4.19	3.2	4.5	4.5
	Notional	86.2	188.4	9.9	14.5	7.7	2.43	3.6	----	----
[ST] No Heating or Cooling										
	Actual	84	281.2	0	0	0	0	0	0	0
	Notional	77.7	197.3	0	0	0	0	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

Key Features

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

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.26	"Wall 1"
Floor	0.2	0.03	"Exposed Floor 1"
Roof	0.15	0.16	"Exposed Roof 1"
Windows, roof windows, and rooflights	1.5	1.31	"Window 1"
Personnel doors	1.5	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	1.5	"Door 1 (High Usage Entrance Door)"

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = 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	2.12