BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Bartrams Non-Residential Areas

As built

Date: Thu Nov 15 15:32:26 2018

Administrative information

Building Details

Address: LONDON, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.9

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.9

BRUKL compliance check version: v5.4.a.1

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name: Dr Mohamad KIANI

Telephone number: 02079287888

Address: Pickfords Wharf, Clink St,, LONDON, SE19DG

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	25.5
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	25.5
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	16.3
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	0.16	0.17	CH000000:Surf[0]
Floor	0.25	0.11	0.11	CR00000F:Surf[5]
Roof	0.25	0.11	0.11	CR00000F:Surf[6]
Windows***, roof windows, and rooflights	2.2	1.3	1.3	LG000003:Surf[5]
Personnel doors	2.2	2.2	2.2	LG000006:Surf[0]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	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 [$W/(m^2K)$]

* 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	3

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- UFH MECHVENT

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	-	0	0	-
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					NO

* 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- DHW + UFH

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	-	0	0	-
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					NO

* 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- HTG AHU

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.33	-	0	0	-
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. For types <=12 kW output, refer to EN 14825 for limiting standards.

4- VRF-P400 AHU02

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.33	6.64	0	0	0.78
Standard value	2.5*	0.7	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. For types <=12 kW output, refer to EN 14825 for limiting standards.

5- VRF-P400 AHU03

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.33	6.64	0	0	0.78
Standard value	2.5*	0.7	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. For types <=12 kW output, refer to EN 14825 for limiting standards.

6- VRF-P350 AHU03

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	5.29	5.79	0	0	0.78
Standard value	2.5*	0.7	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. For types <=12 kW output, refer to EN 14825 for limiting standards.

7- HTG EXT

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.33	-	0	0	-
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. For types <=12 kW output, refer to EN 14825 for limiting standards.

1- DHW + UFH

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.96	0.001
Standard value	2*	N/A

* Standard shown is for all types except absorption and gas engine heat pumps.

1- CHECK2-CHP

	CHPQA quality index	CHP electrical efficiency
This building	0	0.32
Standard value	Not provided	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
changing - LG	-	1.9	0	-	-	-	-	-	-	-	N/A
conversation room - GF	-	1.9	0	-	-	-	-	-	-	-	N/A
gym - LG	-	1.9	0	-	-	-	-	-	-	-	N/A
hoist store - LG	-	1.9	0	-	-	-	-	-	-	-	N/A
pool - LG	-	1.6	0	-	-	-	-	-	-	-	N/A
larder - GF	-	1.9	0	-	-	-	-	-	-	-	N/A
lobby - LG	-	1.9	0	-	-	-	-	-	-	-	N/A
lockerroom - LG	-	1.9	0	-	-	-	-	-	-	-	N/A
managment office - GF	-	1.9	0	-	-	-	-	-	-	-	N/A
reception wellbeing - LG	-	1.9	0	-	-	-	-	-	-	-	N/A
staff room - GF	-	1.9	0	-	-	-	-	-	-	-	N/A
staff shower - LG	-	1.9	0	-	-	-	-	-	-	-	N/A
staff wc shower - GF	-	1.9	0	-	-	-	-	-	-	-	N/A
storage - GF	-	1.9	0	-	-	-	-	-	-	-	N/A
storage - LG	-	1.9	0	-	-	-	-	-	-	-	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	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
storage - LG	-	1.9	0	-	-	-	-	-	-	-	N/A
studio - LG	-	1.9	0	-	-	-	-	-	-	-	N/A
suna - LG	-	1.6	0	-	-	-	-	-	-	-	N/A
treatment room - LG	-	1.9	0	-	-	-	-	-	-	-	N/A
treatment room - LG	-	1.9	0	-	-	-	-	-	-	-	N/A
wc - GF	-	-	0.7	-	-	-	-	-	-	-	N/A
wc - GF	-	-	0.7	-	-	-	-	-	-	-	N/A
wc - GF	-	-	0.7	-	-	-	-	-	-	-	N/A
WC - LG	-	-	0.7	-	-	-	-	-	-	-	N/A
WC - LG	-	-	0.7	-	-	-	-	-	-	-	N/A
wc femeale - GF	-	-	0.7	-	-	-	-	-	-	-	N/A
wc males - GF	-	-	0.7	-	-	-	-	-	-	-	N/A
wc unisex - GF	-	-	0.7	-	-	-	-	-	-	-	N/A
residents lobby and breakout - GF	-	1.9	0	-	-	-	-	-	-	-	N/A
residents lobby and breakout - GF	-	1.9	0	-	-	-	-	-	-	-	N/A

General lighting and display lighting

Zone name	Luminous efficacy [lm/W]			General lighting [W]
	Luminaire	Lamp	Display lamp	
Standard value	60	60	22	
Carpark	-	111	-	671
Carpark	-	111	-	723
Carpark	-	111	-	723
changing - LG	-	102	-	70
circ - GF	-	93	-	38
circ - LG	-	111	-	63
conversation room - GF	93	-	-	89
corridor - 1F	-	93	-	318
corridor - 2F	-	93	-	318
corridor - 3F	-	93	-	288
corridor - 4F	-	93	-	213
corridor - 5F	-	93	-	141
corridor - 6F	-	93	-	98
corridor - 7F	-	93	-	67
corridor - 8F	-	93	-	67
corridor - GF	-	93	-	210
corridor - LG	-	93	-	127
corridor - LG	-	108	-	108
cycle store - LG	108	-	-	20
guest suite - GF	-	93	-	39
gym - LG	-	81	-	108
hoist store - LG	108	-	-	23
pool - LG	-	74	-	890
larder - GF	-	93	15	116

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
lobby - LG	-	93	15	86
lockerroom - LG	-	102	-	21
managment office - GF	93	-	-	79
plant - LG	108	-	-	95
plantroom LG	108	-	-	57
pot washroom - GF	-	93	-	136
reception wellbeing - LG	-	111	15	368
staff room - GF	93	-	-	86
staff shower - LG	-	111	-	19
staff wc shower - GF	-	93	-	16
stair - 1F	-	74	-	45
stair - 2F	-	74	-	45
stair - 3F	-	74	-	45
stair - 4F	-	74	-	45
stair - 5F	-	74	-	45
stair - 6F	-	74	-	45
stair - 7F	-	74	-	45
stair - 8F	-	74	-	45
stair - GF	-	74	-	44
stair - GF	-	74	-	40
steam - LG	-	111	-	62
storage - GF	93	-	-	8
storage - LG	111	-	-	8
storage - LG	108	-	-	14
studio - LG	81	-	-	306
substation - LG	108	-	-	64
suna - LG	-	111	-	74
treatment room - LG	111	-	-	105
treatment room - LG	111	-	-	130
wc - GF	-	93	-	29
wc - GF	-	93	-	23
wc - GF	-	93	-	36
WC - LG	-	111	-	25
WC - LG	-	111	-	25
wc femeale - GF	-	93	-	44
wc males - GF	-	93	-	40
wc unisex - GF	-	93	-	29
residents lobby and breakout - GF	-	93	15	571
residents lobby and breakout - GF	-	93	15	382

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?
conversation room - GF	NO (-76.8%)	NO
guest suite - GF	NO (-55.3%)	NO
gym - LG	N/A	N/A
pool - LG	NO (-89.4%)	NO
larder - GF	NO (-4.4%)	NO
lobby - LG	NO (-27.6%)	NO
managment office - GF	N/A	N/A
reception wellbeing - LG	NO (-53.5%)	NO
staff room - GF	N/A	N/A
steam - LG	N/A	N/A
studio - LG	NO (-49.7%)	NO
suna - LG	N/A	N/A
treatment room - LG	NO (-66.1%)	NO
treatment room - LG	NO (-62.8%)	NO
residents lobby and breakout - GF	NO (-74%)	NO
residents lobby and breakout - GF	NO (-66.4%)	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]	3871.9	3871.9
External area [m^2]	4401.1	4401.1
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	894.19	1423.43
Average U-value [W/m^2K]	0.2	0.32
Alpha value* [%]	10.02	10

* 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
47	**C1 Hotels**
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
39	**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
14	**Others: Car Parks 24 hrs**
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	3.56	7.81
Cooling	2.82	2.21
Auxiliary	4.15	1.95
Lighting	18.17	19.86
Hot water	59.9	49.78
Equipment*	23.55	23.55
TOTAL**	**69.04**	**81.62**

* 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	1.91	0
Wind turbines	0	0
CHP generators	19.57	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	84.02	73.66
Primary energy* [kWh/m^2]	105.33	157.21
Total emissions [kg/m^2]	16.3	25.5

* 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] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	21.9	159.3	1.4	8.9	23.3	4.25	4.96	4.33	6.64
	Notional	0	0	0	0	0	0	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	7.9	0	0	0	2.3	0.86	0	0.96	0
	Notional	36.8	96.7	4	7.1	9	2.56	3.79	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	2.9	300.3	0.2	19.3	12.4	5.19	4.33	5.29	5.79
	Notional	47.6	0	15.3	0	1.9	0.86	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	0.1	366.5	0	20.5	12.9	4.25	4.96	4.33	6.64
	Notional	6.6	214.7	0.7	15.7	3.6	2.56	3.79	----	----
[ST] Central heating using water: floor heating, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	39.5	0	2.7	0	22.2	4.07	0	4.33	0
	Notional	4	214	0.4	15.7	3.8	2.56	3.79	----	----
[ST] Central heating using water: floor heating, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	531.5	0	36.3	0	16.1	4.07	0	4.33	0
	Notional	116.5	0	12.6	0	12.8	2.56	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	76.4	0	0.5	0	13.1	0.86	0	0.96	0
	Notional	461.1	0	50.1	0	9.4	2.56	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	56	0	18	0	6.7	0.86	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	0.03	LG000006:Surf[12]
Floor	0.2	0.02	XX000017:Surf[11]
Roof	0.15	0.11	CR00000F:Surf[6]
Windows, roof windows, and rooflights	1.5	1.3	LG000003:Surf[5]
Personnel doors	1.5	2.2	LG000006:Surf[0]
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = 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	3