BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Tavistock place

As designed

Date: Wed Sep 20 09:15:51 2017

Administrative information

Building Details

Address: 15-17 Tavistock place, London, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.6

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.6

BRUKL compliance check version: v5.2.g.3

Owner Details

Name: London School of Hygene and Tropical Medicine

Telephone number: Phone

Address: Street Address, London, Postcode

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	25.3
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	25.3
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	15.7
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 the building services should achieve reasonable overall standards of energy efficiency

Values not achieving 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	0.16	WR000003:Surf[1]
Floor	0.25	0.16	0.21	PL000001:Surf[0]
Roof	0.25	0.15	0.15	WR000000:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.57	1.6	WR000003:Surf[0]
Personnel doors	2.2	2.2	2.2	WR000005:Surf[1]
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	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- Chilled Beams Boilers

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	5.1	0	1.6	0.7
Standard value	0.91*	2.7	N/A	1.6^	0.5
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.

^ Allowed SFP may be increased by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

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

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

General lighting and display lighting	**Luminous efficacy [lm/W]**			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
WC	-	85	-	55
Stairs	-	85	-	70
Stairs	-	85	-	94
WC	-	85	-	174
WC	-	85	-	55
Stairs	-	85	-	68
Stairs	-	85	-	87
WC	-	85	-	149
WC	-	85	-	55
Stairs	-	85	-	71
WC	-	85	-	211
Stairs	-	85	-	66
Stairs	-	85	-	64
Lab	100	-	-	1676
WC	-	85	-	54
Plant	85	-	-	493
Showers	-	85	-	59
stairs	-	85	-	96
Storage	85	-	-	23
Storage	85	-	-	25
Plant	85	-	-	1437
Stairs	-	85	-	91
Reception	-	85	35	331
GF Lab Core	100	-	-	2594
GF lab S	100	-	-	735
GF Lab W	100	-	-	671

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
GF Lab N	100	-	-	543
GF Lab NE	100	-	-	726
GF Lab SE	100	-	-	730
1st Lab Core	100	-	-	2031
1st Lab S	100	-	-	754
1st Lab W	100	-	-	662
1st Lab N	100	-	-	557
1st Lab NE	100	-	-	723
1st Lab SE	100	-	-	773
2nd Lab Core	100	-	-	1537
2nd Lab S	100	-	-	814
2nd Lab E	100	-	-	338
2nd Lab N	100	-	-	573
2nd Lab NE	100	-	-	299
2nd Lab SE	100	-	-	279
Stairs	-	85	-	116

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?
WC	NO (-37.3%)	NO
Stairs	NO (-57.1%)	NO
Stairs	N/A	N/A
WC	N/A	N/A
WC	N/A	N/A
Stairs	NO (-21.5%)	NO
Stairs	NO (-64.7%)	NO
WC	NO (-94.4%)	NO
WC	N/A	N/A
Stairs	NO (-10.5%)	NO
WC	N/A	N/A
Stairs	N/A	N/A
Stairs	NO (-40.1%)	NO
Lab	NO (-45.2%)	NO
WC	N/A	N/A
Showers	N/A	N/A
stairs	N/A	N/A
Storage	N/A	N/A
Storage	N/A	N/A
Plant	N/A	N/A
Stairs	N/A	N/A
Reception	YES (+79.4%)	NO
GF Lab Core	NO (-88.3%)	NO
GF lab S	NO (-86.8%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
GF Lab W	NO (-55%)	NO
GF Lab N	NO (-68.4%)	NO
GF Lab NE	NO (-69.2%)	NO
GF Lab SE	NO (-69%)	NO
1st Lab Core	NO (-87.3%)	NO
1st Lab S	NO (-82.3%)	NO
1st Lab W	NO (-58.2%)	NO
1st Lab N	NO (-68.3%)	NO
1st Lab NE	NO (-71.9%)	NO
1st Lab SE	NO (-68%)	NO
2nd Lab Core	YES (+295.4%)	NO
2nd Lab S	NO (-65.4%)	NO
2nd Lab E	NO (-55.8%)	NO
2nd Lab N	NO (-64.1%)	NO
2nd Lab NE	NO (-75.2%)	NO
2nd Lab SE	NO (-62.6%)	NO
Stairs	NO (-49.5%)	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]	3661.3	3661.3
External area [m^2]	4789.1	4789.1
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	1704.36	1991.88
Average U-value [W/m^2K]	0.36	0.42
Alpha value* [%]	10	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
	C1 Hotels
	C2 Residential Inst.: Hospitals and Care Homes
	C2 Residential Inst.: Residential schools
	C2 Residential Inst.: Universities and colleges
	C2A Secure Residential Inst.
	Residential spaces
	D1 Non-residential Inst.: Community/Day Centre
	D1 Non-residential Inst.: Libraries, Museums, and Galleries
	D1 Non-residential Inst.: Education
100	**D1 Non-residential Inst.: Primary Health Care Building**
	D1 Non-residential Inst.: 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	16.56	12.71
Cooling	3.56	6.22
Auxiliary	11.19	14.04
Lighting	10.45	22.63
Hot water	2.79	2.79
Equipment*	62.73	62.73
TOTAL**	**44.56**	**58.4**

* Energy used by equipment does not count towards the total for 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	3.93	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]	102.56	124.34
Primary energy* [kWh/m^2]	104.01	146.98
Total emissions [kg/m^2]	15.7	25.3

* 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] Active chilled beams, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	50.5	56.1	17.2	3.7	11.6	0.82	4.21	0.91	5.1
	Notional	41	88.3	13.2	6.5	14.6	0.86	3.79	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	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 BCO can give particular attention to items with specifications that 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	0.16	WR000003:Surf[1]
Floor	0.2	0.12	WR000004:Surf[0]
Roof	0.15	0.15	WR000000:Surf[1]
Windows, roof windows, and rooflights	1.5	1.3	RC000000:Surf[4]
Personnel doors	1.5	2.2	WR000005:Surf[1]
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