BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Abacus Belsize Primary - SCHOOL (BE CLEAN)

As designed

Date: Thu Aug 29 11:15:25 2019

Administrative information

Building Details

Address: 26 Rosslyn Hill, London, NW3 1PD

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.a.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.12

BRUKL compliance check version: v5.6.a.1

Owner Details

Name: ESFA

Telephone number: Phone

Address: Street Address, City, Postcode

Certifier details

Name: Konstantinos Pyrintsos

Telephone number: 01275813500

Address: 65 Macrae Road, Bristol, BS20 0DD

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

The building does not comply with England Building Regulations Part L 2013

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	13.4
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	13.4
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	26.4
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	1.14	1.79	FR000006_W3_A1
Floor	0.25	0.61	2.41	SF000001_F_A4
Roof	0.25	0.17	0.18	SC000000_C
Windows***, roof windows, and rooflights	2.2	2.89	2.89	SC000000_W0_O0
Personnel doors	2.2	2.2	2.2	GR000007_W-1_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"

$U_{a\text{-}Limit}$ = 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	7

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- Gas Condening Boilers-Rads-NatVent-Direct Gas Fired Water Heater

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	0.96	-	-	-	-
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- BE CLEAN-Active Cooling

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	0.91	2.5	-	2.9	-
Standard value	0.91*	2.55	N/A	1.6^	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.

^ 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- SYST0006-DHW

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	0.91	0.001
Standard value	0.9*	N/A

* Standard shown is for gas boilers >30 kW output. For boilers <=30 kW output, limiting efficiency is 0.73.

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**
SF-Staff WC	-	-	0.3	-	-	-	-	-	-	-	N/A
SF-Pupil WC	-	-	0.3	-	-	-	-	-	-	-	N/A
FF-Library	-	-	-	1.3	-	-	-	-	-	0.75	0.5
FF-Staff Room & Repographics	-	-	-	1.4	-	-	-	-	-	0.75	0.5
FF-Pupil WC	-	-	0.3	-	-	-	-	-	-	-	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
FF-Staff WC	-	-	0.3	-	-	-	-	-	-	-	N/A
GF-Kitchen Prep/Servery Suite	-	-	-	-	-	-	-	-	1	-	N/A
GF-Staff WK RM-01	-	-	-	1	-	-	-	-	-	0.75	0.5
GF-Sick Bay	-	-	-	1	-	-	-	-	-	0.75	0.5
GF-Staff WC	-	-	0.3	-	-	-	-	-	-	-	N/A
GF-Pupil WC	-	-	0.3	-	-	-	-	-	-	-	N/A
GF-Staff WK RM-02	-	-	-	1	-	-	-	-	-	0.75	0.5
LGF-Sup WC/Cloak/Ext WC	-	-	0.3	-	-	-	-	-	-	-	N/A
LGF-Year 1	-	-	-	1.1	-	-	-	-	-	0.75	0.5
LGF-Year 2	-	-	-	1.1	-	-	-	-	-	0.75	0.5
LGF-Office/Meeting Room	-	-	-	1.2	-	-	-	-	-	0.75	0.5
LGF-Cleaner Store	-	-	0.3	-	-	-	-	-	-	-	N/A
LGF-Interview Room	-	-	-	1.2	-	-	-	-	-	0.75	0.5
LGF-Staff WC	-	-	0.3	-	-	-	-	-	-	-	N/A
LGF-Pupil WC	-	-	0.3	-	-	-	-	-	-	-	N/A
LGF-Small GRP Room	-	-	-	1.1	-	-	-	-	-	0.75	0.5
LGF-Sup WC/Cloak	-	-	0.3	-	-	-	-	-	-	-	N/A
LGF-WC	-	-	0.3	-	-	-	-	-	-	-	N/A
SF-Small Hall	-	-	-	-	-	-	-	1.1	-	-	N/A
SF-Head Office (Meeting Room)	-	-	-	-	-	-	-	1.1	-	-	N/A
SF-Specialist Practical	-	-	-	-	-	-	-	1.1	-	-	N/A
FF-SEN Room (Res Base)	-	-	-	-	-	-	-	0.3	-	-	N/A
FF-SEN Room (Therapy/MI)	-	-	-	-	-	-	-	0.7	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
SF-Year 4	70	-	-	601
SF-Staff WC	-	70	-	52
SF-Pupil WC	-	70	-	88
SF-CIRC-01	-	70	-	76
SF-CIRC-02	-	70	-	46
SF-Stairs	-	70	-	77
SF-CIRC-03	-	70	-	164
FF-Year 3	70	-	-	656
FF-Studio	70	-	-	365
FF-Library	70	-	-	282
FF-Staff Room & Repographics	70	-	-	406
FF-Pupil WC	-	70	-	94
FF-Staff WC	-	70	-	71
FF-Stairs 1	-	70	-	89
FF-Circ-01	-	70	-	148
FF-Stairs 2	-	70	-	108

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
FF-Circ-02	-	70	-	168
GF-Kitchen Prep/Servery Suite	-	70	-	393
GF-PE Store	70	-	-	41
GF-Hall	-	70	-	962
GF-Staff WK RM-01	70	-	-	306
GF-Stairs-01	-	70	-	94
GF-Circ-01	-	70	-	137
GF-Circ-02	-	70	-	229
GF-Sick Bay	70	-	-	288
GF-Staff WC	-	70	-	59
GF-Pupil WC	-	70	-	83
GF-Gen Office	70	-	-	223
GF-Staff WK RM-02	70	-	-	182
GF-Circ-03	-	70	-	92
LGF-Dry Store	70	-	-	48
LGF-Sup WC/Cloak/Ext WC	-	70	-	97
LGF-Year 1	70	-	-	605
LGF-Year 2	70	-	-	627
LGF-Stairs-01	-	70	-	78
LGF-Office/Meeting Room	70	-	-	274
LGF-Exam Arch	70	-	-	28
LGF-Cleaner Store	70	-	-	28
LGF-Interview Room	70	-	-	178
LGF-Staff WC	-	70	-	59
LGF-Pupil WC	-	70	-	90
LGF-Gen Store	70	-	-	28
LGF-Circ-02	-	70	-	174
LGF-General Plant Room	70	-	-	169
LGF- SRV RM & ICT Hub	70	-	-	158
LGF-Reception Classroom	70	-	-	774
LGF-Small GRP Room	70	-	-	207
LGF-Sup WC/Cloak	-	70	-	81
LGF-WC	-	70	-	42
LGF-Circ-01	-	70	-	104
LGF-Circ-01-a-NewBuild	-	70	-	82
SF-Small Hall	-	70	-	773
SF-Head Office (Meeting Room)	70	-	-	290
SF-Specialist Practical	70	-	-	308
FF-SEN Room (Res Base)	70	-	-	251
FF-SEN Room (Therapy/MI)	70	-	-	176

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?
SF-Year 4	NO (-65.7%)	NO
FF-Year 3	NO (-70.7%)	NO
FF-Studio	NO (-65.6%)	NO
FF-Library	NO (-37.7%)	NO
FF-Staff Room & Repographics	NO (-60.9%)	NO
GF-Hall	NO (-79.2%)	NO
GF-Staff WK RM-01	NO (-43.4%)	NO
GF-Sick Bay	NO (-17.9%)	NO
GF-Gen Office	NO (-62.8%)	NO
GF-Staff WK RM-02	NO (-78.7%)	NO
LGF-Year 1	NO (-77.6%)	NO
LGF-Year 2	N/A	N/A
LGF-Office/Meeting Room	NO (-74.5%)	NO
LGF-Interview Room	NO (-43.6%)	NO
LGF-Reception Classroom	NO (-87%)	NO
LGF-Small GRP Room	N/A	N/A
SF-Small Hall	NO (-33.7%)	NO
SF-Head Office (Meeting Room)	NO (-76.4%)	NO
SF-Specialist Practical	NO (-82.7%)	NO
FF-SEN Room (Res Base)	NO (-49.5%)	NO
FF-SEN Room (Therapy/MI)	NO (-1.8%)	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]	1466	1466
External area [m^2]	2691.7	2691.7
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	7	4
Average conductance [W/K]	2745.96	1410.74
Average U-value [W/m^2K]	1.02	0.52
Alpha value* [%]	7.5	19.96

* 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
	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
100	**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	50.38	16.97
Cooling	0.99	0.96
Auxiliary	9.92	3.35
Lighting	16.54	12.76
Hot water	5.88	5.13
Equipment*	25.55	25.55
TOTAL**	**83.71**	**39.17**

* 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	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]	203.84	155.29
Primary energy* [kWh/m^2]	152.92	78.05
Total emissions [kg/m^2]	26.4	13.4

* 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] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	166.2	43.2	51.4	0	2.6	0.9	0	0.96	0
	Notional	52.6	107.1	17.8	0	1.7	0.82	0	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	132.3	36	43.8	7.4	52.2	0.84	1.35	0.91	2
	Notional	34.1	92.5	11.6	7.1	14	0.82	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	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.26	LG000006_W-1
Floor	0.2	0.22	SF000007_F
Roof	0.15	0.16	SF000003_C
Windows, roof windows, and rooflights	1.5	2.89	SC000000_W0_O0
Personnel doors	1.5	2.2	GR000007_W-1_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"

$U_{i\text{-}Typ}$ = 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	7