

Project name

**16002_Twickenham East
Stand NBE BELEAN**

As designed

Date: Fri Jun 24 16:32:03 2016

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.5

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.5

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

Owner Details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: The calculated CO₂ emission rate for the building should not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	43.9
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	43.9
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	41.4
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 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-Limit}	U _{a-Calc}	U _{i-Calc}	Surface where the maximum value occurs*
Wall**	0.35	0.25	0.25	01000051:Surf[0]
Floor	0.25	0.18	0.18	01000052:Surf[0]
Roof	0.25	0.18	0.18	01000057:Surf[0]
Windows***, roof windows, and rooflights	2.2	1.6	1.6	01000052:Surf[4]
Personnel doors	2.2	-	-	No Personnel doors in building
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-Limit} = Limiting area-weighted average U-values [W/(m²K)]U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]

* 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- Main system

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.88	2.8	0	0.5	0.7
Standard value	0.91*	2.55	N/A	1.6^	0.5
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.					
^ 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.					

2- Kitchen

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.88	-	0.2	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- Toilet Extract

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.88	-	0.2	0	0.7
Standard value	0.91*	N/A	N/A	N/A	0.5
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.					

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

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	Zone	Standard
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1		
Level 04 Goods		-	-	-	-	-	-	-	0.4	-	-	N/A
Level 04 Kitchen		-	-	-	-	-	-	-	-	0.4	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
	ID of system type	A	B	C	D	E	F	G	H		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
Level 04 Kitchen	-	-	-	-	-	-	-	-	0.4	-	N/A
Level 04 Debenture Bar	-	-	-	-	-	-	-	0.4	-	-	N/A
Level 04 Toilet	-	-	-	0.4	-	-	-	-	-	-	N/A
Level 04 Debenture Lounge	-	-	-	-	-	-	-	0.4	-	-	N/A
Level 04 Toilet	-	-	-	0.4	-	-	-	-	-	-	N/A
Level 04 Debenture Lounge	-	-	-	-	-	-	-	0.4	-	-	N/A
Level 04 Toilet	-	-	-	0.4	-	-	-	-	-	-	N/A
Level 04 A Goods	-	-	-	-	-	-	-	0.4	-	-	N/A
Level 04 A Kitchen	-	-	-	-	-	-	-	-	0.4	-	N/A
Level 04 AToilets	-	-	-	0.4	-	-	-	-	-	-	N/A
Level 04 AToilets	-	-	-	0.4	-	-	-	-	-	-	N/A
Level 04 AToilets	-	-	-	0.4	-	-	-	-	-	-	N/A
Level 04 AToilets	-	-	-	0.4	-	-	-	-	-	-	N/A
Level 04 AToilets	-	-	-	0.4	-	-	-	-	-	-	N/A
Level 04 AToilets	-	-	-	0.4	-	-	-	-	-	-	N/A
Level 04 AToilets	-	-	-	0.4	-	-	-	-	-	-	N/A
Level 04 A Super Premium Suite	-	-	-	-	-	-	-	0.4	-	-	N/A
Level 04 AToilets	-	-	-	0.4	-	-	-	-	-	-	N/A
Level 04 AToilets	-	-	-	0.4	-	-	-	-	-	-	N/A
Level 04 AToilets	-	-	-	0.4	-	-	-	-	-	-	N/A
Level 04 AToilets	-	-	-	0.4	-	-	-	-	-	-	N/A
Level 04 AToilets	-	-	-	0.4	-	-	-	-	-	-	N/A
Level 04 AToilets	-	-	-	0.4	-	-	-	-	-	-	N/A
Level 04 AToilets	-	-	-	0.4	-	-	-	-	-	-	N/A
Level 04 AToilets	-	-	-	0.4	-	-	-	-	-	-	N/A
Level 04 AToilets	-	-	-	0.4	-	-	-	-	-	-	N/A
Level 04 A Super Premium Bar	-	-	-	-	-	-	-	0.4	-	-	N/A
Level 04 AToilets	-	-	-	0.4	-	-	-	-	-	-	N/A
Level 04 AToilets	-	-	-	0.4	-	-	-	-	-	-	N/A
Level 04 AToilets	-	-	-	0.4	-	-	-	-	-	-	N/A
Level 04 AToilets	-	-	-	0.4	-	-	-	-	-	-	N/A
Level 04 AToilets	-	-	-	0.4	-	-	-	-	-	-	N/A
Level 04 AToilets	-	-	-	0.4	-	-	-	-	-	-	N/A
Level 04 AToilets	-	-	-	0.4	-	-	-	-	-	-	N/A
Level 04 A Super Premium Suite	-	-	-	-	-	-	-	0.4	-	-	N/A
Level 03 Premium Hospitality	-	-	-	-	-	-	-	0.4	-	-	N/A
Level 03 Kitchen	-	-	-	-	-	-	-	-	0.4	-	N/A
Level 03 Premium Hospitality	-	-	-	-	-	-	-	0.4	-	-	N/A

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name	Standard value	Luminaire	Lamp	Display lamp	
Level 04 Goods	60	90	-	-	36
Level 04 Kitchen	-	-	90	-	2574
Level 04 Kitchen	-	-	90	-	2862

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name	Standard value	Luminaire	Lamp	Display lamp	
	60	60	22		
Level 04 Debenture Bar	-	90	-		1526
Level 04 Toilet	-	90	-		166
Level 04 Debenture Lounge	-	90	-		2645
Level 04 Toilet	-	90	-		211
Level 04 Debenture Lounge	-	90	-		2493
Level 04 Toilet	-	90	-		172
Level 04 A Goods	90	-	-		20
Level 04 A Kitchen	-	90	-		2419
Level 04 AToilets	-	90	-		10
Level 04 AToilets	-	90	-		15
Level 04 AToilets	-	90	-		16
Level 04 AToilets	-	90	-		20
Level 04 AToilets	-	90	-		25
Level 04 AToilets	-	90	-		11
Level 04 AToilets	-	90	-		46
Level 04 A Super Premium Suite	-	90	-		1616
Level 04 AToilets	-	90	-		11
Level 04 AToilets	-	90	-		51
Level 04 AToilets	-	90	-		27
Level 04 AToilets	-	90	-		13
Level 04 AToilets	-	90	-		16
Level 04 AToilets	-	90	-		20
Level 04 AToilets	-	90	-		16
Level 04 A Super Premium Bar	-	90	-		1330
Level 04 AToilets	-	90	-		11
Level 04 AToilets	-	90	-		46
Level 04 AToilets	-	90	-		25
Level 04 AToilets	-	90	-		13
Level 04 AToilets	-	90	-		16
Level 04 AToilets	-	90	-		18
Level 04 AToilets	-	90	-		14
Level 04 A Super Premium Suite	-	90	-		1627
Level 04 A Kitchen	-	90	-		2410
Level 03 Premium Hospitality	-	90	-		2688
Level 03 Kitchen	-	90	-		3357
Level 03 Premium Hospitality	-	90	-		2249

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?
Level 04 Goods	N/A	N/A
Level 04 Debenture Bar	YES (+14.2%)	NO
Level 04 Debenture Lounge	NO (-4%)	NO
Level 04 Debenture Lounge	NO (-3.4%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Level 04 A Goods	N/A	N/A
Level 04 A Super Premium Suite	NO (-60.2%)	NO
Level 04 A Super Premium Bar	NO (-56%)	NO
Level 04 A Super Premium Suite	NO (-61.2%)	NO
Level 03 Premium Hospitality	YES (+38.2%)	NO
Level 03 Premium Hospitality	NO (-10.9%)	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?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m ²]	9409.5	9409.5
External area [m ²]	13341.1	13341.1
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	3
Average conductance [W/K]	6740.42	5746.04
Average U-value [W/m ² K]	0.51	0.43
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
 D1 Non-residential Inst.: Primary Health Care Building
 D1 Non-residential Inst.: Crown and County Courts

100 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	22.77	14.47
Cooling	6.96	3.58
Auxiliary	23.92	34.99
Lighting	2.8	6.8
Hot water	89.89	82.58
Equipment*	55.74	55.74
TOTAL**	146.33	142.43

* 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/m²]

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

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	114.05	93.77
Primary energy* [kWh/m ²]	238.23	254.21
Total emissions [kg/m ²]	41.4	43.9

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

HVAC Systems Performance

System Type	Heat dem MJ/m ²	Cool dem MJ/m ²	Heat con kWh/m ²	Cool con kWh/m ²	Aux con kWh/m ²	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity									
Actual	69.7	71.7	27.7	8.9	11	0.7	2.25	0.88	2.8
Notional	53.9	62.2	17.4	4.6	17.7	0.86	3.79	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity									
Actual	51.4	0	18.2	0	57.9	0.79	0	0.88	0
Notional	58.5	0	18.9	0	75	0.86	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity									
Actual	4.2	0	1.5	0	74.6	0.79	0	0.88	0
Notional	0.5	0	0.2	0	104.1	0.86	0	----	----

Key to terms

Heat dem [MJ/m ²]	= Heating energy demand
Cool dem [MJ/m ²]	= Cooling energy demand
Heat con [kWh/m ²]	= Heating energy consumption
Cool con [kWh/m ²]	= Cooling energy consumption
Aux con [kWh/m ²]	= 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-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.25	01000051:Surf[0]
Floor	0.2	0.18	01000052:Surf[0]
Roof	0.15	0.18	01000057:Surf[0]
Windows, roof windows, and rooflights	1.5	1.6	01000052:Surf[4]
Personnel doors	1.5	-	No Personnel doors in building
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-Typ} = Typical individual element U-values [W/(m ² K)]		U _{i-Min} = Minimum individual element U-values [W/(m ² K)]	
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m ³ /(h.m ²) at 50 Pa	5	3