BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

CST_06 After Energy Demand Reduction As designed

Date: Sun Oct 18 22:13:06 2015

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.4

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.4

BRUKL compliance check version: v5.2.d.2

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 CO_2 emission rate for the building should not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	21.6
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	21.6
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	19.3
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 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	0.1	0.1	PL000003:Surf[0]
Floor	0.25	0.09	0.1	PL000003:Surf[4]
Roof	0.25	0.12	0.12	CR000000:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.31	1.64	NR000005:Surf[1]
Personnel doors	2.2	1.72	1.72	PL000003:Surf[2]
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- Gas Boilers : Nat Vent

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	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.

2- Gas Boilers : MVHR

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	0.2	0	0.8
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.

"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	
Common Plant	58	-	-	109
Common Plant	55	-	-	60
CPF Entrance	-	74	-	37
CPF Hall	-	80	-	1179
CPF Office	55	-	-	76
CPF Reading	50	-	-	110
CPF Reception	88	-	-	39
CPF Snug	-	80	-	313
CPF Staff	43	-	-	90
CPF Staff Corridor	-	68	-	27
CPF Stair	-	120	-	8
CPF Stair	-	122	-	14
CPF WC	-	82	-	25
CPF WC	-	86	-	21
CPF WC	-	84	-	24
CPF WC	-	83	-	23
CPF WC	-	95	-	16
Housing Entrance	-	81	-	106
Housing Lift	-	154	-	21
MUGA Change	-	96	-	66

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
MUGA Change	-	97	-	67
MUGA Lift	-	164	-	22
MUGA Lift	-	84	-	22
MUGA Lobby	-	69	-	53
MUGA Stair	-	97	-	60
MUGA Stair	-	67	-	60
MUGA WC	-	95	-	16
Nursery Kitchen Corridor	-	66	-	125
Nursery Kitchenette	-	69	-	67
Nursery Office	44	-	-	79
Nursery Parents	43	-	-	70
Nursery WC	-	134	-	27
Nursery WC	-	106	-	42
CPF Plant	61	-	-	27
Nursery	-	85	-	432
Nursery Lobby	-	86	-	55
Nursery Group	52	-	-	107
Nursery Staff	48	-	-	96

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?
CPF Hall	NO (-29.9%)	YES
CPF Office	NO (-10.3%)	YES
CPF Reading	NO (-38.9%)	YES
CPF Reception	NO (-78.9%)	NO
CPF Snug	NO (-71.7%)	NO
CPF Staff	NO (-72.6%)	NO
MUGA Change	N/A	N/A
MUGA Change	N/A	N/A
Nursery Office	NO (-77.7%)	NO
Nursery Parents	NO (-50.7%)	NO
Nursery	NO (-58.2%)	YES
Nursery Group	NO (-46.6%)	YES
Nursery Staff	NO (-71.5%)	YES

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]	702	702
External area [m^2]	2076.5	2076.5
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	458.79	817.06
Average U-value [W/m^{2}K]	0.22	0.39
Alpha value* [%]	9.48	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
100	**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
	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	56.37	65.84
Cooling	0	0
Auxiliary	3	1.12
Lighting	8.31	11.92
Hot water	6.44	3.77
Equipment*	23.14	23.14
TOTAL**	**74.12**	**82.66**

* 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	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]	140.01	204.34
Primary energy* [kWh/m^2]	110.49	123.98
Total emissions [kg/m^2]	19.3	21.6

* 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: floor heating, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	19.3	0	7.8	0	7.9	0.69	0	0.91	0
	Notional	53.4	0	17.2	0	3.7	0.86	0	----	----
[ST] Central heating using water: floor heating, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	148.9	0	60	0	1.6	0.69	0	0.91	0
	Notional	215.5	0	69.4	0	0.9	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 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	0.1	PL000003:Surf[0]
Floor	0.2	0.08	NR00000E:Surf[0]
Roof	0.15	0.12	PL000003:Surf[1]
Windows, roof windows, and rooflights	1.5	1.31	CP000000:Surf[2]
Personnel doors	1.5	1.72	PL000003:Surf[2]
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
$m^3/(h.m^2)$ at 50 Pa	5	3