BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

170465 - Shepway Leisure Centre - Run18 As designed

Date: Thu Jun 08 16:37:33 2017

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.7

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.7

BRUKL compliance check version: v5.3.a.0

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 must not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	118.3
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	118.3
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	114.8
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	0.22	0.26	GF00001D:Surf[1]
Floor	0.25	0.2	0.2	FF00000B:Surf[0]
Roof	0.25	0.16	0.16	FF00001D:Surf[0]
Windows***, roof windows, and rooflights	2.2	1.55	1.6	FF00000B:Surf[1]
Personnel doors	2.2	2.2	2.2	GF000005: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	4

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- Under Floor Heating - Extract

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.95	-	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					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- Split System - AHU/MVHR

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	2.5	0	0	0.73
Standard value	2.5*	3.2	N/A	N/A	0.5
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.

3- Under Floor Heating - MVHR

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.95	-	0.2	0	0.73
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					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.

4- AHU Mech Heating - Swimming

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.95	-	0.2	1.9	0.73
Standard value	0.91	N/A	N/A	1.5^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

^ 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.

5- Radiators - Nat Vent

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.95	-	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					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.

6- Split System - Comms Room

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	2.5	-	0	-
Standard value	2.5*	3.2	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- Under Floor Heating - Nat Vent

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.95	-	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					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.

8- Radiators - MVHR

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.95	-	0.2	0	0.73
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					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.

9- AHU Mech Heating - Kitchen

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.95	-	0.2	0.9	-
Standard value	0.91	N/A	N/A	1.5^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

^ 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"

1- CHECK2-CHP

	CHPQA quality index	CHP electrical efficiency
This building	0	0.33
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
FF - Dance Studio	-	1.6	0	-	-	-	-	-	-	-	N/A
FF - Exercise Studio	-	1.6	0	-	-	-	-	-	-	-	N/A
FF - Female Dry Change	-	-	-	1.6	-	-	-	-	-	-	N/A
FF - Male Dry Change	-	-	-	1.6	-	-	-	-	-	-	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 - Spin Studio	-	1.6	0	-	-	-	-	-	-	-	N/A
GF - 20 Person Group Changing 1	-	-	-	1.6	-	-	-	-	-	-	N/A
GF - 20 Person Group Changing 2	-	-	-	1.6	-	-	-	-	-	-	N/A
GF - Admin Suite	-	1.6	0	-	-	-	-	-	-	-	N/A
GF - Cafe	-	1.6	0	-	-	-	-	-	-	-	N/A
GF - Changing Place	-	-	-	1.6	-	-	-	-	-	-	N/A
GF - Changing Village Child	-	-	-	1.6	-	-	-	-	-	-	N/A
GF - Changing Village Main - Cubicles 1	-	-	-	1.6	-	-	-	-	-	-	N/A
GF - Changing Village Main - Cubicles 2	-	-	-	1.6	-	-	-	-	-	-	N/A
GF - Changing Village Main - Showers	-	-	-	1.6	-	-	-	-	-	-	N/A
GF - Dis Chang Shower 1	-	-	-	1.6	-	-	-	-	-	-	N/A
GF - Dis Chang Shower 2	-	-	-	1.6	-	-	-	-	-	-	N/A
GF - First Aid	-	-	-	1.6	-	-	-	-	-	-	N/A
GF - General Office	-	1.6	0	-	-	-	-	-	-	-	N/A
GF - Kitchen	-	-	0.9	-	-	-	-	-	-	-	N/A
GF - Reception	-	1.6	0	-	-	-	-	-	-	-	N/A
FF - Fitness Suite - Daylight Z2	-	1.6	0	-	-	-	-	-	-	-	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	
FF - Acc WC	-	70	-	51
FF - Circ Open Stairs	-	70	-	66
FF - Cl Store	63	-	-	33
FF - Dance Studio	-	70	-	837
FF - Disc WC Shower	-	70	-	70
FF - Exercise Studio	-	70	-	789
FF - Female Dry Change	-	70	-	337
FF - Female WC	-	70	-	92
FF - Lobby	-	70	-	129
FF - Male Dry Change	-	70	-	342
FF - Male WC	-	70	-	92
FF - Spectators Seating	-	70	-	449
FF - Spin Studio	-	70	-	289
FF - Stair Core 2	-	70	-	98
FF - Store	63	-	-	69
FF - Store 1	63	-	-	50
FF - Store 2	63	-	-	44
GF - 20 Person Group Changing 1	-	70	-	127
GF - 20 Person Group Changing 2	-	70	-	122
GF - Acc WC	-	70	-	45
GF - Admin Comms	63	-	-	37
GF - Admin Suite	63	-	-	643

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
GF - Admin WC	-	70	-	38
GF - Buggies	-	70	-	22
GF - Cafe	-	70	-	654
GF - Cafe Acc WC 1	-	70	-	40
GF - Cafe Acc WC 2	-	70	-	41
GF - Changing Place	-	70	-	94
GF - Changing Village Child	-	70	-	100
GF - Changing Village Main - Circulation & Lockers	-	70	-	1154
GF - Changing Village Main - Cubicles 1	-	70	-	163
GF - Changing Village Main - Cubicles 2	-	70	-	101
GF - Changing Village Main - Showers	-	70	-	214
GF - Chemical Store 1	63	-	-	31
GF - Chemical Store 2	63	-	-	31
GF - Circ Open Stairs	-	70	-	58
GF - Circulation	-	70	-	101
GF - Clean Store	63	-	-	28
GF - Dis Chang Shower 1	-	70	-	55
GF - Dis Chang Shower 2	-	70	-	70
GF - Female WC	-	70	-	108
GF - First Aid	63	-	-	163
GF - General Office	63	-	-	159
GF - Kitchen	-	70	-	260
GF - Lobby	-	70	-	30
GF - Male WC	-	70	-	110
GF - Plant	63	-	-	633
GF - Pool Store	63	-	-	136
GF - Reception	-	70	50	183
GF - Servery	-	70	-	80
GF - Stair Core 2	-	70	-	95
GF - Swimming Pool	-	85	-	9064
Roof - Plant Room	63	-	-	388
FF - Fitness Suite - Daylight Z2	-	75	-	5942

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?
FF - Dance Studio	NO (-16.7%)	NO
FF - Exercise Studio	NO (-43.6%)	NO
FF - Spin Studio	N/A	N/A
GF - Admin Comms	N/A	N/A
GF - Admin Suite	N/A	N/A
GF - Cafe	NO (-2%)	NO
GF - First Aid	N/A	N/A
GF - General Office	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
GF - Reception	NO (-73.5%)	NO
GF - Servery	NO (-79.9%)	NO
GF - Swimming Pool	NO (-1.1%)	NO
FF - Fitness Suite - Daylight Z2	NO (-14.5%)	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?	NO
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]	3021.6	3021.6
External area [m^2]	5402.9	5402.9
Weather	SOU	SOU
Infiltration [m^3/hm^2@ 50Pa]	4	3
Average conductance [W/K]	1660.89	1737.79
Average U-value [W/m^2K]	0.31	0.32
Alpha value* [%]	11.27	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 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
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: 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/m^2]

	Actual	Notional
Heating	39.2	51.68
Cooling	2.65	1.64
Auxiliary	21.59	12.07
Lighting	34.36	16.86
Hot water	438.39	423.75
Equipment*	54.21	54.21
TOTAL**	**499.82**	**506**

* 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	36.37	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	166.44	185.51
Primary energy* [kWh/m^2]	651.9	673.63
Total emissions [kg/m^2]	114.8	118.3

* 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] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	9.3	114.9	0.7	8.5	33.6	3.92	3.74	4	5
	Notional	13.3	72.4	1.4	5.3	13.6	2.56	3.79	----	----
[ST] Central heating using water: floor heating, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	12.7	0	3.2	0	14.8	0.89	0	0.95	0
	Notional	12.2	0	3.9	0	5.9	0.86	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	0.1	0	0	0	10.7	0.89	0	0.95	0
	Notional	5.3	0	1.7	0	4.3	0.86	0	----	----
[ST] Central heating using air distribution, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	387.8	0	90.4	0	23.3	0.98	0	0.95	0
	Notional	476.7	0	153.6	0	19.3	0.86	0	----	----
[ST] Central heating using air distribution, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	8.2	0	2.4	0	26.4	0.83	0	0.95	0
	Notional	8	0	2.6	0	22.9	0.86	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	16.9	0	4.3	0	2.8	0.89	0	0.95	0
	Notional	37	0	11.9	0	1.7	0.86	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	0	0	0	0	0	3.92	3.74	4	5
	Notional	0	0	0	0	0	2.56	3.79	----	----
[ST] Central heating using water: floor heating, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	54.2	0	13.7	0	35.8	0.89	0	0.95	0
	Notional	81.3	0	26.2	0	23.6	0.86	0	----	----
[ST] Central heating using water: floor heating, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	63.1	0	15.6	0	2.8	0.89	0	0.95	0
	Notional	80.5	0	25.9	0	1.7	0.86	0	----	----
[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 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	0.22	GF00001D:Surf[105]
Floor	0.2	0.2	GF000009:Surf[0]
Roof	0.15	0.15	GF00001D:Surf[402]
Windows, roof windows, and rooflights	1.5	1.38	FF000012:Surf[66]
Personnel doors	1.5	2.2	GF000005: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
m³/(h.m²) at 50 Pa	5	4