

## Project name

# The Greenwood Centre Part L2 2013 Correct Lighting with ER20 CHP & PV's

As designed

Date: Fri Mar 17 11:17:48 2017

## Administrative information

## Building Details

Address: Greenwood Place, London, NW5

## Owner Details

Name: London Borough of Camden

Telephone number: Phone

Address: 38-50 Bidborough Street, London, WC1H 9DB

## 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

## Certifier details

Name: Synergy Consulting Engineers

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: The calculated CO<sub>2</sub> emission rate for the building should not exceed the target

CO <sub>2</sub> emission rate from the notional building, kgCO <sub>2</sub> /m <sup>2</sup> .annum	32.5
Target CO <sub>2</sub> emission rate (TER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	32.5
Building CO <sub>2</sub> emission rate (BER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	24.2
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 <sub>a</sub> -Limit	U <sub>a</sub> -Calc	U <sub>i</sub> -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.2	0.22	RM000004:Surf[1]
Floor	0.25	0.2	0.2	03000000:Surf[0]
Roof	0.25	0.13	0.13	17000000:Surf[6]
Windows***, roof windows, and rooflights	2.2	1.48	1.5	03000004:Surf[1]
Personnel doors	2.2	1	1	0100000C: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 <sub>a</sub> -Limit = Limiting area-weighted average U-values [W/(m <sup>2</sup> K)] U <sub>a</sub> -Calc = Calculated area-weighted average U-values [W/(m <sup>2</sup> K)] U <sub>i</sub> -Calc = Calculated maximum individual element U-values [W/(m <sup>2</sup> K)]				
* 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 <sup>3</sup> /(h.m <sup>2</sup> ) at 50 Pa	10	5

## 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.

<b>Whole building lighting automatic monitoring &amp; targeting with alarms for out-of-range values</b>	YES
<b>Whole building electric power factor achieved by power factor correction</b>	>0.95

### 1- Gas central heating radiators with Natural Ventilation

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
<b>This system</b>	0.97	-	0.47	0	-
<b>Standard value</b>	0.91*	N/A	N/A	N/A	N/A
<b>Automatic monitoring &amp; targeting with alarms for out-of-range values for this HVAC system</b>					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- Gas central heating radiators with AC units

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
<b>This system</b>	0.97	4.08	0	0	0.67
<b>Standard value</b>	0.91*	3.2	N/A	N/A	0.65
<b>Automatic monitoring &amp; targeting with alarms for out-of-range values for this HVAC system</b>					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.					

### 3- Gas central heating radiators with Mechanical Ventilation ( Extract Only)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
<b>This system</b>	0.97	-	0.48	0	-
<b>Standard value</b>	0.91*	N/A	N/A	N/A	N/A
<b>Automatic monitoring &amp; targeting with alarms for out-of-range values for this HVAC system</b>					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- Gas central heating radiators with Mechanical Ventilation (Supply & Extract)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
<b>This system</b>	0.97	-	0.5	0	0.89
<b>Standard value</b>	0.91*	N/A	N/A	N/A	0.65
<b>Automatic monitoring &amp; targeting with alarms for out-of-range values for this HVAC system</b>					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.					

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

### 1- CHECK2-CHP

	CHPQA quality index	CHP electrical efficiency
<b>This building</b>	0	0.32
<b>Standard value</b>	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	Zone	Standard
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1		
0.36 Dementia Office	-	0.9	0.5	-	-	-	-	-	-	-	-	N/A
0.27 Dementia Dining Room	-	-	0.5	-	-	-	-	-	-	-	-	N/A
0.37 Dementia Meeting Room	-	0.9	0.5	-	-	-	-	-	-	-	-	N/A
0.17 PMLD Activity Room	-	-	-	0.9	-	-	-	-	-	-	-	N/A
0.19 PMLD Sensory Room	-	-	-	0.9	-	-	-	-	-	-	-	N/A
0.24 PMLD Accessible WC	-	-	0.3	-	-	-	-	-	-	-	-	N/A
0.23 PMLD Meeting Room/Quiet Room	-	-	-	0.9	-	-	-	-	-	-	-	N/A
0.20 PMLD Changing Places WC	-	-	0.3	-	-	-	-	-	-	-	-	N/A
0.22 Laundry	-	-	-	0.9	-	-	-	-	-	-	-	N/A
0.52 Bicycle Store	-	-	0.3	-	-	-	-	-	-	-	-	N/A
0.3 First Aid Room	-	-	-	0.9	-	-	-	-	-	-	-	N/A
0.53 Access Corridor	-	-	-	0.9	-	-	-	-	-	-	-	N/A
0.7 Cleaners Cupboard	-	-	0.3	-	-	-	-	-	-	-	-	N/A
0.10 Accessible WC	-	-	0.3	-	-	-	-	-	-	-	-	N/A
0.13 Female WC Provision	-	-	0.3	-	-	-	-	-	-	-	-	N/A
1.29 Accessible WC/Shower Provision	-	-	0.3	-	-	-	-	-	-	-	-	N/A
1.37 Mental Health Large Consulting Room	-	0.9	0.5	-	-	-	-	-	-	-	-	N/A
1.23 Mental Health Accessible WC	-	-	0.3	-	-	-	-	-	-	-	-	N/A
1.22 Mental Health Activity Room 1	-	0.9	0.5	-	-	-	-	-	-	-	-	N/A
1.7 Large Meeting Room	-	0.9	0.5	-	-	-	-	-	-	-	-	N/A
1.10 Accessible WC Provision	-	-	0.5	-	-	-	-	-	-	-	-	N/A
1.9 Accessible WC Provision	-	-	0.5	-	-	-	-	-	-	-	-	N/A
1.4 Meeting Room	-	0.9	0.5	-	-	-	-	-	-	-	-	N/A
1.3 Meeting Room	-	0.9	0.5	-	-	-	-	-	-	-	-	N/A
1.6 Server Room	-	0.9	0.5	-	-	-	-	-	-	-	-	N/A
1.5 Meeting Room	-	0.9	0.5	-	-	-	-	-	-	-	-	N/A
1.19 ASC Base Room	-	-	-	0.9	-	-	-	-	-	-	-	N/A
1.20 ASC Base Room	-	-	0.3	-	-	-	-	-	-	-	-	N/A
1.24 Mental Health Activity Room 2	-	0.9	0.5	-	-	-	-	-	-	-	-	N/A
1.25 Mental Health Activity Room 3	-	-	-	0.9	-	-	-	-	-	-	-	N/A
1.32 Mental Health Dining Room	-	-	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	Zone	Standard
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1		
2.8 Staff Shower/WC	-	-	0.3	-	-	-	-	-	-	-	-	N/A
2.6 Accessible WC	-	-	0.3	-	-	-	-	-	-	-	-	N/A
2.19 Sensory Room	-	-	-	0.9	-	-	-	-	-	-	-	N/A
2.13 New Shoots Space	-	0.9	0.5	-	-	-	-	-	-	-	-	N/A
2.14 New Shoots Changing Places WC	-	-	0.3	-	-	-	-	-	-	-	-	N/A
2.16 New Shoots Accessible WC	-	-	0.3	-	-	-	-	-	-	-	-	N/A
2.11 Music Studio	-	-	-	0.9	-	-	-	-	-	-	-	N/A
2.12 Music Room	-	0.9	0.5	-	-	-	-	-	-	-	-	N/A
2.1 IT Room	-	-	-	0.9	-	-	-	-	-	-	-	N/A
0.26 PMLD Dining	-	-	0.5	-	-	-	-	-	-	-	-	N/A
0.16 PMLD Day Room	-	-	-	0.9	-	-	-	-	-	-	-	N/A
1.13/1.21 ASC Entrance/ASC Day Room	-	-	-	0.9	-	-	-	-	-	-	-	N/A
1.14 ASC Unisex Changing Area	-	-	0.3	-	-	-	-	-	-	-	-	N/A
1.27 Standard WC Provision - Unisex	-	-	0.3	-	-	-	-	-	-	-	-	N/A
0.5 Office	-	-	-	0.8	-	-	-	-	-	-	-	N/A
0.xx Dementia Acc WC Peninsular	-	-	0.3	-	-	-	-	-	-	-	-	N/A
0.29 Dementia Acc WC	-	-	0.3	-	-	-	-	-	-	-	-	N/A
0.28 Dementia Changing Places	-	-	0.3	-	-	-	-	-	-	-	-	N/A
0.30 Dementia Acc WC	-	-	0.3	-	-	-	-	-	-	-	-	N/A
2.21 Demonstration Flat Accessible WC	-	-	0.1	-	-	-	-	-	-	-	-	N/A
2.2 Waiting Area	-	-	-	0.9	-	-	-	-	-	-	-	N/A

"LENI calculation for lighting energy provided in a separate submission."

### 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?
0.35 Dementia Office	NO (-80.4%)	NO
0.36 Dementia Office	NO (-68.3%)	NO
0.27 Dementia Dining Room	NO (-30.4%)	NO
0.37 Dementia Meeting Room	NO (-75.2%)	NO
0.17 PMLD Activity Room	NO (-7.6%)	NO
0.19 PMLD Sensory Room	N/A	N/A
0.23 PMLD Meeting Room/Quiet Room	N/A	N/A
0.3 First Aid Room	N/A	N/A
1.31 Mental Health Day Room	NO (-44.4%)	NO
1.37 Mental Health Large Consulting Room	NO (-58.5%)	NO
1.22 Mental Health Activity Room 1	NO (-45%)	NO
1.7 Large Meeting Room	NO (-79.1%)	NO
1.4 Meeting Room	NO (-80.3%)	NO
1.3 Meeting Room	NO (-79%)	NO
1.6 Server Room	NO (-79%)	NO
1.5 Meeting Room	NO (-77.2%)	NO
1.19 ASC Base Room	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
1.20 ASC Base Room	NO (-51.9%)	NO
1.24 Mental Health Activity Room 2	NO (-15%)	NO
1.25 Mental Health Activity Room 3	N/A	N/A
1.32 Mental Health Dining Room	NO (-8.1%)	NO
2.9 Office	NO (-7.6%)	NO
2.18 New Shoots Office	NO (-61.6%)	NO
2.19 Sensory Room	N/A	N/A
2.13 New Shoots Space	NO (-68.9%)	NO
2.11 Music Studio	NO (-60.6%)	NO
2.12 Music Room	NO (-40.1%)	NO
1.2 Office	NO (-36.6%)	NO
1.8 Waiting Area	YES (+1.4%)	NO
1.1 Office	NO (-15.9%)	NO
2.1 IT Room	NO (-56.3%)	NO
0.26 PMLD Dining	NO (-2.6%)	NO
0.16 PMLD Day Room/dining with UFH	NO (-26.7%)	NO
0.33 Dementia Day Room	NO (-47%)	NO
0.16 PMLD Day Room	NO (-67.2%)	NO
1.16 ASC Activity Room	NO (-22.8%)	NO
1.13/1.21 ASC Entrance/ASC Day Room	YES (+21.4%)	NO
1.28 Office	N/A	N/A
1.30 Office	NO (-7.3%)	NO
2.10 Art Room (Kiln)	NO (-44.2%)	NO
2.10 Art Room	NO (-24.9%)	NO
0.5 Office	N/A	N/A
0.2 Mutil Purpose Hall	NO (-33.1%)	NO
0.39 Dementia Lobby	N/A	N/A
2.5 Demonstration Flat	NO (-74.6%)	NO
2.2 Waiting Area	YES (+0.1%)	NO
2.17 New Shoots Space	NO (-53.7%)	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 <sup>2</sup> ]	3201.4	3201.4
External area [m <sup>2</sup> ]	5698.6	5698.6
Weather	LON	LON
Infiltration [m <sup>3</sup> /hm <sup>2</sup> @ 50Pa]	5	3
Average conductance [W/K]	2212.53	2413.55
Average U-value [W/m <sup>2</sup> K]	0.39	0.42
Alpha value* [%]	9.26	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<sup>2</sup>]

	Actual	Notional
Heating	34.26	26.65
Cooling	0.44	0.79
Auxiliary	3.23	2.86
Lighting	8.8	14.64
Hot water	99.27	81.05
Equipment*	30.3	30.3
<b>TOTAL**</b>	<b>127.59</b>	<b>125.99</b>

\* 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<sup>2</sup>]

	Actual	Notional
Photovoltaic systems	2.65	0
Wind turbines	0	0
CHP generators	18.41	0
Solar thermal systems	0	0

## Energy & CO<sub>2</sub> Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m <sup>2</sup> ]	108.13	93.47
Primary energy* [kWh/m <sup>2</sup> ]	143.71	186.13
Total emissions [kg/m <sup>2</sup> ]	24.2	32.5

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

## HVAC Systems Performance

System Type	Heat dem MJ/m <sup>2</sup>	Cool dem MJ/m <sup>2</sup>	Heat con kWh/m <sup>2</sup>	Cool con kWh/m <sup>2</sup>	Aux con kWh/m <sup>2</sup>	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
<b>[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity</b>									
Actual	89.3	56.5	15.9	2.6	4.5	0.9	5.99	0.97	8.02
Notional	72.7	63.5	23.4	4.7	4.2	0.86	3.79	----	----
<b>[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity</b>									
Actual	125.8	0	21.8	0	1.4	0.9	0	0.97	0
Notional	102.7	0	33.1	0	1	0.86	0	----	----
<b>[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity</b>									
Actual	24.3	0	3.8	0	5.7	0.9	0	0.97	0
Notional	24.1	0	7.8	0	4.9	0.86	0	----	----
<b>[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity</b>									
Actual	122.6	0	24.6	0	3.1	0.9	0	0.97	0
Notional	109.9	0	35.4	0	4.5	0.86	0	----	----
<b>[ST] No Heating or Cooling</b>									
Actual	0	0	0	0	0	0	0	0	0
Notional	0	0	0	0	0	0	0	----	----

### Key to terms

Heat dem [MJ/m <sup>2</sup> ]	= Heating energy demand
Cool dem [MJ/m <sup>2</sup> ]	= Cooling energy demand
Heat con [kWh/m <sup>2</sup> ]	= Heating energy consumption
Cool con [kWh/m <sup>2</sup> ]	= Cooling energy consumption
Aux con [kWh/m <sup>2</sup> ]	= 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 <sub>i-Typ</sub>	U <sub>i-Min</sub>	Surface where the minimum value occurs*
Wall	0.23	0.19	01000004:Surf[0]
Floor	0.2	0.2	03000000:Surf[0]
Roof	0.15	0.13	02000001:Surf[1]
Windows, roof windows, and rooflights	1.5	1.18	04000005:Surf[11]
Personnel doors	1.5	1	0100000C: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 <sub>i-Typ</sub> = Typical individual element U-values [W/(m <sup>2</sup> K)]		U <sub>i-Min</sub> = Minimum individual element U-values [W/(m <sup>2</sup> K)]	
* There might be more than one surface where the minimum U-value occurs.			

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