Shurgard UK – Camden

Energy Statement

Rev 02 – Issued for Comment/Review

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DOCUMENT CONTROL

Issue	Date	Status	Author	Review	Notes
01	30/10/19		DM	RM	Energy Statement – for review
02	15/11/19		RM	NP	Energy Statement – for review

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1. Executive Summary

This Energy Assessment has been prepared by Butler Consulting Engineers on behalf of Shurgard UK. The aim of this report is to demonstrate the design for the Shurgard UK, self-storage unit in Camden complies with the Energy Reduction Target part of Policy 5.2 of the Draft London Plan.

To address the Great London Authority (GLA) and the local policy requirements, the strategy for reducing the energy consumption and carbon dioxide emissions associated with the proposed development is guided by the Mayor's Energy Hierarchy:

- passive design and energy efficiency; (Be Lean)
- energy efficient supply of services; (Be Clean) and
- on-site renewable energy technologies to provide energy (Be Green).

The results from energy modelling conclude that by following the improvements and associated design specification within Section 3, the regulated carbon dioxide results can be reduced from 2.62 to -0.05 Tonnes/annum. This total reduction significantly exceeds the 35% reduction requirement of Policy 5.2 of the Draft London Plan.

The measures implemented to achieve this substantial reduction are given below:

Be Lean: Implement energy demand reduction measures such as improved fabric thermal performance, low energy lighting and introducing heat recovery to mechanical ventilation, as per Section 3.1 of this report.

Be Clean: A CHP installation is not a feasible solution for this development as confirmed in Section 3.2 of this Report. Where technically feasible, space to install district heating plant, such as tees and valves within hot water heaters, and external pipework routes for connection to the district heating network should be considered as per the guidance set out in the District Heating Manual for London.

Be Green: Installation of 24m^2 of PV array has been allowed for to achieve a (Be Green) iteration result of Zero Carbon Dioxide. This equates to around 5.37kWp (based on SUNPOWER E Series Panel SPR-E20-327-COM).

The below table shows the CO_2 emissions / Savings:

Table 1. CO_2 Emissions after each stage of Energy Hierarchy

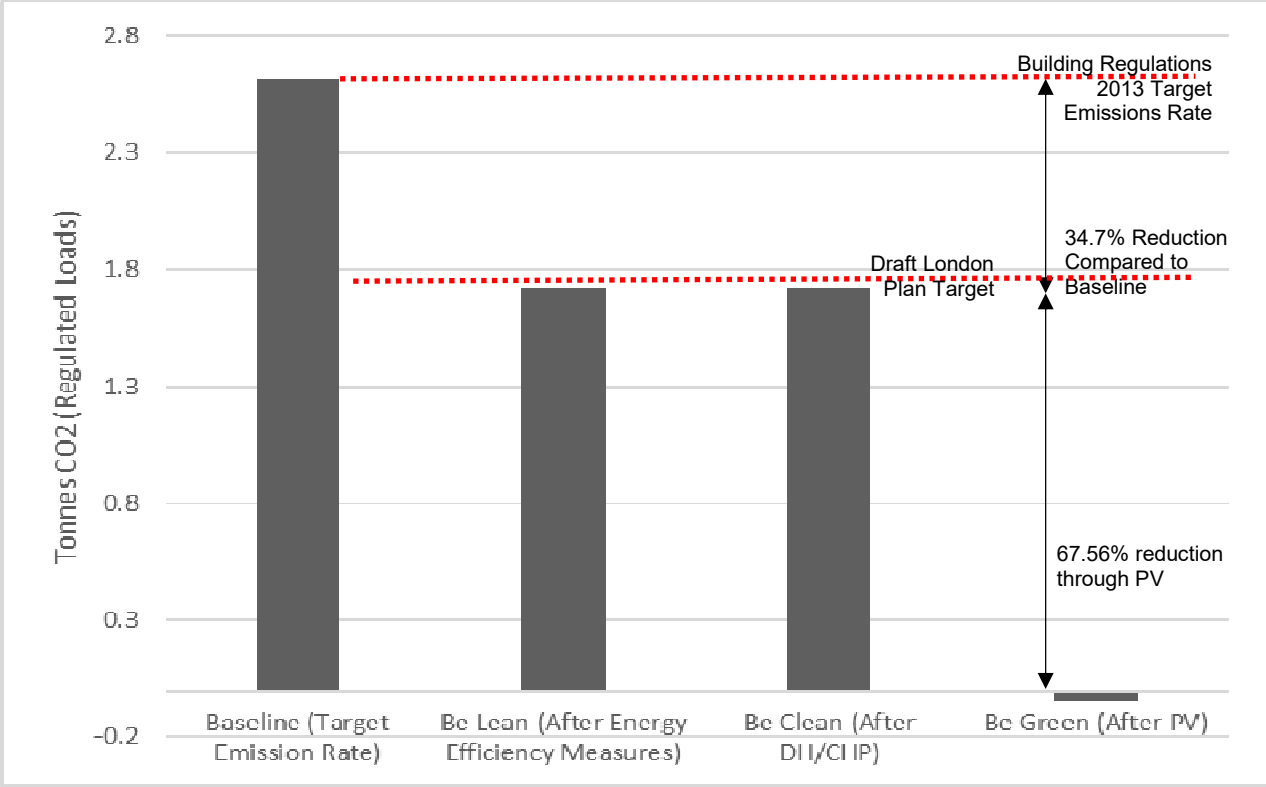
	CO_2 Emissions (Tonnes / annum)	
	Regulated	**Unregulated**
Baseline Part L 2013 of the Building Regulation Compliant Development	2.62	22.2
After energy demand reduction (Be Lean)	1.72	22.2
After potential DH connection (Be Clean)	1.72	22.2
After PV on-site renewables (Be Green)	-0.05	22.2

Table 2. Regulated CO_2 Savings

	Regulated CO_2 (Tonnes / annum)	
	Regulated savings	**% Savings**
Savings After energy demand reduction (Be Lean)	0.9	34.35%
Savings After potential CHP/DH connection (Be Clean)	0	0%
Savings After PV on-site renewables (Be Green)	1.77	66.30%
Cumulative on-site savings	2.67	102%

The following figure 1 shows a graphical representation of the estimated regulated CO_2 emissions when compared to the requirement of the Draft London Plan.

Figure 1. GLA Energy Hierarchy Results



1.0 Assessment Methodology

Butler Consulting Engineers have compiled this Energy Assessment in support of the proposed Shurgard Self-storage Unit in Camden.

The site is located within the London Borough of Camden. The proposal is the erection of an extension within the courtyard of the existing building to provide additional self-storage accommodation (Use Class B8) and associated car and cycle parking.

The overall assessment identified to reduce the regulated energy consumption and associated CO_2 emissions of the Proposed Development includes the following measures which will be incorporated in order to demonstrate compliance with the Building Regulations follow the guidance set out by the local policies:

- Passive design and energy efficiency;
- Energy efficient and low carbon supply of services; and
- On-site renewable energy technologies to provide energy where appropriate.

Generally, this is applied to a development as follows:

- Calculation of the ADL 2013 compliant regulated and unregulated baseline energy demand and associated CO_2 emissions;

- Determination of the most appropriate energy efficiency and passive design measures. These are then incorporated into the energy calculations, representing an enhanced scheme.

- Identification of clean energy supply technologies (e.g. CHP and/or DH network) and incorporation to the energy calculations, in accordance with local policies;

- Identification of the most applicable renewable energy technologies to further reduce the CO_2 emissions of the development through on-site renewable sources.

1.1 Differing Planning Policies

There are several differing planning policies that are relevant to the Shurgard Camden development. This section of the report summarises the energy and CO_2 emission requirements applicable to the development.

1.2 The Draft London Plan, July 2019

The Mayor's "The Draft London Plan: Spatial Development Strategy for Greater London" represents a significant revision of previous editions of the London Plan. The plan sets out six detailed objectives, to ensure London is:

- A city that meets the challenges of economic and population growth
- An internationally competitive and successful city
- A city of diverse, strong, secure and accessible neighbourhoods
- A city that delights the senses
- A city that becomes a world leader in improving the environment
- A city where it is easy, safe and convenient for everyone to access job, opportunities and facilities

The plan draws on the framework of the previous plan and, in terms of sustainability, sets an overarching vision that London should be "A city that becomes a world leader in improving the environment locally and globally, taking the lead in tackling climate change, reducing pollution, developing a low carbon economy, consuming fewer resources and using them more efficiently".

Section 5, and other sections of the plan outlines policies on responding to climate change.

Policy 5.2, which provides defined carbon reductions expected of new developments, and it encourages the use of renewable energy technologies, Combined Heat and Power (CHP) and district energy networks without giving defined quanta of saving that are to be achieved from these specific technologies.

Policy 5.2 outlines the following carbon reductions expected as improvements over 2010 Building Regulations. These are scaled to be increasingly more demanding with time, as follows:

Residential buildings:
- 2010 – 2013: 25% improvement (Code for Sustainable Homes Level 4)
- 2013 – 2016: 40% improvement
- 2016 – 2031: Zero Carbon

Non-domestic buildings:
- 2010 – 2013: 25% improvement
- 2013 – 2016: 40% improvement
- 2016 – 2019: As per building regulations
- 2019 – 2031: Zero Carbon

Policy 5.2 also notes that major developments should include a detailed energy assessment to demonstrate their performance within the energy hierarchy, and that this assessment is to include:

- Calculation of baseline energy and CO_2 emissions; (both controlled by building regulations and those from any other part of the development).
- Proposals for the reduction of CO_2 emissions generated through efficient design of the site and building services.
- Proposals to further reduce CO_2 emissions via the use of decentralised energy
- Proposals to further reduce CO_2 emissions through the use of on-site renewable energy

1.3 Camden Local Plan

The Camden Local Development Plan Policy EN4 Sustainable Design and Construction is likely to be relevant to the Shurgard Camden development. Local Plan Policy CC1 outlines the requirements for sustainable design and the criteria against which proposed developments will be assessed. In relation to the proposed Shurgard Camden, the following standard is relevant:

> (*b) (i). All new non-residential development and non-self-contained residential accommodation should meet at least BREEAM 'Excellent' unless it is demonstrated that it is not technically feasible or viable to do so, in which case proposals should demonstrate a 'Very Good' rating;*

All development proposals will require a supporting statement to demonstrate the sustainability principles applied. The statement, as a minimum, must comply with the requirements set out in the Draft London Plan Sustainable Design and Construction SPG.

This Energy Report does not check against compliance with BREEAM and therefore confirmation from the appropriate BREEAM assessor is required to have confirmation that the BRUKL report results are sufficient with regards to the requirements of BREEAM.

1.4 Calculation of Regulated Emissions

To establish the regulated CO_2 emission for the development, an energy model of the proposed building has been created using DCLG approved Dynamic Simulation Modelling Software IES VE. The energy modelling has been undertaken to determine the Target Emission Rate (TER) required for compliance with Criterion 1 of PartL2A of the 2013 Building Regulations. This TER is also the baseline CO_2 emission value that shall be applied in the energy hierarchy assessment outlined within this report.

Shurgard UK Limited have confirmed that the warehouse areas of the building will be unheated and full space heating shall be limited to the Front of House portions of the building. As a result, the warehouse areas have been excluded from the TER calculation and subsequently this energy assessment as per the guidance outlined in Paragraphs 2.24-2.27 of Part L 2A 2013.

As per the Mayor of London Energy Assessment Guidance (October 2018) both the Baseline and 'Be Lean' design iteration uses Gas Boiler (with efficiency of 91%) as the heating source.

1.5 Calculation of Unregulated Emissions

The unregulated CO_2 emissions associated with office equipment, appliances, lifts and external lighting etc. have been sourced from the annual energy consumptions for the Shurgard Woolwich development which was completed in January 2016. This building is comparable with Shurgard Dylan Road as it has been constructed to the same energy performances in terms of fabric, plant and equipment. The calculations of the unregulated energy consumptions for Shurgard Woolwich, (which have been applied in this report for Shurgard Camden) are presented in Appendix A of this report.

2.0 Design Outline

To minimise CO_2 emissions, the following Mayor's energy hierarchy, included in Policy 5.2 of The Draft London Plan 2011, has been applied to the design strategy of the development:

- Demand Reduction (Be Lean)
- District Heating and CHP (Be Clean)
- On-site renewables (Be Green)

The three principles outlined above have been applied in sequence and systematically in the development of the proposal. These are illustrated in the following sections.

2.1 Demand Reduction (BE LEAN)

From the previous Energy Assessment it is clear that the major contributors to the buildings regulated CO_2 emissions are from lighting and heating/ cooling of the retail unit. It is therefore these aspects of the design where energy efficiency measures to reduce consumption have been focused to minimise the buildings regulated CO_2 emissions. This includes high levels of insulation and airtightness to minimise heat loads, and solar control glass to reduce cooling loads. Specific details applied within the design calculations to reduce demand are outlined below:

2.1.1 FABRIC THERMAL PERFORMANCE

Heat losses from the building fabric will be minimised through the specification of high performing insulation to achieve low building element U-values, this includes heat loss elements between the heated shop unit and un-heated warehouse. Similarly, an airtight envelope will be achieved in order to reduce heat losses associated with the ingress and egress of cold and warm air respectively. To minimise solar gain to the shop unit, solar control glass will be applied to minimise the requirement for mechanical cooling. The fabric performances applied within the 'Be Lean' energy model that are applicable to the shop unit are provided below:

Table 3. Be Lean Architectural Assumptions

Variable	Design Value
External/ heat loss wall U-value	0.20 W/m2K
Heat loss floor U-value	0.20 W/m2K
Heat loss ceiling	0.18 W/m2K
Window overall U-value (inc. frame)	1.25 W/m2K
Doors	1.4 W/m²K
Window G-value	0.4
Window Daylight Transmittance	71%
Air permeability	5 $m^3/h.m^2$@50Pa

2.1.2 HEATING & COOLING

The shop unit will require both space heating and cooling. In order to provide this requirement a reversible air sourced heat pump (also known as a VRF/ VRV) system will be installed. This system can provide both functions, space heating and cooling. In addition to being a versatile conditioning strategy, VRF/ VRV commonly achieve high operating efficiencies of up to 400%. As a result, this has a significant impact on reducing the buildings energy consumptions and associated CO_2 emissions.

Heating source for both heating and DHW load is based on a Gas Boiler (with 91% efficiency) for the Baseline and 'Be Lean' design iterations (as per section 2.3 guidance).

2.1.3 LIGHTING

The lighting has been based on internal lighting calculations based on a highly efficient lighting strategy. Which includes LED within the main reception and fluorescents within storage and plant areas. All areas lighting loads are found within the appropriate BRUKL report within Appendix B.

1.1.1 VENTILATION

Major supply and extract fans of the mechanical ventilation system will be low-energy, with a specific fan power (SFP) no greater than 1.4W/l/s. Heat recovery should also be adopted with a thermal efficiency of 70%.

Implementing the above demand reduction measures within the energy model demonstrates that a Building Emission Rate (BER) of 25.0 kg/CO_2/m² can be achieved as illustrated in the BRUKL Document in Appendix B. This equates to carbon footprint of 1.72 tonnes of CO_2 per annum.

Comparing the above results against the baseline figures of 38.2kg/CO_2/m^2, demonstrates that a 34.55% reduction in regulated CO_2 emissions is achieved through the Be Lean hierarchy measure.

2.2 District Heating and CHP (BE CLEAN)

Analysis of the London Heat Map (below Figure 2) demonstrates that the site is located 1.4km from the proposed Euston Road CHP district heating network, and approximately 5km north west of the existing Shoreditch district heating scheme. The low heat demand of the building does not merit the significant extension of these existing and proposed district heating mains. It is however recommended that provisions are allowed to future proof the connection of the building to a district heating main should these be extended in the near future. This includes providing adequate space within the building for district heating plant (i.e. providing tees and valves within hot water headers) and external pipework routes for connection to the district heating network. The low heat demand of the building precludes the practical application of CHP for this installation.

Figure 2. London Heat Map

The proposed VRF/ VRV system is a recognised low carbon technology that better suits the heating and cooling needs of the buildings Front of house accommodation.

As no CHP or district heating are proposed, the results demonstrate no reduction in regulated CO_2 emissions can be achieved through the Be Clean hierarchy measure.

2.3 On-site Renewables (BE GREEN)

The results from the energy modelling demonstrate that there are minimal carbon emissions and energy loads associated with heat generation. It can therefore be concluded that renewable heat generating technologies such as biomass, solar thermal panels and ground sourced heat pumps offer little in scope in reducing the buildings annual CO_2 emissions.

Wind turbines have been excluded for the proposals due to the potential planning issues with this technology. Similarly, water sourced heat pumps have been excluded as there is no body of water than can be used as a heat sink.

The front of house areas of the building will however be conditioned via a reversible air source heat pump system of high seasonal heating and cooling efficiencies. VRF/VRV/ASHP systems are classed as renewable technologies under the GLA Guidance and therefore contribute to the 'Be Green' energy hierarchy.

To achieve the 35% improvement beyond Part L 2013 Building Regulation compliance and secure the BREEAM Excellent rating, photovoltaic panels are proposed as a suitable on-site renewable technology.

The 'Be Green' therefore includes for a 24m^2 South facing PV array. This equates to around 5.37kWp (based on SUNPOWER E Series SPR-E20-327-COM 20.1% efficient Panel type).

Comparing the above results against the 'Be Lean' iteration figures of 25.0kg/CO_2/m^2, demonstrates that a further 66.30% reduction in regulated CO_2 emissions is achieved through the inclusion of ASHP and PV array.

3.0 Summary of Energy Hierarchy

It can be concluded from the findings within Section 3 that through the demand reduction design measures (Be Lean), and inclusion of south facing PV on the roof, and use of ASHP technology for both heating and cooling (Be Green) the regulated Carbon dioxide can be reduced to Zero.

The CO_2 emissions after each stage of the energy hierarchy are provided within the following tables, these results demonstrate that the Shurgard Camden development significantly exceeds compliance against Policy 5.2 of the Draft London Plan Energy Reduction Requirements.

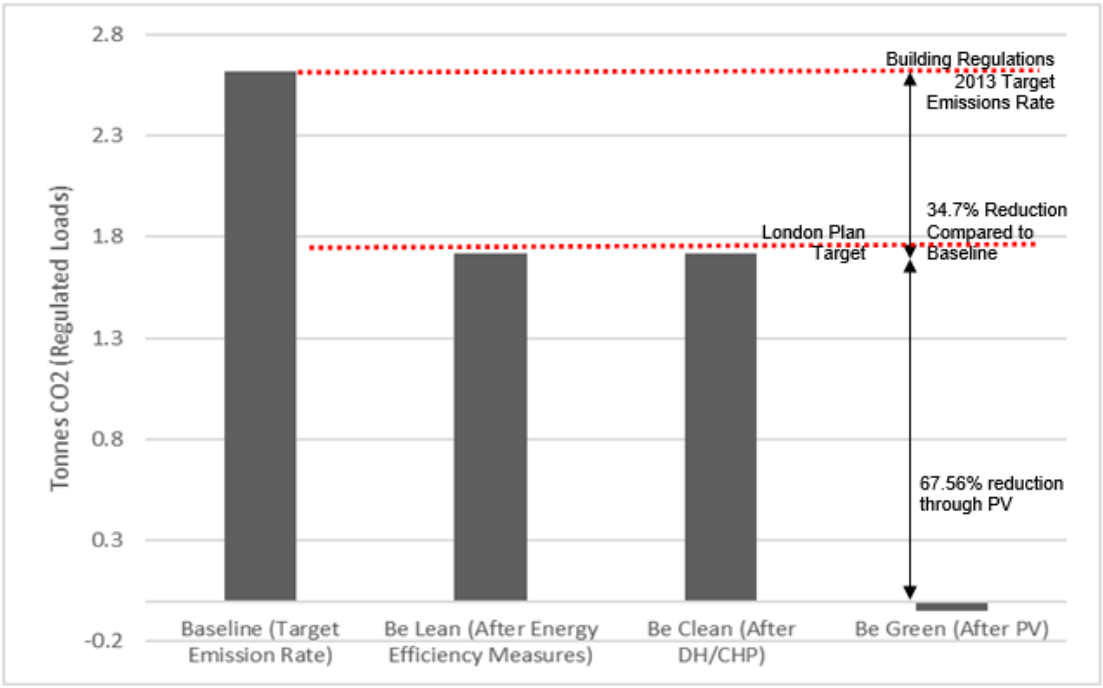
Table 4. CO_2 Emissions after each stage of Energy Hierarchy

	CO_2 Emissions (Tonnes / annum)	
	Regulated	**Unregulated**
Baseline Part L 2013 of the Building Regulation Compliant Development	2.62	22.2
After energy demand reduction (Be Lean)	1.72	22.2
After potential DH connection (Be Clean)	1.72	22.2
After PV on-site renewables (Be Green)	-0.05	22.2

Table 5. Regulated CO_2 Savings

	Regulated CO_2 Emissions (Tonnes / annum)	
	Regulated	**(%)**
Savings After energy demand reduction (Be Lean)	0.9	34.35%
Savings After potential CHP/DH connection (Be Clean)	0	0%
Savings After PV on-site renewables (Be Green)	1.77	66.30%
Cumulative on-site savings	2.67	102%

Figure 3. GLA Energy Hierarchy Results



Following the Mayor of London guidance, the below table illustrates the total energy demand extracted from each design iteration:

Table 6. Total energy demand MWh/year

	Energy Demand MWh/year						
	Space Heating	**Hot Water**	**Lighting**	**Auxiliary**	**Cooling**	**Unregulated Electricity**	**Unregulated Gas**
Baseline	0.43	0.32	4.40	0.21	0.22	6.88	0.59
Be Lean	0.98	0.35	2.19	0.34	0.11	4.89	1.14
Be Green	0.37	0.33	2.19	0.34	0.11	5.38	0

APPENDIX A

This Appendix information is based on a previously completed Shurgard project to present the un-regulated energy and CO_2 emissions calculations. Information from the Shurgard Woolwich site has been used as a basis for estimating the emission for the Shurgard Dylan Road development.

The Shurgard Woolwich and Dylan Road developments are similar in terms of design and operation with both buildings having the same fabric thermal performances, plant and equipment, as well being self-storage facilities. Both buildings have also been assessed against the same revision of Part L2A (Conservation of Fuel and Power in Building Other than Dwellings, Building Regulations of England and Wales, 2014 Edition) and only use mains electricity to power plant and equipment. As such the actual energy consumption and CO_2 emissions of the Woolwich building can be used as a basis for the Dylan Road development.

Shurgard UK have provided the actual electrical energy consumption for the Woolwich site over the period of 1st July 2016 to the 22nd May 2017 with the total energy consumption being 97,949 kWh. This equates to an average 5,441 kWh per month and thus the site uses on average 65,299kWh per annum electricity. The Part L2A BRUKL report confirms that the regulated energy for the shop unit is 5,122kWh per annum and thus the unregulated energy is 60,177kWh.

The calculations outlined below confirm that a Shurgard development being built to the same specification as the Woolwich and Dylan Road buildings will emit approximately 2.77 $kgCO_2/m^2$/annum. On this basis the Shurgard Camden development is likely to emit 22,232 kg CO_2 per annum based on a GIFA of 8,026m².

Table 7. Unregulated Energy and CO_2 Emission Calculation Shurgard Woolwich

Woolwich energy consumption (01/01/2016 – 22/05/2017)	97,949 kWh
Average monthly energy consumption Whole Site =	5,441 kWh
Annual energy consumption Whole Site	65,299 kWh
Part L2A Regulated Energy Consumption for Shop Unit	5,122 kWh
Un-regulated Energy Consumption	60,177 kWh
Mains electricity carbon factor =	0.519 $kgCO_2$/ kWh
Estimated annual Unregulated CO_2 Emission =	31,231 $kgCO_2$
Building gross Internal Floor Area =	11,255 m²
Annual Unregulated CO_2 Emissions for New Build Unit =	2.77 $kgCO_2/m^2$

APPENDIX B

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Shurgard - Lean

As designed

Date: Tue Oct 29 17:56:11 2019

Administrative information

Building Details

Address: York Way, London, N7 9LG

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.11

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.11

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

Owner Details

Name: Name

Telephone number: Telephone

Address: Street Address, City, Postcode

Certifier details

Name: Rosemary McLafferty

Telephone number: 07855801999

Address: 2 Park Avenue,, Balloch, G83 8JS

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	38.2
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	38.2
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	25
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	0.2	0.2	FF000012:Surf[2]
Floor	0.25	0.2	0.2	FF000012:Surf[0]
Roof	0.25	-	-	UNKNOWN
Windows***, roof windows, and rooflights	2.2	1.25	1.25	FF000012:Surf[1]
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

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]
$U_{i\text{-}Calc}$ = 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	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.

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- VRV System

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	4	0	0	0.7
Standard value	0.91*	3.2	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.

2- Local Electric System (+ DHW)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	0.2	0	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

"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**		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	**Zone**	**Standard**
Office	-	1.4	0	-	-	-	-	-	-	-	N/A
Office	-	1.4	0	-	-	-	-	-	-	-	N/A
Reception	-	1.4	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	
Office	65	-	-	115
Office	65	-	-	88
Reception	149	-	-	147
Store	65	-	-	105
WC	210	-	-	27

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?
Office	NO (-93.9%)	NO
Office	NO (-74.7%)	NO
Reception	NO (-58.3%)	NO
Store	N/A	N/A
WC	N/A	N/A

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 [m²]	68.7	68.7
External area [m²]	187.2	187.2
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	5	5
Average conductance [W/K]	48.94	0
Average U-value [W/m²K]	0.26	0
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
100	**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
	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	14.27	6.29
Cooling	1.65	3.2
Auxiliary	4.94	3.02
Lighting	31.82	64.09
Hot water	5.17	4.71
Equipment*	29.86	29.86
TOTAL**	57.85	81.3

* 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/m²]

	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/m²]	61.98	63.76
Primary energy* [kWh/m²]	146.93	223.56
Total emissions [kg/m²]	25	38.2

* 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] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	43.2	20.9	14.2	2	6.1	0.85	2.84	0.91	4
	Notional	15.8	54.1	4.9	4	3.7	0.91	3.79	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	53.1	0	14.7	0	0	1	0	1	0
	Notional	38	0	12.2	0	0	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 Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	$U_{l\text{-}Typ}$	$U_{l\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.2	FF000012:Surf[2]
Floor	0.2	0.2	FF000012:Surf[0]
Roof	0.15	-	UNKNOWN
Windows, roof windows, and rooflights	1.5	1.25	FF000012:Surf[1]
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

$U_{l\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{l\text{-}Min}$ = 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	5

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Shurgard - Green

As designed

Date: Tue Oct 29 17:57:17 2019

Administrative information

Building Details

Address: York Way, London, N7 9LG

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.11

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.11

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

Owner Details

Name: Name

Telephone number: Telephone

Address: Street Address, City, Postcode

Certifier details

Name: Rosemary McLafferty

Telephone number: 07855801999

Address: 2 Park Avenue,, Balloch, G83 8JS

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	38.4
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	38.4
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	-0.7
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	0.2	0.2	FF000012:Surf[2]
Floor	0.25	0.2	0.2	FF000012:Surf[0]
Roof	0.25	-	-	UNKNOWN
Windows***, roof windows, and rooflights	2.2	1.25	1.25	FF000012:Surf[1]
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

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

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- VRV System

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	4	0	0	0.7
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					NO

* 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.

2- Local Electric System (+ DHW)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	0.2	0	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

1- Local Electric System (+ DHW)

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	-
Standard value	1	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
Office	-	1.4	0	-	-	-	-	-	-	-	N/A
Office	-	1.4	0	-	-	-	-	-	-	-	N/A
Reception	-	1.4	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	
Office	65	-	-	115
Office	65	-	-	88

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Reception	149	-	-	147
Store	65	-	-	105
WC	210	-	-	27

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?
Office	NO (-93.9%)	NO
Office	NO (-74.7%)	NO
Reception	NO (-58.3%)	NO
Store	N/A	N/A
WC	N/A	N/A

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 [m²]	68.7	68.7
External area [m²]	187.2	187.2
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	5	5
Average conductance [W/K]	48.94	0
Average U-value [W/m²K]	0.26	0
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
100	**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
	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	5.46	3.59
Cooling	1.65	3.2
Auxiliary	4.94	3.02
Lighting	31.82	64.09
Hot water	4.71	4.65
Equipment*	29.86	29.86
TOTAL**	48.57	78.55

* 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/m²]

	Actual	Notional
Photovoltaic systems	49.9	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/m²]	61.98	62.19
Primary energy* [kWh/m²]	157.09	225.44
Total emissions [kg/m²]	-0.7	38.4

* 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] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	43.2	20.9	3.2	2	6.1	3.73	2.84	4	4
	Notional	13.9	54.1	1.5	4	3.7	2.56	3.79	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	53.1	0	14.7	0	0	1	0	1	0
	Notional	38	0	12.2	0	0	0.86	0	----	----

Key to terms

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