CAMDEN GOODS YARD: PFS PARCEL SITE JUNIPER BUILDING REVISIONS

Energy Strategy Addendum
WBS-ZZ-ZZ-RP-SU-10001 P07

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Comments		Planning Submission with updated content		

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1. EXECUTIVE SUMMARY

The purpose of this Energy Statement Addendum is to set out the updated energy and carbon emission performance of the Juniper Building (PFS Parcel Site) in support of the third July 2022 S73 application to the Camden Goods Yard extant planning permission. This document forms an addendum to the consented Revised Energy Strategy produced by Energist (6th July 2020) for the proposed amendments to the Juniper Building (the former Petrol Filling Station (PFS Parcel site) which forms part of the Camden Goods Yard development site (reference: 2020/3116/P as amended).

Planning permission was originally granted for the redevelopment of the Morrisons Superstore and Petrol Filling Station (PFS site) in June 2018 (reference: 2017/3847/P) and has subsequently been amended by two minor material amendment applications. The second S73 Application (reference: 2020/3116/P) was approved in December 2020 and is the current planning permission for the Site (the December 2020 consent).

The proposed amendments sought by this application relate to the PFS Parcel only and as such covered by this Energy Statement Addendum. No amendments are proposed to the Camden Goods Yard main site parcel and details of that scheme are to remain as per the December 2020 consent.

Scheme Benefits:

This section summaries further changes made to the approved scheme in respect to the PFS Parcel site Juniper Building, in order to improve carbon emissions and minimise energy use.

This Addendum provides specific emissions predictions for the PFS Parcel proposed development - Juniper Building, to demonstrate an improvement to those outlined in the 3rd December 2020 Consented Scheme (reference 2020/3116/P) Revised Energy Strategy Statement (dated July 2020). Where applicable, compliance with recent policy and guidance changes that have been adopted since the December 2020 consent have also been evaluated.

The approach of the Energy Strategy Addendum for the PFS Parcel proposed development is broadly similar to the 3rd December 2020 consented scheme, with Air Source Heat Pump's (ASHP) used as the primary source of heating and cooling. However, recognising GLA policy guidance (Policy SI 2 following the energy hierarchy) and (LETI) Guide best practice, the scheme moves away from fossil fuels entirely and therefore does not connect to the main site ASHP heating network as this uses back-up fossil fuel gas fired boilers to supplement heat demand. The proposed strategy simplifies and avoids the need for pumping energy to distribute heating / cooling to site as well as highly complex logistics of crossing under rail line bridge and servicing the two sites together. The Juniper Building will instead use standalone ASHP's to provide the required heating and cooling entirely with waste heat rejection for areas in cooling recovered to meet simultaneous heating and hot water demands in the building.

As a result of the amendments set out in this Addendum, significant optimisation of the energy usage has occurred, which has resulted in a substantial decrease in the energy and carbon usage predicted at each stage of the energy hierarchy. Where feasible, alterations have also been incorporated in order to bring the proposals in line with the latest energy planning guidance, and requirements of the London Plan 2021.

The revisions include additional demand reduction measures, to improve the inherent energy efficiency of the scheme, which has resulted in the 'Be Lean' (Fabric Efficiency) performance achieving 16% against the 13% target site-wide improvement (set out in the 3rd December 2020 Consented Scheme (reference 2020/3116/P extant planning permission) over the calculated baseline. As ASHP's afford the highest percentage of energy and carbon emission reductions, this technology has been prioritised

(eliminating gas fired heating) and resulting in much lower emissions over the Part L target baseline as set out below and surpassing the requirements of the both the applicable and latest policy and guidance.

This is also a significant improvement over the 27% reduction outlined within the 15th June 2018 (reference: 2017/3847/P) (***the 2018 Permission***) and 40% improved in the Revised Energy Strategy for the 3rd December 2020 consent. High efficiency photovoltaic arrays are also still proposed in line with the consented scheme in order to reduce site emissions further, however the area of PV specifically adopted on the Juniper Building has been reduced slightly in order to accommodate the space required for ASHP's which yield the greatest carbon emissions savings.

The proposed amendments to the Juniper Building will result in a number of significant benefits. In respect to the Energy Strategy Addendum, these improvements are summarised below:

- Converted to an all-electric building with heating and cooling generated entirely from Air Source Heat Pumps in accordance with GLA Energy Hierarchy and LETI Guidance.
- Achieving 16% fabric efficiency requirements for the building as whole compared to the latest GLA planning policy requirement of 15% (Retail and Office).
- High efficiency variable speed-controlled ventilation systems which will reduce fan energy by 35% over previous specified proposals and include CO_2 control.
- Achieving 56% CO_2 reduction over Part L 2013 baseline (compared to 40% within the S73 Energist Energy Statement 6th July 2020 as part of3rd December 2020 Consented Scheme). For the office areas, there will be 38% CO_2 reduction from heat pump system and 3% from PV panels. If considered across the PFS Parcel site (i.e. office and retail units), there will be 37% CO_2 reduction from heat pump system and 2% from PV panels.
- The building will achieve a BREEAM rating of 'Excellent'.

Results of Energy Modelling:

The PFS Parcel comprises of construction of a 6 storey office building with ancillary retail and café-restaurant provision. The PFS Parcel Site proposed development offers the flexibility for multi-tenancy office space.

The updated carbon dioxide (CO_2) emissions performance for Juniper Building site has been assessed in line with GLA Energy Assessment Guide and the use of SAP10 emissions fuel factors (i.e., decarbonised grid electricity fuel factors). Benchmarking is against the notional in the consented scheme (2013 Part L). The London Plan 2021 energy target requires to meet at least 35% CO_2 reduction through Mayor's Energy Hierarchy steps of which there should be 15% from energy efficiency measures. Following the Mayor's Energy Hierarchy:

- The PFS Parcel office areas are predicted to achieve 57% improvement over baseline emission using SAP10 emission factors, of which there is 16% reduction from energy efficiency measures at Be Lean Stage. This means the proposed Office performance exceeds the London Plan energy efficiency and overall CO_2 reduction targets. There will be 38% CO_2 reduction from heat pump system and 3% from PV panels

- The PFS Parcel Retail units are predicted to achieve 36% improvement over baseline emission using SAP10 emission factors, of which there is 17% reduction from energy efficiency measures at Be Lean Stage. This means the proposed Retails performance exceeds the London Plan energy efficiency and overall CO_2 reduction targets.
- Overall the PFS Parcel proposed development is predicted to achieve ~56% improvement over baseline emission using SAP10 emission factors, of which there is ~16% reduction from energy efficiency measures at Be Lean Stage. This means, overall, the PFS Parcel site exceeds the London Plan energy efficiency and overall CO_2 reduction targets.

The proposed energy efficiency measures required to deliver the above performance are summarised below:

- Efficient fabric thermal performance through high performance double skin facade
- Mechanical ventilation heat recovery on main ventilation plant
- Provision of energy efficient dimmable LED light fittings with presence detection and daylight dimming control
- Provision of air source heat pump (ASHP) systems for heating and cooling.
- Provision of ASHP fed hot water system (HWS) generation plant,
- PV panels on plant screen louvres and flat roof,
- Variable Air Volume (VAV) control of supply / extract air with CO_2 control to optimise ventilation rates
- Integral DX units within AHUs for increased efficiency and less embodied carbon
- Smart enabled building with Smart building backbone for energy metering and control

Figure 1: Carbon Dioxide Emissions – Office

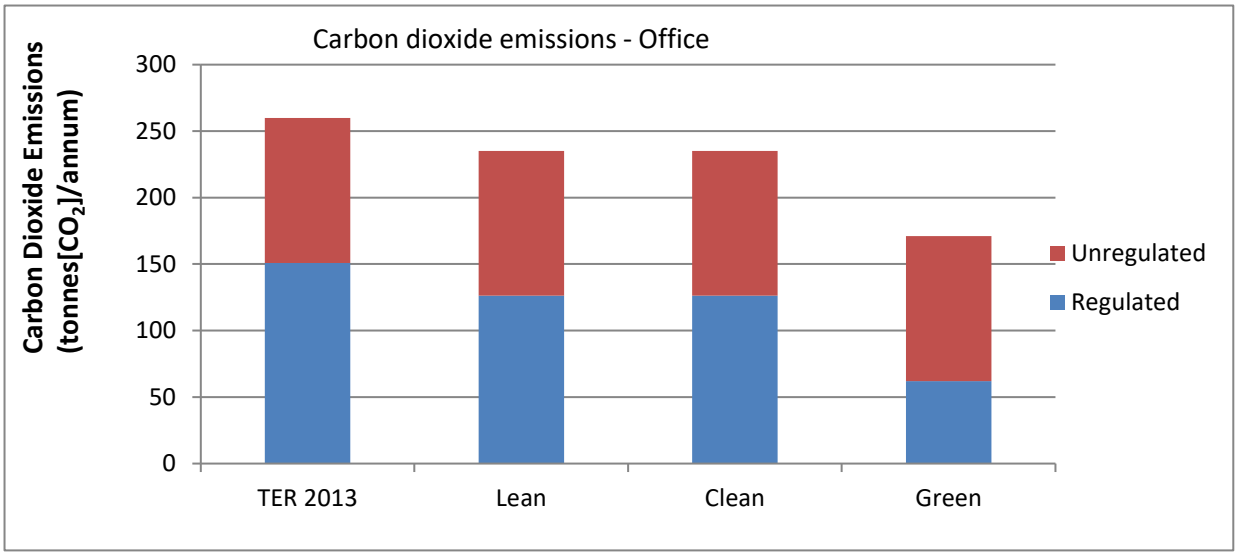


Table 1: Carbon Dioxide Emissions - Office

	SAP 10 Carbon dioxide emissions – Office (tonnes [CO_2]/annum)		
	Regulated	Unregulated	Regulated and Unregulated
TER 2013	151	109	260
Lean	126	109	235
Clean	126	109	235
Green	65	109	174

Table 2: Carbon Dioxide Savings – Office

	SAP 10 Carbon dioxide savings – Office			
	(tonnes [CO_2]/annum)		(%)	
	Regulated	Regulated and Unregulated	Regulated	Regulated and Unregulated
Lean savings	24	24	16%	9%
Clean savings	0	0	0%	0%
Green Savings	62	62	41%[A]	24%
Total savings	86	86	57%	33%

[A:] 38% from heat pump system, 3% from PV panels

Figure 2: Carbon Dioxide Emissions – Retail Units

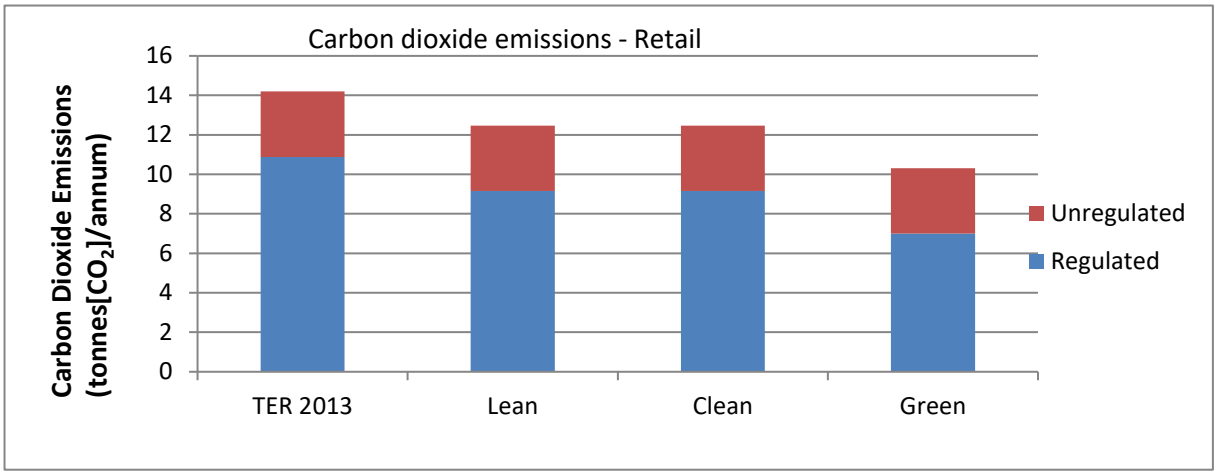


Table 3: Carbon Dioxide Emissions – Retail Units

	SAP 10 Carbon dioxide emissions – Retails (tonnes [CO_2]/annum)		
	Regulated	Unregulated	Regulated and Unregulated
TER 2013	11	3	14
Lean	9	3	12
Clean	9	3	12
Green	7	3	10

Table 4: Carbon Dioxide Savings – Retail Units

	SAP 10 Carbon dioxide savings – Retails			
	(tonnes [CO_2]/annum)		(%)	
	Regulated	Regulated and Unregulated	Regulated	Regulated and Unregulated
Lean savings	2	2	17%	13%
Clean savings	0	0	0%	0%
Green Savings	2	2	19%	15%
Total savings	4	4	36%	28%

2. INTRODUCTION

This Energy Strategy Addendum relates to the PFS Parcel proposed development at Camden Goods Yard located on Chalk Farm Road, London, NW1 8EH, in the London Borough of Camden (LBC).

The focus of the design approach and design amendments to the existing consented proposals for the PFS Parcel site proposed development have been to limit building energy consumption and CO_2 emissions through optimising the performance of the proposed building together with energy efficiency measures. These steps of the energy strategy follow the Mayor of London's "Energy Hierarchy" which identifies building design and resultant energy use to be considered in the following order of priority:

1. Use less energy

   "Be Lean"

2. Supply energy efficiently

   "Be Clean"

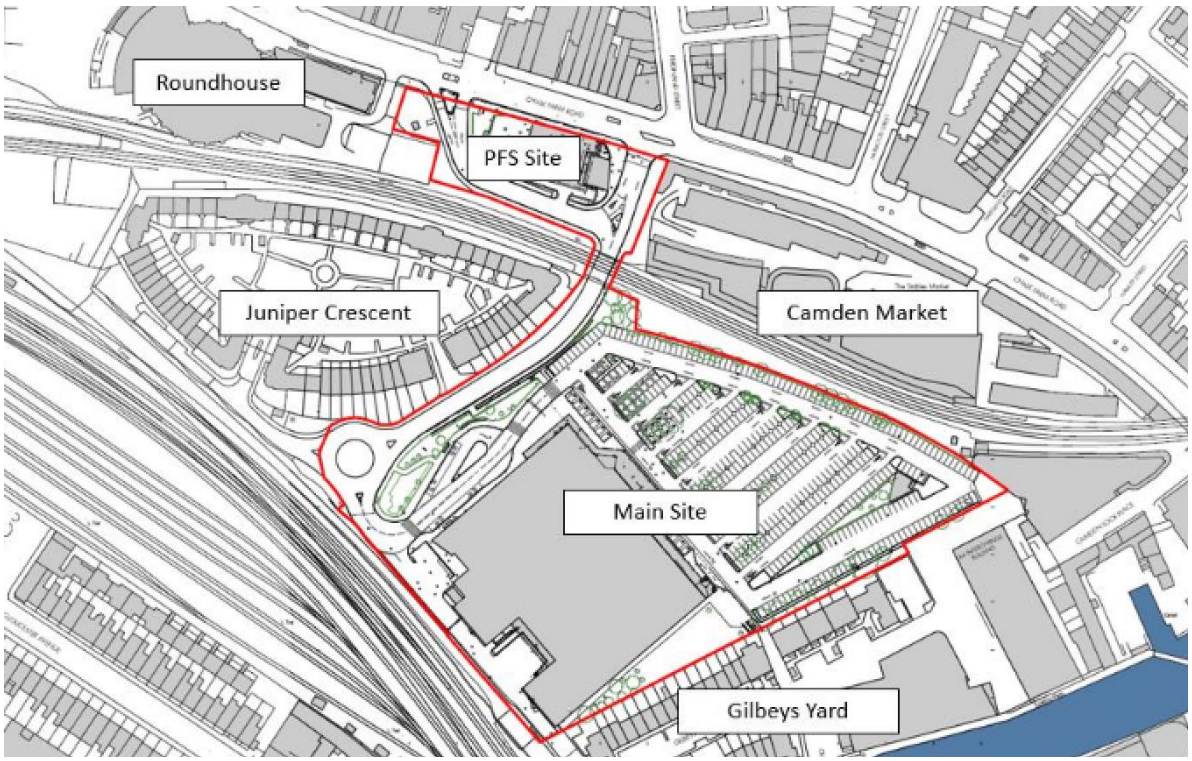
3. Use renewable energy

   "Be Green"

3. Monitoring Energy Performance

   "Be Seen"

Figure 3: Existing Site Location



2.1 Development Overview

The PFS Parcel comprises of construction of a 6 storey office building (the Juniper Building) with ancillary retail and café-restaurant provision. The building offers multi-tenancy office space with areas as set out in Table 5.

The general energy strategy approach for the PFS Parcel is broadly similar to the 3 December 2020 consented scheme, with Air Source Heat Pump's (ASHP) used as the primary source of heating and cooling. However, recognising GLA policy guidance (Policy SI 2 following the energy hierarchy) and LETI Guide best practice, the scheme seeks to move away from fossil fuels entirely and therefore does not connect to the main site ASHP heating network as this uses back-up fossil fuel gas fired boilers to supplement heat demand. The proposed strategy simplifies and avoids the need for pumping energy to distribute heating / cooling to site as well as highly complex logistics of crossing the rail line and servicing the two sites (PFS Parcel and MS parcel sites) together. The Juniper Building will instead use standalone ASHP's to provide the required heating and cooling entirely with waste heat rejection for areas in cooling recovered to meet simultaneous heating and hot water demands in the building.

As a result of the amendments set out in this addendum, significant optimisation has occurred, which has resulted in an increase in the energy and carbon savings predicted at each stage of the energy hierarchy. Where feasible, alterations have also been incorporated in order to bring the proposals in line with the latest energy planning guidance, and requirements of the 2021 London Plan.

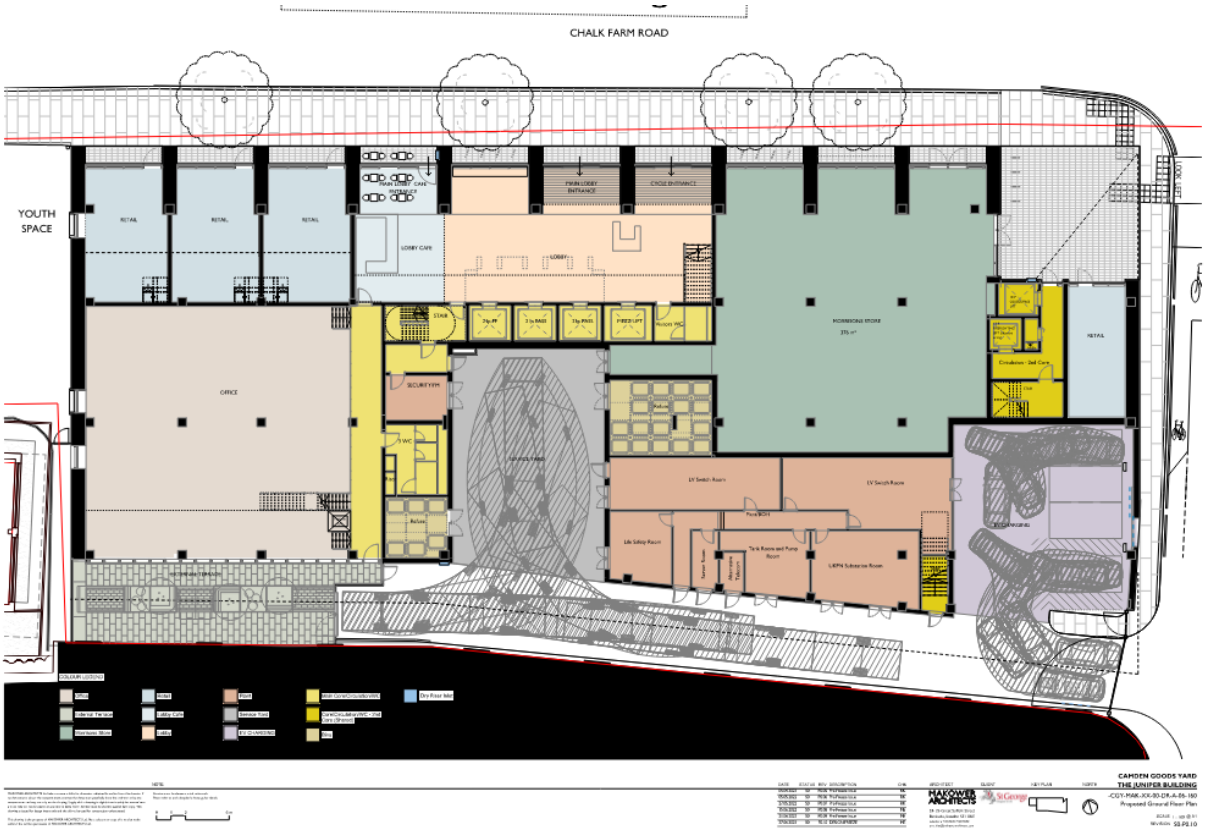
Table 5: PFS Parcel Site Area

Use	Consented (December 2020 ref: 2020/3116/P) Quantum of Development			Proposed Quantum of Development		
	GEA (sqm)	GIA (sqm)	NIA* (sqm)	GEA (sqm)	GIA (sqm)	NIA* (sqm)
Office[1]	**8,114**	**6,873**	**6,585**	**9,398**	**9,080**	**8,766**[2]
Retail (A1, A3, A4)	**1,627**	**1,446**	**1,103**	**1,048**[3]	**1,013**[4]	**994**
Winter garden	**329**[5]	**143**[6]	**98**	**100**[7]	**97**[8]	**96**
Sub Total	**10,070**	**8,462**	**7,786**	**10,546**	**10,190**	**9,856**
Open sided covered area/service yard and EV Charging Station	**1,118**	**0**	**0**	**339**	**339**	**-**
Plant room	**55**	**46**	**0**	**0**	**0**	**-**
Primary Core/Circulation	**0**	**0**	**0**	**1,571**	**1,518**	**-**
Secondary Core/Circulation	**0**	**0**	**0**	**513**	**495**	**-**
BOH[9]	**562**[10]	**534**	**0**	**828**	**800**	**-**
Total	**11,805**	**9,042**	**7,786**	**13,797**	**13,342**	**-**

[1] GEA and GIA figures are inclusive of office lobby and office lobby café. Exclusive of core/circulation as itemised above.
[2] Excludes office lobby and lobby café as unlettable space.
[3] Excludes core and circulation. Inclusive of retail floorspace (272 sqm GEA), Morrisons Store (389 sqm GEA) and Restaurant/Café (387 sqm GEA).
[4] Excludes core and circulation. Inclusive of retail floorspace (263 sqm GIA), Morrisons Store (376 sqm GIA) and Restaurant/Café (374 sqm GIA).
[5] Includes 5th floor void area and circulation (139 sqm GEA).
[6] Includes circulation space.
[7] Excludes secondary core, circulation and terrace.
[8] Excludes secondary core, circulation and terrace.
[9] BOH includes plant (excluding 46 sqm GEA and 46 sqm GIA plant room in consented scheme as already included above), refuse, cycle changing/showers, internal cycle storage but excluding service yard and EV charging station.
[10] GEA for BOH not provided within consented scheme accommodation schedule. St George have inserted a GEA figures at a GEA to GIA conversion of 95%.

Below provides an illustration of the building footprint.

Figure 4: Building Footprint



The geographical location of the site was set to “London” in dynamic thermal modelling, IESVE simulation software, which is a close representation to the site’s geographical location.

2.2 Policy and Legislation

The National Planning Policy Framework sets out the Government’s planning policies for England and how these are expected to be applied. It sets out the Government’s requirements for the planning system.

Planning plays a key role in helping shape places to secure radical reductions in greenhouse gas emissions, minimising vulnerability and providing resilience to the impacts of climate change, and supporting the delivery of renewable and low carbon energy and associated infrastructure. This is central to the economic, social, and environmental dimensions of sustainable development.

The following regulations and policies have been considered when updating the energy strategy for the PFS Parcel site.

2.2.1 Consented Scheme

Benchmarking is against the 2013 Part L notional building as per the 3rd December 2020 extant consented scheme.

The London Plan (March 2021):

The Policies have been produced in a way that allows London to implement the London Plan as soon as possible. There is no requirement for the policies to be repeated at the local level. However, in some instances a local approach is required within the context of the overall policy. The new London Plan clearly sets out where this is the case.

- Policy SI2 Minimising greenhouse gas emissions

    - Major development should be net zero-carbon.
    - This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the energy hierarchy.
    - A minimum on-site reduction of at least 35% beyond Building Regulations is required for major development.
    - Non-residential development should achieve 15% through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:

        1) through a cash in lieu contribution to the borough's carbon offset fund, or
        2) off-site provided that an alternative proposal is identified, and delivery is certain.

    - If the zero-carbon target cannot be met on site, then the annual remaining carbon emissions figure is multiplied by the assumed lifetime of the development's services (e.g., 30 years) to give the cumulative shortfall. The cumulative shortfall is multiplied by the CO_2 offset price to determine the required cash-in-lieu contribution. It is expected to use the recommended carbon offset price of £95 per tonne of CO_2. This equates to tonne of CO_2 multiplied by £2,850.

- Policy SI 4 Managing heat risk

    - Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure.
    - Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:

        1) reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure
        2) minimise internal heat generation through energy efficient design
        3) manage the heat within the building through exposed internal thermal mass and high ceilings
        4) provide passive ventilation
        5) provide mechanical ventilation
        6) provide active cooling systems.

2.2.2 GLA Energy Assessment Guide (April 2020)

The energy assessment must clearly identify the carbon footprint of the development after each stage of the energy hierarchy. Regulated emissions must be provided and, separately, those emissions associated with uses not covered by Building Regulations i.e., unregulated energy uses. The figures for the domestic elements of development should be presented separately from the non-domestic elements as domestic buildings have a different policy target to non-domestic.

If the carbon savings are not achieved on site, the annual remaining carbon emissions figure is multiplied by the assumed lifetime of the development's services (e.g., 30 years) to give the cumulative shortfall. The cumulative shortfall is multiplied by the carbon dioxide offset price to determine the required cash-in-lieu contribution.

The Viability Assessment for London Plan assumed a carbon offset price of £95 per tonne of carbon dioxide for a period of 30 years. Boroughs may use this price or set their own by undertaking a locally specific viability assessment. Where the borough applies a carbon dioxide offset price of £95 per tonne, it is not considered necessary to carry out a further viability assessment of the policy approach. The GLA will regularly review the recommended carbon offset price.

2.2.3 London Borough of Camden

The Camden Local Plan 2017, Policy CC1 Climate Change Mitigation and Policy CC2 Adaptation to Climate Change require developments to promote zero carbon development and to meet the high possible environmental standards in line with London Plan through a) energy efficiency measures and b) energy hierarchy, respectively.

3. REDUCING ENERGY DEMAND (BE LEAN)

In line with the London Plan 2021 energy efficiency measures are proposed to minimise the energy used by the PFS Parcel proposed development and consequently reduce carbon emissions

The Simplified Building Energy Model (SBEM) is the Government's recommended methodology for energy rating enabling calculation of the energy demand and the CO_2 emissions associated with the non-residential areas in WG development. The performance was assessed by comparing the building emissions rate (BER) against the target emissions rate (TER). In addition, unregulated energy consumption is also calculated as explained under SBEM calculation methodology.

Noting that the GLA has decided that from January 2019 and until central Government updates Part L with the latest carbon emission factors, planning applicants are encouraged to use the SAP 10 emission factors for referable applications when estimating CO_2 emission performance against London Plan policies, therefore, the following fuel factors were used for calculations.

SAP10 Emission Factors:

- 0.210 kgCO_2/kWh Gas mains fuel factor
- 0.233 kgCO_2/kWh Grid electricity fuel factor

3.1 Fabric Performance

Below provides summary of the proposed façade thermal properties for PFS Parcel. These will be developed further during detailed design and the energy analysis refined to ensure compliance with the commitments set out herein.

Table 6: Fabric Performance (Area Weighted)

Element	Target Maximum U-values area weighted W/m²K
CLADDING / CURTAIN WALLING	1.0
WALL / NON-CLADDING walls between heated and unheated	0.15
FLOOR exposed floor ground floor slab between heated & unheated space	0.10
ROOF Main roof ceiling of heated space below terraces, balconies	0.12 0.15
GLAZING glazing and glazed doors including frame g-value see below.	area weighted: 1.0
Party Wall	fully filled and sealed

- Air permeability ≤ 3.0 m^3/m^2/hr at 50 Pa
- Office glass g-value/ LT value: a passive flu wall combined system g value (g_{eff}) with blinds in use of 0.09 and 0.42 with blinds up and respective LT values of 0.68 blinds up and 0.10 blinds down.
- Retail glass g-value 0.40, LT value 0.70

3.2 Building Services

Below is the list of building services performance values assumed to represent the services strategy.

Table 7: Services Strategy

Room	Comfort		Target Ventilation sfp W/l/s		
	Space heating	Cooling	AHU	extract fan	supply fan
Retail *(shell)*	VRF		MVHR 89% HR	1.0	
GF Flexible Working	Chiller Heat Pump (HP) serving under floor AET system *		2.0 HR 74.9%	-	-
GF Café, Reception				-	-
Open Plan Office				-	-
Shower / Lockers	Chiller HP serving UFH	via AHU	-	0.5	-
Access Corridor to Lockers	unconditioned		-	-	-
Cycle Storage	via AHU	-	-	0.5	1.1
Basement Office	Chiller HP serving FCU		1.8 HR 74.9%	-	-
WC	unconditioned		-	0.5	1.1
Stair	Chiller HP serving Rads	-	-	-	-
Plant room	unconditioned		-	0.5	1.1

* this is the medium dirty filter sfp value, based on calculation method detailed in BS EN 13779 2007 Annex D, for AHU with variable flow, the design sfp can be reduced to 65% to represent the annual performance. There is also a fan-tile unit with SFP 0.1W/l/s

Table 8: Heating, Cooling, Plant Efficiency

Area	system	Heating Plant Efficiency (SCoP)	Cooling Plant Efficiency (SEER)
Office Area	Heat Pump Chiller	4.3 [A]	5.11 [A]
Retail (shell)	VRF cassette heat pump	4.0	5.0

A: Consented scheme (3RD December 2020) commits to seasonal efficiency (SCoP) of 3.10 for heating and seasonal efficiency (SEER) of 3.3 for cooling. The PFS Parcel site addendum proposals performance values achieve ~39%, ~55% improvement in efficiency, respectively

For the retail units it will be the future tenant responsibility to follow the stated values.

Table 9: Hot Water Strategy

Area		System	efficiency
Office Area	Shower	Communal heat Pump	3.5
	WC		
Retail (shell)	all areas	Individual heat pump or hydrobox	2.95

For the retail units it will be the future tenant responsibility to follow the stated values.

MVHR: mechanical ventilation heat recovery

ASHP: air source heat pump

HR: heat recovery

AHU: air handling unit

HR: heat recovery

SCoP: seasonal coefficient of performance

SEER: Seasonal Energy Efficiency Ratio

SFP: specific fan power

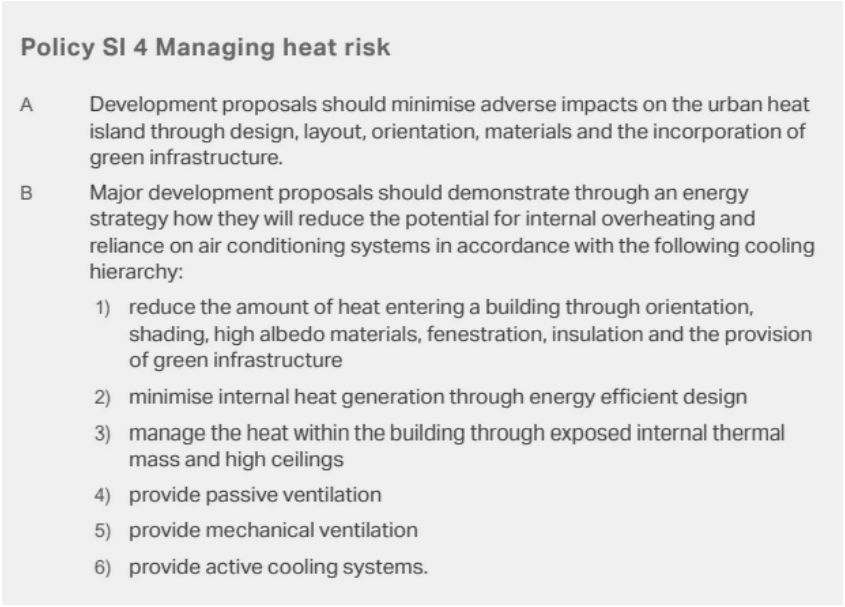
3.3 Auxiliary Pumps

All pumps will be variable speed multiple pressure sensor drive with load control via the BMS.

3.4 Cooling Requirement

The design complies with London Plan Policy SI 4 Managing Heat Risk, as set out below:

Figure 5: Policy SI 4 - Cooling Hierarchy



Policy SI 4 Managing heat risk

A Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure.

B Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:

1) reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure
2) minimise internal heat generation through energy efficient design
3) manage the heat within the building through exposed internal thermal mass and high ceilings
4) provide passive ventilation
5) provide mechanical ventilation
6) provide active cooling systems.

3.4.1 Minimise Internal Heat Generation by Energy Efficient Design

The lighting design will be optimised to reduce internal heat gain by means of the commitment to using high efficiency, low energy LED lighting with dimmable control operated through an intelligent control system responding to both daylight levels and occupancy requirements. Lighting heat gain will not exceed a target of 4.5W/m2 under the base provision at circa 300Lux. The internal gains are also minimised through the choice of energy efficient equipment and services system in combination with good insulation in the distribution pipework system.

3.4.2 Reduce the Amount of Heat Entering a Building in Summer

The amount of heat entering the building will be reduced by:

- Energy efficient intelligent passive flu wall façade with automated interstitial blinds that lower at periods of direct high solar irradiance to reduce solar gain and raise during periods where solar gain is low in order to maximise useful daylight penetration.
- System U value with area weighted U value of 1.0W/m2k maximum to limit heat gain through direct thermal transmittance
- Air tightness Building Air Leakage target of 3m3/hr/m2@50Pa to limit heat gain through infiltration.

3.4.3 Managing Heat within the Building by Exposed Internal Thermal Mass and High Ceilings

The PFS Parcel site proposes the use of exposed concrete soffits which offer the advantage of providing coolth through the inherent thermal mass. ‘Night purge’ can be achieved at appropriate times of the year by running the ventilation plant in to cool down the slabs at night ready to absorb heat during the day, reducing peak cooling loads.

3.4.4 Passive Ventilation and Mechanical Ventilation

To improve the energy efficiency of the Juniper Building on the PFS Parcel, heat recovery will be installed on the main mechanical ventilation systems. The offices will have variable speed control for the main air handling plant which will be controlled based on CO_2 sensing in the office space and regulated using variable air volume units (VAV). The retail units will be developed as shell and it will be the future tenant responsibility to install heat recovery on the ventilation plant serving that demise area.

3.4.5 Active Cooling Systems

As shown below the cooling demand of the office element of the PFS Parcel site is less than the notional benchmark which are indication of efficient design.

Comfort cooling via ASHP has been assumed to be provided by future tenant in the retail units as required by their operation.

Table 10: Cooling Demand – Office

	Area weighted average non-domestic cooling demand (MJ/m2)	Total area weighted non-domestic cooling demand (MJ/year)
Actual	124	1442293
Notional	158	1831852

Table 11: Cooling Demand – Retail Units

	Area weighted average non-domestic cooling demand (MJ/m2)	Total area weighted non-domestic cooling demand (MJ/year)
Actual	75	52579
Notional	97	68164

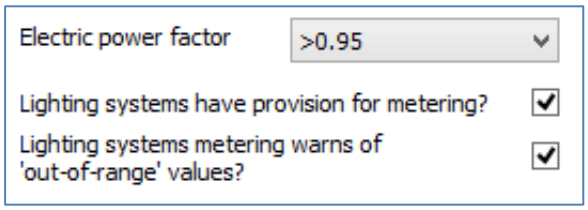
3.5 Lighting

Energy efficient LED lighting has become an essential feature of building design in recent years. Changes to standards such as Part L Building Regulations, have pushed the standards for efficiency in lighting installations and promoted the use of lighting controls systems.

The following lamp / Luminaire efficacy are proposed along with dimmable daylight control and PIR presence detection.

Table 12: Lighting Efficacy

Area	Efficacy (luminaire Lumens/circuit Watt)	Occupancy sensing	Daylight Control
Retail (shell)	115	manual on/off	-
Office	132	auto on/off	dimm
Reception	100	manual on/off	-
Shower / Lockers	100	auto on/off	
WC	100	auto on/off	-
Lobby / Corridor / Stair	100	auto on/off	-
Plantroom	120	manual on/off	-
display Lighting	70	manual on/off	-



4. DELIVERING ENERGY EFFICIENTLY (BE CLEAN)

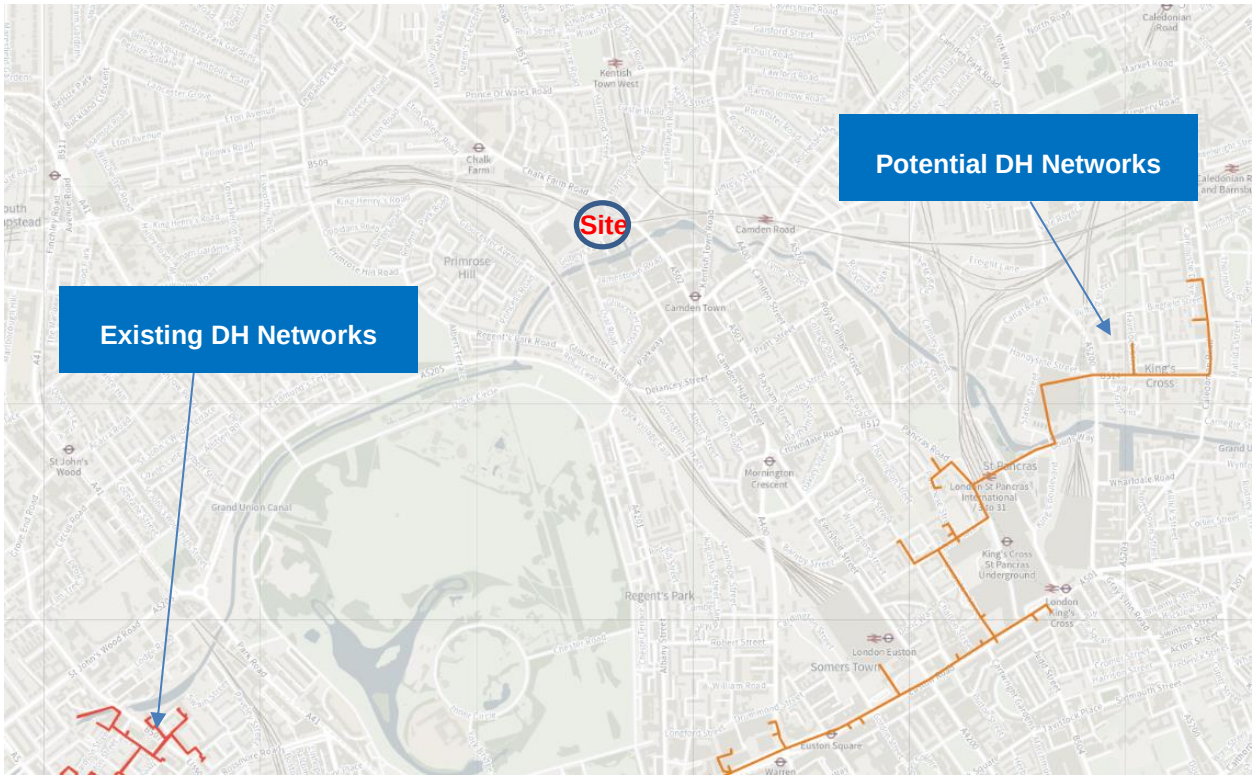
4.1 Potential District Heating Network Connection

We have researched the area surrounding the site to establish the availability of district heating networks and CHP sites from which the site could benefit. The closest existing district heating network to site is approximately 3,000m away. The closest potential expansion route is approximately 4,000m.

In this study, connection to district heating network is not considered in the carbon emissions calculation. The heating system at the PFS Parcel will be designed to take advantage of potential connections to the district heating networks when / should they become available.

During the determination of the December 2020 consent LB Camden confirmed that the District Heating Network would not be proceeding to the boundary of the Camden Goods Yard project. All s106 obligations to connect into the DHN were removed.

Figure 6: Proximity to Available DH Network - London Heat Map



4.2 Combined Heat and Power (CHP)

The economic justification for Combined Heat and Power (CHP) is largely dependent on the size of the development and the heat demand.

As stated within the latest GLA Energy Assessment Guide publication in October 2018, grid electricity has significantly decarbonised since the last update of Part L in April 2014 and in July 2018 the Government published updated carbon emission factors (SAP 10) demonstrating this. The impact of

these new emission factors is significant in that technologies generating on-site electricity, such as gas-engine CHP, will not achieve the carbon savings they have provided in the past.

Knowing that the GLA has decided that from January 2019 and until Government updates Part L with the latest carbon emission factors, planning applicants are encouraged to use the SAP 10 emission factors for referable applications when estimating CO_2 emission performance against London Plan policies. Based on above, the use of CHP has not been considered on this project.

5. RENEWABLE ENERGY (BE GREEN)

The following sections evaluate feasibility of renewable energy technologies which can be considered in the Be Green step of the energy hierarchy.

5.1 Wind Power

Wind power is conversion of wind energy into more useful forms. Common contemporary wind power is generated in the form of electricity by converting the rotation of turbine blades into electrical current by means of an electrical generator. Wind energy is renewable, widely distributed, clean, and reduces toxic atmospheric and greenhouse gas emissions if used to replace fossil-fuel-derived electricity. Horizontal or vertical axis wind turbines could be used to assist in the power requirements for a building. Not as a single solution, but part of renewable energy strategy, a turbine could be integrated into a building profile.

Figure 7: Wind Turbine

It is essential that turbines should be sited away from obstructions, with a clear exposure or fetch for the prevailing wind. However, the noise generated by wind turbines (typically 60 to 65 dBA) is not favourable for sites which include terraced areas and outside amenity spaces. Aside from this issue, the fact that the PFS Parcel site is in a dense urban location, it is not ideal for wind turbines as there is a lot of interference with wind flows causing turbulence which decreases the efficiency of wind turbines and yields insufficient wind velocities to make them viable. Other negative impacts that have been considered as such:

- Installing a large turbine in an area such as this is not considered to be appropriate due to its appearance and physical impact on the built-up environment and conservation area. Residents' and neighbours' concerns may include the look of the turbine, the hum of the generator and the possibility of stroboscopic shadowing from the blades on homes - and the proximity to the Network Rail Anglian Line.

- Wind speed has been checked for the PFS Parcel site scheme using the NOABL wind map: http://www.rensmart.com/Weather/BERR. The wind speed for the PFS Parcel site is too low for technical viability.
- Typical payback times for a single turbine are expected to be greater than 15 years which means that the cost of installing and maintaining a single wind turbine is not considered a commercially-viable option.

Following review, the negative impact that wind turbines would have on building occupants and the visual impact / height of turbines, this option is found unfeasible for the PFS Parcel site.

5.2 Ground Source Cooling

A closed loop ground source cooling system circulates a fluid, usually water, through the buried loop field pipes. In a closed loop system, there is no direct interaction between the fluid and the earth, only heat transfer across the pipe. Horizontal closed loops require a high site footprint to net internal ratio which is not available at the PFS Parcel site and for this reason vertical loops would be required.

The cooling available from the vertical loops required is a function of the ground formation thermal conductivity, deep earth temperature, and depends on the balance between the amount of heat rejected to and absorbed from the ground during the year. As a guide, the surrounding soil temperature is the average annual temperature for the region. For London, this is approximately 14°C.

A vertical closed loop field is composed of pipes that run vertically in the ground. A hole is bored in the ground, typically, 50 to 150m deep. Pipe pairs are installed in the hole and are joined with a U-shaped cross connector at the bottom of the hole. The borehole is commonly filled with a bentonite grout surrounding the pipe to provide a good thermal connection to the surrounding soil or rock. Vertical loop fields are typically used when there is a limited square footage of land available. Bore holes are spaced 5–6 m apart and are generally 15m deep per kW_{th} of capacity. Typically, high capital costs are associated with vertical ground source cooling systems due to the complications associated with the drilling of deep boreholes.

Figure 8: Ground Source Cooling

Based on the site location there is extensive complex utilities around the site, the close proximity of the TfL Northern Line directly under Chalk Farm Road and insufficient site area to allow sufficient ground loops to be installed to meet demand. Moreover, the efficiency of a ground source solution offers negligible benefit to that of comparable air source heat pump strategies. ASHP technology efficiency has greatly improved in recent years resulting in comparable or better energy performance once pumping factors are considered in the UK climate. For this reason, ground source cooling has been discounted in favour of air source heat pumps.

5.3 Air Source Heat Pump

Air source heat pumps (ASHP) work on a similar basis as ground source heat pumps albeit they absorb heat from the outside air rather the ground to generate the heat for space heating via radiators, underfloor heating systems, or warm air convectors, and domestic hot water. The heat pump extracts heat from the outside air in the same way that a fridge extracts heat from within the refrigerated compartments. Heat pumps can extract useful heat energy from the outside air even when the temperature is as low as -15^{o}C.

The advantage of ASHP's over ground source heat pump systems is that the units and installation require less space and the systems are less complicated to install and operate. With the reduced components and less pipework necessary with ASHP's, the embodied carbon for air source solution is typically much less than Ground Source alternatives. Using efficient heat pump systems substantially reduces running costs and carbon emissions by up to 75%. Traditionally ground source heat pumps were favourable from an efficiency perspective because the ground temperature remains constant, typically around 10degC. ASHP's work within more variable temperature conditions, and this effects the unit efficiency. However, with the increases in efficiency seen in modern heat pump technology, the performance gap is much smaller, particularly when the energy consumption associated with the pumps serving the buried loops is factored

An ASHP solution is very flexible and adaptable and suitable for installation in new and existing buildings. Other advantages of an air source heat pumps are listed below:

- Fossil fuel free and ‘all electric’ to suit the decarbonisation of the grid
- The systems can provide cooling, space heating and domestic hot water
- Heat recovery is feasible so that heat rejection from cooling can be used for hot water and heating demands.
- Maintenance is relatively simple
- Outdoor units can be installed at both ground level and the roof level.

Figure 9: Air Source Heat Pump Chiller system

The PFS Parcel site will utilise an air source heat pump system for the provision of space heating, hot water generation and cooling demand.

The system efficiencies are shown in section 3.2.

5.4 Biomass

An efficient biomass heating strategy requires both efficient biomass boilers and a large central plant room containing the biomass boilers with gas back up boilers.

One of the issues with biomass boilers is the supply of the fuel. Currently, within the UK there is abundance in the supply of wood chip batches which can be used for fuel within Biomass, however, this type of fuel leads to greater inefficiencies compared to other types of biomass fuel such as wood pellets that are currently limited in supply, although suppliers within the UK are increasing. Wood pellets are more controllable in terms of their moisture content and heat calorific value whereas the heat calorific value of the wood chips batches may vary as the moisture content varies within natural resources and subsequently it can cause issues for the heat demand, maintenance and servicing of boilers. In addition to this issue, the management of fuel deliveries, traffic routes, and highway design is problematic for developments in urban locations.

Biomass has factors that mitigate against the use of boilers. These include transport carbon emissions, boiler and fuel storage space, boiler maintenance, fuel delivery frequency in urban or suburban areas, fuel source availability and reliability and high NOx emission compared to natural gas. In respect to these matters and more importantly inadequacy of available on-site space for the biomass fuel storage, this technology is not assessed any further.

Figure 10: Biomass Boilers

Moreover, biomass installations are not acceptable in central London because biomass fired boilers will generate high levels of particulate matter (PM10) and Nox emissions which are both detrimental to air quality. Therefore, this technology is not recommended for the PFS Parcel site.

5.5 Photovoltaics (PV)

Solar energy is the energy force that sustains life on the earth for all plants, animals, and people. The earth receives this radiant energy from the sun in the form of electromagnetic waves, which the sun continually emits into space. The earth is essentially a huge solar energy collector receiving large quantities of this energy which manifests itself in various forms, such as direct sunlight used through Can I have your confirmation rain which can form rivers.

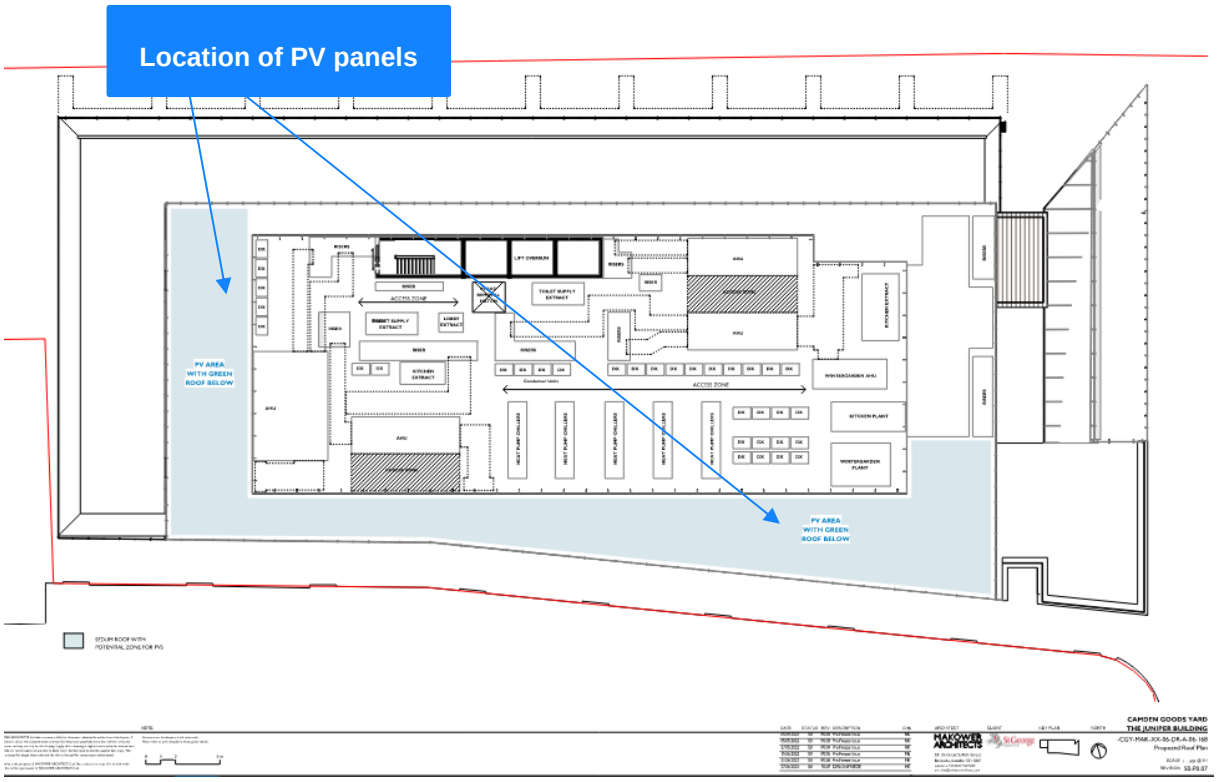
Solar energy is therefore a renewable resource that is inexhaustible and is locally available. It is a clean energy source that allows for local energy independence. The sun's power flow reaching the earth is typically about 1,000 W/m^2, although availability varies with location and time of year. Capturing solar energy typically requires equipment with a relatively high initial capital cost. However, over the lifetime of the solar equipment, these systems can prove to be cost-competitive, as compared to conventional energy technologies. The key to successful solar energy installation is to use quality components that have long lifetimes and require minimal maintenance.

We reviewed the roof spaces and the layouts to identify the suitable areas for maximising PV installations on the roofs. It is predicted to be able to install ~19kWp PV panels, South and East facing on the flat roof area and as part of the plant screen. Our Analysis assumes PV panels are up to 20% efficient and 140m2 of PV area will be installed on the flat roof and 72m^2 on the plant screen. It is predicted that the installation will generate ~ 19,000kWh per annum approx. This is less than that confirmed in the 3rd December 2020 extant planning consent which targeted 37,400kwh. The output has reduced due to extent of PV being reduced to accommodate the roof mounted air source heat pumps which yield the biggest carbon emissions reduction when compared to PV following the LETI energy hierarchy guidance and demonstrated by the further energy reduction set out herein.

The energy strategy therefore prioritises and maximises the delivery of the greatest carbon savings deliverable by ASHP whilst maximising the use of all remaining available roof space for PVs.

For the office areas, there will be 38% CO_2 reduction from heat pump system and 3% from PV panels. If considered across the overall PFS Parcel (i.e., office and retail units), there will be 37% CO_2 reduction from heat pump system compared to 2% from PV panels.

Figure 11: Suitable Location of PV panels



6. MONITOR, VERIFY, REPORT ON PERFORMANCE (BE SEEN)

As stated in the 2021 London Plan “to truly achieve net zero-carbon buildings, we need to have a better understanding of their actual operational energy performance and work towards bridging the ‘performance gap’ between design theory and actual energy use”.

The London Plan Policy SI 2 sets out the ‘be seen’ requirement for all major development proposals to monitor and report on their actual operational energy performance.

The ‘be seen’ policy will hopefully enable the developers / local authorities to understand the performance gap and identify road maps for an efficient transition for compliance with London’s net zero-carbon target. Guidance has been published to explain how to comply with this policy as well as a reporting spreadsheet which planning applicants will be expected to use.

Referring to the London Plan the applicant is required to provide accurate and verified estimates of each of the planning stage performance indicators through the planning stage using the ‘be seen’ excel spreadsheet platform.

This will be undertaken and shared with the local planning authority at agreed stages within the project

7. CONCLUSIONS

The PFS Parcel (Juniper Building) proposed development located in London Borough of Camden has been assessed using approved software to demonstrate the potential energy usage and CO_2 emissions.

The strategic design approach follows the London Plan energy hierarchy outlined below:

1) Use less energy

   "Be Lean"

2) Supply energy efficiently

   "Be Clean"

3) Use renewable energy

   "Be Green"

4) Monitoring Energy Performance

   "Be Seen"

The carbon dioxide (CO_2) emissions performance for the PFS Parcel site has been assessed in line with GLA Energy Assessment Guide and the use of SAP10 emissions fuel factors (i.e., decarbonised grid electricity fuel factors). Benchmarking is against the notional in the consented scheme (2013 Part L). The London Plan energy target requires to meet at least 35% CO_2 reduction through Mayor's Energy Hierarchy steps of which there should be 15% from energy efficiency measures. Following the Mayor's Energy Hierarchy:

- the PFS Parcel Office Areas are predicted to achieve 57% improvement over baseline emission using SAP10 emission factors, of which there is 16% reduction from energy efficiency measures at Be Lean Stage. This means the proposed Office performance exceeds the London Plan energy efficiency and overall CO_2 reduction targets. For the office areas, there will be 38% CO_2 reduction from heat pump system and 3% from PV panels.
- the PFS Parcel Retail units are predicted to achieve 36% improvement over baseline emission using SAP10 emission factors, of which there is 17% reduction from energy efficiency measures at Be Lean Stage. This means the proposed Retails performance exceeds the London Plan energy efficiency and overall CO_2 reduction targets.
- the overall PFS Parcel site is predicted to achieve ~56% improvement over baseline emission using SAP10 emission factors, of which there is ~16% reduction from energy efficiency measures at Be Lean Stage. This means, overall, PFS Parcel site exceeds the London Plan energy efficiency and overall CO_2 reduction targets. If considered across the PFS Parcel site (i.e. office and retail units), there will be 37% CO_2 reduction from heat pump system and 2% from PV panels.

APPENDICES

A. Office - SBEM

Be Lean

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

CGY OFFICE - BE LEAN

As designed

Date: Tue Jul 19 15:36:01 2022

Administrative information

Building Details

Address: Camden Goods Yard, LONDON,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: MOHAMAD KIANI

Telephone number: 07887801098

Address: WATERMAN BUILDING SERVICES, LONDON, SE19DG

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	22.8
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	22.8
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	17
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	-	-	UNKNOWN
Floor	0.25	0.1	0.1	2F00000E:Surf[0]
Roof	0.25	0.13	0.15	3F000000:Surf[5]
Windows***, roof windows, and rooflights	2.2	1	1	2N000001:Surf[0]
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	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- Stairs

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	-	0	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- Shower Lockers

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	5.11	0	0	-
Standard value	0.91*	2.6	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.

3- Office Flexi Cafe Reception

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	5.11	0	1.3	0.75
Standard value	0.91*	3.2	N/A	1.6^	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.

^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

1- DHW office areas

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.92	0.001
Standard value	0.8	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**
1F-MEZZ - SHOWER	-	-	0.5	-	-	-	-	-	-	-	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
1F-MEZZ - SHOWER	-	-	0.5	-	-	-	-	-	-	-	N/A
3F - OPEN PLAN OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
3F - SHOWER	-	-	0.5	-	-	-	-	-	-	-	N/A
3F - SHOWER	-	-	0.5	-	-	-	-	-	-	-	N/A
3F - RESTURANT CAFE	-	-	-	-	-	-	-	0.1	-	-	N/A
3F - OPEN PLAN OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
4F - OPEN PLAN OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
4F - SHOWER	-	-	0.5	-	-	-	-	-	-	-	N/A
4F - SHOWER	-	-	0.5	-	-	-	-	-	-	-	N/A
4F - OPEN PLAN OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
5F - SHOWER	-	-	0.5	-	-	-	-	-	-	-	N/A
5F - SHOWER	-	-	0.5	-	-	-	-	-	-	-	N/A
5F - OPEN PLAN OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
1F - FLEXI OFFICE SPACE	-	-	-	-	-	-	-	0.1	-	-	N/A
1F - OPEN PLAN OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
1F - OPEN PLAN OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
1F - SHOWER	-	-	0.5	-	-	-	-	-	-	-	N/A
1F - SHOWER	-	-	0.5	-	-	-	-	-	-	-	N/A
1F-MEZZ - OPEN PLAN OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
1F-MEZZ - OPEN PLAN OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
2F - OPEN PLAN OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
2F - SHOWER	-	-	0.5	-	-	-	-	-	-	-	N/A
2F - SHOWER	-	-	0.5	-	-	-	-	-	-	-	N/A
2F - FLEXI OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
2F - OPEN PLAN OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
5F - OPEN PLAN OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
GF-MEZZ - OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
GF-MEZZ - CHANGING FACILITIES	-	-	0.5	-	-	-	-	-	-	-	N/A
GF- RECEPTION	-	-	-	-	-	-	-	0.1	-	-	N/A
GF- OFFICE	-	-	-	-	-	-	-	0.1	-	-	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	
1F-MEZZ - CIRCULATION	-	100	-	27
1F-MEZZ - CIRCULATION STAIR	-	100	-	63
1F-MEZZ - DIS WC	-	100	-	28
1F-MEZZ - FLU WALL	-	100	-	0
1F-MEZZ - LIFT LOBBY CIRCULATION	-	100	-	105
1F-MEZZ - PLANT	100	-	-	35
1F-MEZZ - PLANT	100	-	-	39
1F-MEZZ - PLANT	100	-	-	34
1F-MEZZ - PLANT	100	-	-	36

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
1F-MEZZ - SHOWER	-	100	-	28
1F-MEZZ - SHOWER	-	100	-	21
1F-MEZZ - STAIR	-	100	-	33
1F-MEZZ - WC CLUSTER	-	100	-	57
1F-MEZZ - WC CLUSTER	-	100	-	49
1F-MEZZ - STAIR	-	100	-	36
3F - CIRCULATION	-	100	-	30
3F - CIRCULATION STAIR	-	100	-	65
3F - DIS WC	-	100	-	32
3F - FLU WALL	-	100	-	0
3F - LIFT LOBBY CIRCULATION	-	100	-	111
3F - OPEN PLAN OFFICE	132	-	-	990
3F - PLANT	100	-	-	39
3F - PLANT	100	-	-	43
3F - PLANT	100	-	-	38
3F - PLANT	100	-	-	40
3F - SHOWER	-	100	-	32
3F - SHOWER	-	100	-	21
3F - STAIR	-	100	-	35
3F - WC CLUSTER	-	100	-	62
3F - WC CLUSTER	-	100	-	54
3F - STAIR	-	100	-	38
3F - RESTURANT CAFE	-	100	-	464
3F - OPEN PLAN OFFICE	132	-	-	5716
4F - CIRCULATION	-	100	-	30
4F - CIRCULATION STAIR	-	100	-	65
4F - DIS WC	-	100	-	32
4F - FLU WALL	-	100	-	0
4F - LIFT LOBBY CIRCULATION	-	100	-	111
4F - OPEN PLAN OFFICE	132	-	-	990
4F - PLANT	100	-	-	39
4F - PLANT	100	-	-	43
4F - PLANT	100	-	-	38
4F - PLANT	100	-	-	40
4F - SHOWER	-	100	-	32
4F - SHOWER	-	100	-	21
4F - STAIR	-	100	-	35
4F - WC CLUSTER	-	100	-	62
4F - WC CLUSTER	-	100	-	54
4F - STAIR	-	100	-	38
4F - OPEN PLAN OFFICE	132	-	-	5636
4F - PLANT	100	-	-	85
5F - DIS WC	-	100	-	34

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
5F - LIFT LOBBY CIRCULATION	-	100	-	114
5F - PLANT	100	-	-	41
5F - PLANT	100	-	-	45
5F - PLANT	100	-	-	40
5F - PLANT	100	-	-	42
5F - SHOWER	-	100	-	34
5F - SHOWER	-	100	-	21
5F - WC CLUSTER	-	100	-	65
5F - WC CLUSTER	-	100	-	56
5F - STAIR	-	100	-	39
5F - OPEN PLAN OFFICE	132	-	-	413
5F - FLU WALL	-	100	-	0
1F - CIRCULATION	-	100	-	29
1F - CIRCULATION STAIR	-	100	-	64
1F - DIS WC	-	100	-	31
1F - FLEXI OFFICE SPACE	132	-	-	970
1F - FLU WALL	-	100	-	404
1F - LIFT LOBBY CIRCULATION	-	100	-	108
1F - OPEN PLAN OFFICE	132	-	-	5666
1F - OPEN PLAN OFFICE	132	-	-	989
1F - PLANT	100	-	-	37
1F - PLANT	100	-	-	41
1F - PLANT	100	-	-	36
1F - PLANT	100	-	-	38
1F - SHOWER	-	100	-	31
1F - SHOWER	-	100	-	21
1F - STAIR	-	100	-	35
1F - WC CLUSTER	-	100	-	60
1F - WC CLUSTER	-	100	-	52
1F - STAIR	-	100	-	37
1F-MEZZ - OPEN PLAN OFFICE	132	-	-	684
1F-MEZZ - OPEN PLAN OFFICE	132	-	-	3795
2F - CIRCULATION	-	100	-	30
2F - CIRCULATION STAIR	-	100	-	65
2F - DIS WC	-	100	-	32
2F - FLU WALL	-	100	-	0
2F - LIFT LOBBY CIRCULATION	-	100	-	111
2F - OPEN PLAN OFFICE	132	-	-	990
2F - PLANT	100	-	-	39
2F - PLANT	100	-	-	43
2F - PLANT	100	-	-	38
2F - PLANT	100	-	-	40
2F - SHOWER	-	100	-	32

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
2F - SHOWER	-	100	-	21
2F - STAIR	-	100	-	35
2F - WC CLUSTER	-	100	-	62
2F - WC CLUSTER	-	100	-	54
2F - STAIR	-	100	-	38
2F - FLEXI OFFICE	132	-	-	936
2F - OPEN PLAN OFFICE	132	-	-	5716
5F - OPEN PLAN OFFICE	132	-	-	4415
5F - CIRCULATION STAIR	-	100	-	67
5F - PLANT	100	-	-	87
5F - STAIR	-	100	-	36
GF-MEZZ - OFFICE	132	-	-	1221
GF-MEZZ - CORRIDOR	-	100	-	162
GF-MEZZ - CYCLE STOR	100	-	-	283
GF-MEZZ - CHANGING FACILITIES	-	100	-	413
GF-MEZZ - PLANT	100	-	-	229
GF- RECEPTION	-	100	70	741
GF- OFFICE	132	-	-	1656

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?
1F-MEZZ - SHOWER	N/A	N/A
1F-MEZZ - SHOWER	N/A	N/A
3F - OPEN PLAN OFFICE	NO (-99.4%)	NO
3F - SHOWER	N/A	N/A
3F - SHOWER	N/A	N/A
3F - RESTURANT CAFE	NO (-81.8%)	YES
3F - OPEN PLAN OFFICE	NO (-24.3%)	YES
4F - OPEN PLAN OFFICE	NO (-99.5%)	NO
4F - SHOWER	N/A	N/A
4F - SHOWER	N/A	N/A
4F - OPEN PLAN OFFICE	NO (-49.8%)	YES
5F - SHOWER	N/A	N/A
5F - SHOWER	N/A	N/A
5F - OPEN PLAN OFFICE	NO (-46.7%)	YES
1F - FLEXI OFFICE SPACE	NO (-79%)	YES
1F - OPEN PLAN OFFICE	NO (-29.8%)	YES
1F - OPEN PLAN OFFICE	NO (-99.5%)	NO
1F - SHOWER	N/A	N/A
1F - SHOWER	N/A	N/A
1F-MEZZ - OPEN PLAN OFFICE	NO (-99.8%)	NO
1F-MEZZ - OPEN PLAN OFFICE	NO (-100%)	NO
2F - OPEN PLAN OFFICE	NO (-99.4%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
2F - SHOWER	N/A	N/A
2F - SHOWER	N/A	N/A
2F - FLEXI OFFICE	NO (-81.8%)	YES
2F - OPEN PLAN OFFICE	NO (-31.9%)	YES
5F - OPEN PLAN OFFICE	NO (-62.9%)	YES
GF-MEZZ - OFFICE	NO (-99.5%)	NO
GF-MEZZ - CHANGING FACILITIES	N/A	N/A
GF- RECEPTION	NO (-74.9%)	YES
GF- OFFICE	NO (-75.2%)	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]	11594.5	11594.5
External area [m^2]	9456	9456
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	6080.16	4728.42
Average U-value [W/m^2K]	0.64	0.5
Alpha value* [%]	1.68	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
100	**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
	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	5.28	3.07
Cooling	2.42	6.76
Auxiliary	8.8	9.44
Lighting	9.95	18.31
Hot water	23.75	21.55
Equipment*	40.33	40.33
TOTAL**	**50.2**	**59.12**

* 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/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]	58.13	78.92
Primary energy* [kWh/m^2]	98.77	133.3
Total emissions [kg/m^2]	17	22.8

* 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] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	8	52.2	3.1	2.8	10.4	0.72	5.11	0.92	5.11
	Notional	4.5	82.1	1.5	8	11.2	0.86	2.84	----	----
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	174.6	71.6	67.4	3.9	2	0.72	5.11	0.92	5.11
	Notional	92.1	75.9	29.7	5.6	1.6	0.86	3.79	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	128.2	0	49.5	0	1.7	0.72	0	0.92	0
	Notional	125.4	0	40.4	0	1	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	-	UNKNOWN
Floor	0.2	0.1	2F00000E:Surf[0]
Roof	0.15	0.12	4F000002:Surf[0]
Windows, roof windows, and rooflights	1.5	1	2N000001: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

$U_{i\text{-}Typ}$ = 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	3

Be Green

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

CGY OFFICE - BE GREEN

As designed

Date: Tue Jul 19 16:59:59 2022

Administrative information

Building Details

Address: Camden Goods Yard, LONDON,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: MOHAMAD KIANI

Telephone number: 07887801098

Address: WATERMAN BUILDING SERVICES, LONDON, SE19DG

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	21.7
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	21.7
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	12.4
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 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	-	-	UNKNOWN
Floor	0.25	0.1	0.1	2F00000E:Surf[0]
Roof	0.25	0.12	0.12	3F000000:Surf[5]
Windows***, roof windows, and rooflights	2.2	1	1	2N000001:Surf[0]
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	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- Stairs

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.3	-	0	0	-
Standard value	2.5*	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 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- Shower Lockers

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.3	5.11	0	0	-
Standard value	2.5*	2.6	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.					

3- Office Flexi Cafe Reception

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.3	5.11	0	1.3	0.75
Standard value	2.5*	3.2	N/A	1.6^	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. ^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

1- DHW office areas

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	3.5	0.001
Standard value	2*	N/A
* Standard shown is for all types except absorption and gas engine heat pumps.		

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
1F-MEZZ - SHOWER	-	-	0.5	-	-	-	-	-	-	-	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
1F-MEZZ - SHOWER	-	-	0.5	-	-	-	-	-	-	-	N/A
3F - OPEN PLAN OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
3F - SHOWER	-	-	0.5	-	-	-	-	-	-	-	N/A
3F - SHOWER	-	-	0.5	-	-	-	-	-	-	-	N/A
3F - RESTURANT CAFE	-	-	-	-	-	-	-	0.1	-	-	N/A
3F - OPEN PLAN OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
4F - OPEN PLAN OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
4F - SHOWER	-	-	0.5	-	-	-	-	-	-	-	N/A
4F - SHOWER	-	-	0.5	-	-	-	-	-	-	-	N/A
4F - OPEN PLAN OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
5F - SHOWER	-	-	0.5	-	-	-	-	-	-	-	N/A
5F - SHOWER	-	-	0.5	-	-	-	-	-	-	-	N/A
5F - OPEN PLAN OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
1F - FLEXI OFFICE SPACE	-	-	-	-	-	-	-	0.1	-	-	N/A
1F - OPEN PLAN OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
1F - OPEN PLAN OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
1F - SHOWER	-	-	0.5	-	-	-	-	-	-	-	N/A
1F - SHOWER	-	-	0.5	-	-	-	-	-	-	-	N/A
1F-MEZZ - OPEN PLAN OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
1F-MEZZ - OPEN PLAN OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
2F - OPEN PLAN OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
2F - SHOWER	-	-	0.5	-	-	-	-	-	-	-	N/A
2F - SHOWER	-	-	0.5	-	-	-	-	-	-	-	N/A
2F - FLEXI OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
2F - OPEN PLAN OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
5F - OPEN PLAN OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
GF-MEZZ - OFFICE	-	-	-	-	-	-	-	0.1	-	-	N/A
GF-MEZZ - CHANGING FACILITIES	-	-	0.5	-	-	-	-	-	-	-	N/A
GF- RECEPTION	-	-	-	-	-	-	-	0.1	-	-	N/A
GF- OFFICE	-	-	-	-	-	-	-	0.1	-	-	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	
1F-MEZZ - CIRCULATION	-	100	-	27
1F-MEZZ - CIRCULATION STAIR	-	100	-	63
1F-MEZZ - DIS WC	-	100	-	28
1F-MEZZ - FLU WALL	-	100	-	0
1F-MEZZ - LIFT LOBBY CIRCULATION	-	100	-	105
1F-MEZZ - PLANT	120	-	-	29
1F-MEZZ - PLANT	120	-	-	32
1F-MEZZ - PLANT	120	-	-	29
1F-MEZZ - PLANT	120	-	-	30

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
1F-MEZZ - SHOWER	-	100	-	28
1F-MEZZ - SHOWER	-	100	-	21
1F-MEZZ - STAIR	-	100	-	33
1F-MEZZ - WC CLUSTER	-	100	-	57
1F-MEZZ - WC CLUSTER	-	100	-	49
1F-MEZZ - STAIR	-	100	-	36
3F - CIRCULATION	-	100	-	30
3F - CIRCULATION STAIR	-	100	-	65
3F - DIS WC	-	100	-	32
3F - FLU WALL	-	100	-	0
3F - LIFT LOBBY CIRCULATION	-	100	-	111
3F - OPEN PLAN OFFICE	132	-	-	990
3F - PLANT	120	-	-	32
3F - PLANT	120	-	-	36
3F - PLANT	120	-	-	32
3F - PLANT	120	-	-	34
3F - SHOWER	-	100	-	32
3F - SHOWER	-	100	-	21
3F - STAIR	-	100	-	35
3F - WC CLUSTER	-	100	-	62
3F - WC CLUSTER	-	100	-	54
3F - STAIR	-	100	-	38
3F - RESTURANT CAFE	-	100	-	464
3F - OPEN PLAN OFFICE	132	-	-	5716
4F - CIRCULATION	-	100	-	30
4F - CIRCULATION STAIR	-	100	-	65
4F - DIS WC	-	100	-	32
4F - FLU WALL	-	100	-	0
4F - LIFT LOBBY CIRCULATION	-	100	-	111
4F - OPEN PLAN OFFICE	132	-	-	990
4F - PLANT	120	-	-	32
4F - PLANT	120	-	-	36
4F - PLANT	120	-	-	32
4F - PLANT	120	-	-	34
4F - SHOWER	-	100	-	32
4F - SHOWER	-	100	-	21
4F - STAIR	-	100	-	35
4F - WC CLUSTER	-	100	-	62
4F - WC CLUSTER	-	100	-	54
4F - STAIR	-	100	-	38
4F - OPEN PLAN OFFICE	132	-	-	5636
4F - PLANT	120	-	-	71
5F - DIS WC	-	100	-	34

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
5F - LIFT LOBBY CIRCULATION	-	100	-	114
5F - PLANT	120	-	-	34
5F - PLANT	120	-	-	38
5F - PLANT	120	-	-	33
5F - PLANT	120	-	-	35
5F - SHOWER	-	100	-	34
5F - SHOWER	-	100	-	21
5F - WC CLUSTER	-	100	-	65
5F - WC CLUSTER	-	100	-	56
5F - STAIR	-	100	-	39
5F - OPEN PLAN OFFICE	132	-	-	413
5F - FLU WALL	-	100	-	0
1F - CIRCULATION	-	100	-	29
1F - CIRCULATION STAIR	-	100	-	64
1F - DIS WC	-	100	-	31
1F - FLEXI OFFICE SPACE	132	-	-	970
1F - FLU WALL	-	100	-	404
1F - LIFT LOBBY CIRCULATION	-	100	-	108
1F - OPEN PLAN OFFICE	132	-	-	5666
1F - OPEN PLAN OFFICE	132	-	-	989
1F - PLANT	120	-	-	31
1F - PLANT	120	-	-	34
1F - PLANT	120	-	-	30
1F - PLANT	120	-	-	32
1F - SHOWER	-	100	-	31
1F - SHOWER	-	100	-	21
1F - STAIR	-	100	-	35
1F - WC CLUSTER	-	100	-	60
1F - WC CLUSTER	-	100	-	52
1F - STAIR	-	100	-	37
1F-MEZZ - OPEN PLAN OFFICE	132	-	-	684
1F-MEZZ - OPEN PLAN OFFICE	132	-	-	3795
2F - CIRCULATION	-	100	-	30
2F - CIRCULATION STAIR	-	100	-	65
2F - DIS WC	-	100	-	32
2F - FLU WALL	-	100	-	0
2F - LIFT LOBBY CIRCULATION	-	100	-	111
2F - OPEN PLAN OFFICE	132	-	-	990
2F - PLANT	120	-	-	32
2F - PLANT	120	-	-	36
2F - PLANT	120	-	-	32
2F - PLANT	120	-	-	34
2F - SHOWER	-	100	-	32

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
2F - SHOWER	-	100	-	21
2F - STAIR	-	100	-	35
2F - WC CLUSTER	-	100	-	62
2F - WC CLUSTER	-	100	-	54
2F - STAIR	-	100	-	38
2F - FLEXI OFFICE	132	-	-	936
2F - OPEN PLAN OFFICE	132	-	-	5716
5F - OPEN PLAN OFFICE	132	-	-	4415
5F - CIRCULATION STAIR	-	100	-	67
5F - PLANT	120	-	-	73
5F - STAIR	-	100	-	36
GF-MEZZ - OFFICE	132	-	-	1221
GF-MEZZ - CORRIDOR	-	100	-	162
GF-MEZZ - CYCLE STOR	100	-	-	283
GF-MEZZ - CHANGING FACILITIES	-	100	-	413
GF-MEZZ - PLANT	120	-	-	191
GF- RECEPTION	-	100	70	741
GF- OFFICE	132	-	-	1656

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?
1F-MEZZ - SHOWER	N/A	N/A
1F-MEZZ - SHOWER	N/A	N/A
3F - OPEN PLAN OFFICE	NO (-99.4%)	NO
3F - SHOWER	N/A	N/A
3F - SHOWER	N/A	N/A
3F - RESTURANT CAFE	NO (-81.8%)	YES
3F - OPEN PLAN OFFICE	NO (-24.3%)	YES
4F - OPEN PLAN OFFICE	NO (-99.5%)	NO
4F - SHOWER	N/A	N/A
4F - SHOWER	N/A	N/A
4F - OPEN PLAN OFFICE	NO (-49.8%)	YES
5F - SHOWER	N/A	N/A
5F - SHOWER	N/A	N/A
5F - OPEN PLAN OFFICE	NO (-46.7%)	YES
1F - FLEXI OFFICE SPACE	NO (-79%)	YES
1F - OPEN PLAN OFFICE	NO (-29.8%)	YES
1F - OPEN PLAN OFFICE	NO (-99.5%)	NO
1F - SHOWER	N/A	N/A
1F - SHOWER	N/A	N/A
1F-MEZZ - OPEN PLAN OFFICE	NO (-99.8%)	NO
1F-MEZZ - OPEN PLAN OFFICE	NO (-100%)	NO
2F - OPEN PLAN OFFICE	NO (-99.4%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
2F - SHOWER	N/A	N/A
2F - SHOWER	N/A	N/A
2F - FLEXI OFFICE	NO (-81.8%)	YES
2F - OPEN PLAN OFFICE	NO (-31.9%)	YES
5F - OPEN PLAN OFFICE	NO (-62.9%)	YES
GF-MEZZ - OFFICE	NO (-99.5%)	NO
GF-MEZZ - CHANGING FACILITIES	N/A	N/A
GF- RECEPTION	NO (-74.9%)	YES
GF- OFFICE	NO (-75.2%)	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]	11594.5	11594.5
External area [m^2]	9456	9456
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	6056.92	4728.42
Average U-value [W/m^2K]	0.64	0.5
Alpha value* [%]	1.64	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
100	**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
	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	0.87	1.03
Cooling	2.43	6.76
Auxiliary	7.12	9.44
Lighting	9.95	18.31
Hot water	5.62	7.26
Equipment*	40.33	40.33
TOTAL**	**25.99**	**42.8**

* 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/m^2]

	Actual	Notional
Photovoltaic systems	1.41	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]	58.23	78.92
Primary energy* [kWh/m^2]	77.8	128.1
Total emissions [kg/m^2]	12.4	21.7

* 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] Fan coil systems, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	7.8	52.5	0.5	2.9	8.4	4.3	5.11	4.3	5.11
	Notional	4.5	82.1	0.5	8	11.2	2.56	2.84	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	174.4	71.9	11.3	3.9	2	4.3	5.11	4.3	4
	Notional	92.1	75.9	10	5.6	1.6	2.56	3.79	----	----
[ST] Central heating using water: radiators, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	127.9	0	8.3	0	1	4.3	0	4.3	0
	Notional	125.4	0	13.6	0	1	2.56	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	-	UNKNOWN
Floor	0.2	0.1	2F00000E:Surf[0]
Roof	0.15	0.12	3F000000:Surf[5]
Windows, roof windows, and rooflights	1.5	1	2N000001: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

$U_{i\text{-}Typ}$ = 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	3

B. Retail - SBEM

Be Lean

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

CGY RETAIL - BE LEAN

As designed

Date: Thu Jul 21 14:33:19 2022

Administrative information

Building Details

Address: Camden Goods Yard, LONDON,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: MOHAMAD KIANI

Telephone number: 07887801098

Address: WATERMAN BUILDING SERVICES, LONDON, SE19DG

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	31.5
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	31.5
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	24.9
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	-	-	UNKNOWN
Floor	0.25	0.1	0.1	GF00002D:Surf[12]
Roof	0.25	0.15	0.15	GF000023:Surf[0]
Windows***, roof windows, and rooflights	2.2	1	1	GF000023: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	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- RETAIL

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	0.92	5	0	0	0.89
Standard value	0.91*	2.6	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.

1- DHW RETAIL

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	0.92	-
Standard value	0.8	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**
GF-MEZZ - 3 RETAILS MEZZ	-	1	0	-	-	-	-	-	-	-	N/A
GF- RETAIL MORRISON	-	1	0	-	-	-	-	-	-	-	N/A
GF- 3 RETAILS	-	1	0	-	-	-	-	-	-	-	N/A
GF- RETAIL	-	1	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	
GF-MEZZ - 3 RETAILS MEZZ	-	100	70	652
GF- RETAIL MORRISON	-	100	70	3476
GF- 3 RETAILS	-	100	70	1670
GF- RETAIL	-	100	70	459

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?
GF-MEZZ - 3 RETAILS MEZZ	NO (-36%)	NO
GF- RETAIL MORRISON	NO (-76.7%)	NO
GF- 3 RETAILS	NO (-52.9%)	NO
GF- RETAIL	NO (-96.7%)	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^2]	702.5	702.5
External area [m^2]	1259.8	1259.8
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	647.82	485.85
Average U-value [W/m^2K]	0.51	0.39
Alpha value* [%]	1.76	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
100	**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
	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	11.26	7.61
Cooling	4.7	7.12
Auxiliary	4.46	3.06
Lighting	34.48	48.07
Hot water	1.84	1.86
Equipment*	20.26	20.26
TOTAL**	**56.75**	**67.72**

* 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/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]	121.91	120.7
Primary energy* [kWh/m^2]	146.62	185.92
Total emissions [kg/m^2]	24.9	31.5

* 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	37.3	84.6	11.3	4.7	4.5	0.92	5	0.92	5
	Notional	23.6	97.1	7.6	7.1	3.1	0.86	3.79	----	----
[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	-	UNKNOWN
Floor	0.2	0.1	GF00002D:Surf[12]
Roof	0.15	0.15	GF000023:Surf[0]
Windows, roof windows, and rooflights	1.5	1	GF000023: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

$U_{i\text{-}Typ}$ = 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	3

Be Green

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

CGY RETAIL - BE GREEN

As designed

Date: Thu Jul 21 15:14:59 2022

Administrative information

Building Details

Address: Camden Goods Yard, LONDON,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: MOHAMAD KIANI

Telephone number: 07887801098

Address: WATERMAN BUILDING SERVICES, LONDON, SE19DG

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	31.1
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	31.1
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	21.6
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	-	-	UNKNOWN
Floor	0.25	0.1	0.1	GF00002D:Surf[12]
Roof	0.25	0.12	0.12	GF000023:Surf[0]
Windows***, roof windows, and rooflights	2.2	1	1	GF000023: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	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- RETAIL

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	4	5.2	0	0	0.89
Standard value	2.5*	2.6	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.					

1- DHW RETAIL

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	2.95	0.001
Standard value	2*	N/A
* Standard shown is for all types except absorption and gas engine heat pumps.		

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**
GF-MEZZ - 3 RETAILS MEZZ	-	1	-	-	-	-	-	-	-	-	N/A
GF- RETAIL MORRISON	-	1	-	-	-	-	-	-	-	-	N/A
GF- 3 RETAILS	-	1	-	-	-	-	-	-	-	-	N/A
GF- RETAIL	-	1	-	-	-	-	-	-	-	-	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	
GF-MEZZ - 3 RETAILS MEZZ	-	115	70	567
GF- RETAIL MORRISON	-	115	70	3023
GF- 3 RETAILS	-	115	70	1452
GF- RETAIL	-	115	70	399

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?
GF-MEZZ - 3 RETAILS MEZZ	NO (-36%)	NO
GF- RETAIL MORRISON	NO (-76.7%)	NO
GF- 3 RETAILS	NO (-52.9%)	NO
GF- RETAIL	NO (-96.7%)	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^2]	702.5	702.5
External area [m^2]	1259.8	1259.8
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	646.16	485.85
Average U-value [W/m^2K]	0.51	0.39
Alpha value* [%]	1.97	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
100	**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
	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	2.67	2.56
Cooling	4.22	7.12
Auxiliary	4.46	3.06
Lighting	30.86	48.07
Hot water	0.58	0.63
Equipment*	20.26	20.26
TOTAL**	**42.78**	**61.44**

* 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/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]	117.4	120.7
Primary energy* [kWh/m^2]	128.06	183.92
Total emissions [kg/m^2]	21.6	31.1

* 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	38.4	79	2.7	4.2	4.5	4	5.2	4	5.2
	Notional	23.6	97.1	2.6	7.1	3.1	2.56	3.79	----	----
[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	-	UNKNOWN
Floor	0.2	0.1	GF00002D:Surf[12]
Roof	0.15	0.12	GF000023:Surf[0]
Windows, roof windows, and rooflights	1.5	1	GF000023: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

$U_{i\text{-}Typ}$ = 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	3

C. GLA SAP10 Excel Spreadsheet

The following GLA excel files are available upon request:

1. *Office*
2. *Retail*

D. CO2 reduction Breakdown

Office

Part L 2013

	Total regulated emissions (Tonnes CO_2 / year)	CO_2 savings (Tonnes CO_2 / year)	Percentage savings (%)
Part L 2013 baseline	264.3		
Be lean	196.9	67.4	26%
Be clean	196.9	0.0	0%
Be green	144.2	52.7	20%
Total Savings	-	120.1	45%

SAP10

	Total regulated emissions (Tonnes CO_2 / year)	CO_2 savings (Tonnes CO_2 / year)	Percentage savings (%)
Part L 2013 baseline	150.9		
Be lean	126.4	24.5	16%
Be clean	126.4	0.0	0%
Be green	64.7	61.7	41%
Total Savings	-	86.2	57%

Retails

Part L 2013

	Total regulated emissions (Tonnes CO_2 / year)	CO_2 savings (Tonnes CO_2 / year)	Percentage savings (%)
Part L 2013 baseline	22.1		
Be lean	17.5	4.6	21%
Be clean	17.5	0.0	0%
Be green	15.2	2.3	10%
Total Savings	-	6.9	31%

SAP10

	Total regulated emissions (Tonnes CO_2 / year)	CO_2 savings (Tonnes CO_2 / year)	Percentage savings (%)
Part L 2013 baseline	10.7		
Be lean	8.9	1.8	17%
Be clean	8.9	0.0	0%
Be green	6.8	2.1	19%
Total Savings	-	3.9	36%

UK and Ireland Office Locations