BURO HAPPOLD

Haringey Civic Centre
Energy Statement

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8 March 2023

Revision P02

Revision	Description	Issued by	Date	Checked
P01	Issued for information – planning draft	IS	09.03.2023	
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Glossary

Term	Definition
AHU	Air Handling Unit
ASHP	Air Source Heat Pump
BH	Buro Happold
BMS	Building management system
CHW	Chilled Water Service
DHW	Domestic Hot Water
FCU	Fan coil unit system
GIA	Gross Internal Area
ICT	Information and communication technology equipment
LTHW	Low Temperature Hot Water (<100°C – 60 °C)
NIA	Net Internal Area
NLA	Net Lettable Area
POE	Post-occupancy evaluation
POU	Point of use
PV	Photovoltaic (solar panels)
Simulation	The building energy model used to estimate of the energy consumption of the Project and create an EUI for the building.
ULTHW	Ultra-Low Temperature Hot Water (<45°C – 30 °C)
VRF	Variable Refrigerant Flow Cooling / heating System
VAV	Variable Air Volume Box
WSHP	Water Source Heat Pump

1 Executive summary

This report details the energy strategy for the Haringey Civic Centre buildings located at 255 High Rd, London N22 8LE. The Haringey civic centre is a grade II listed building undergoing a major refurbishment connecting to a new building with a total GIA of 10,003m^2.

It follows the GLA energy hierarchy; first applying lean measures such as consideration of highly efficient fabric and low air tightness of the building to reduce energy consumption, before then applying efficient systems and renewable technologies. The development is driving towards a Net Zero Carbon target.

The New Annex achieves a carbon dioxide emissions reduction of 52% below the Baseline. This is a significant reduction, exceeding the current London Plan target of a 35% reduction through on-site measures. The existing building refurbishment design has been compared to the current building performance and improves by 80%, as an exemplar example of retrofitting.

Buro Happold has carried out a prediction of operational energy consumption using advance simulation modelling in accordance with CIBSE TM54 requirements as part of the GLA Be Seen approach.

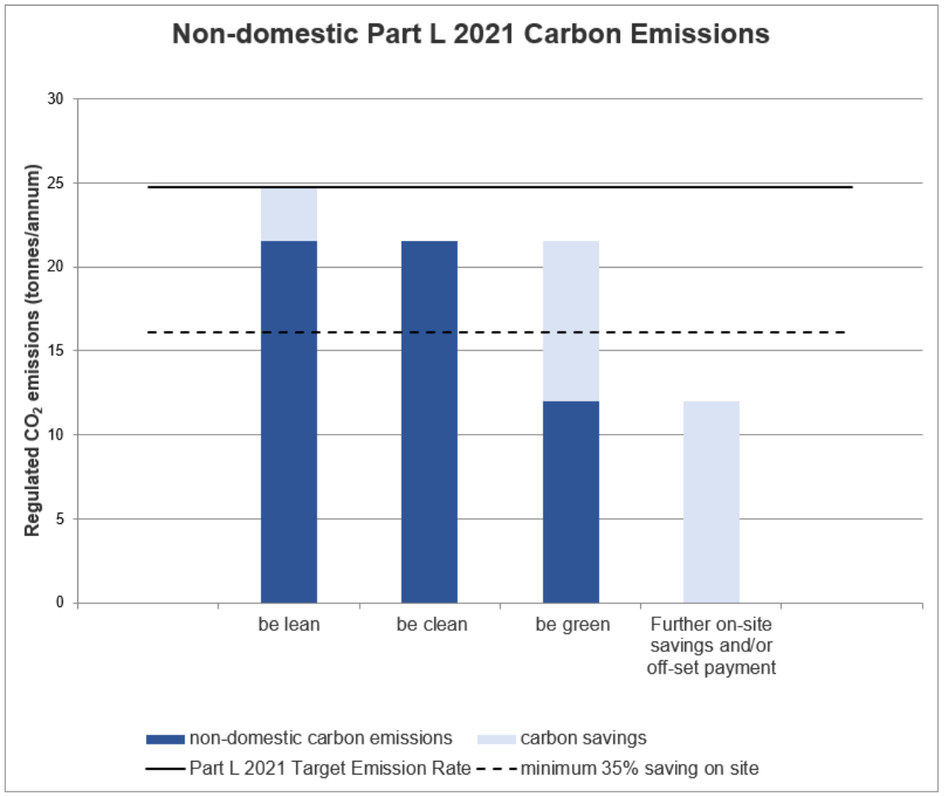


Figure 1—1 New Annex part L results

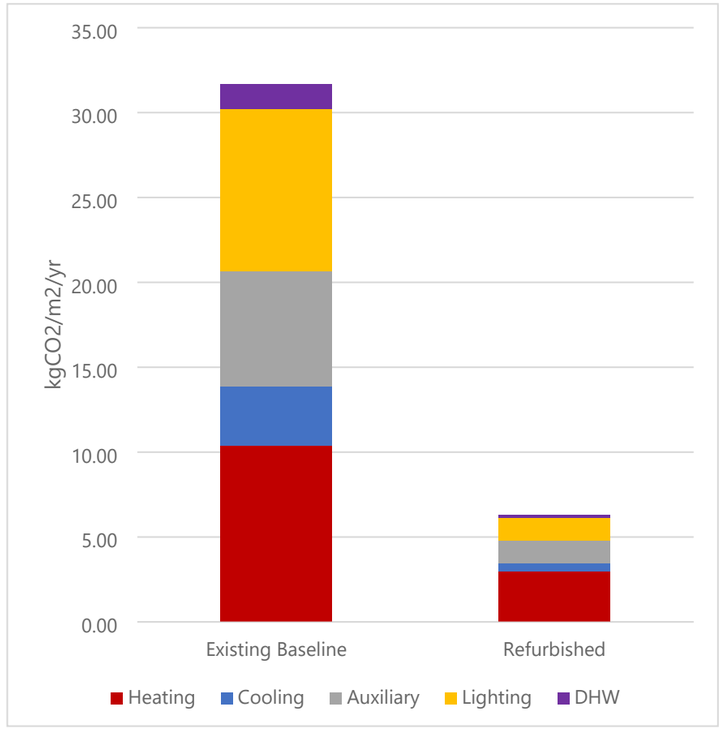


Figure 1—2 Refurbished existing civic centre part L result

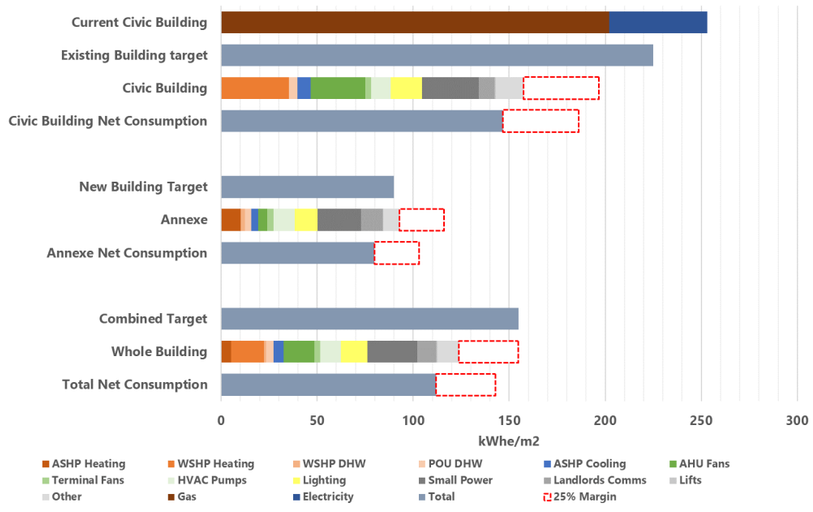


Figure 1—3 Operational energy results

2 Site Analysis

Figure 2—1 Haringey Civic Centre proposed front elevation

To assess the external conditions, weather information has been taken from CIBSE weather data, using the London Weather Centre 2020 (DSY1, high 50) weather file. To future proof the design, further temperature analysis was done using the London Weather Centre 2080 (DSY1, high 50) weather file. This information is shown graphically below and has been produced using Rhino 6 software. Additionally, rainfall data has been taken from data recorded by the Met Office; future projections for rainfall are not readily available.

2.1 Sun path diagram

A sun path diagram displays the route that the sun takes over a certain location over the course of a day and year. This is expressed using the cardinal directions (North, South, East, West) relative to the location. This can be used to inform the design of the glazing, to optimise the solar heat gains in beneficial locations, control glare, whilst maximising useful daylighting. It can also be used to advise on the optimal direction for PV arrays.

Figure 2—2 shows the sun path over the site in plan view. The red arrow shows the sun path during the summer solstice and the blue arrow show the sun path during the winter solstice. Each yellow line shows the position of the sun at an hour of the day, tracking how this change across the year's months.

The plan diagram shows that the Sun rises in the east, peaks in the south (and is predominantly southerly during the day) and sets in the west. As such, the south facades will likely require the most shading, or minimal amounts of glazing in order to mitigate overheating and glare risks. The glazed façade of the listed existing civic centre building is a protected feature, and as such it's visual appearance must be retained. This may particularly pose a challenge on the west façade where the impact of the late afternoon sun and external air temperatures will be exacerbated by areas where the glazing ratio is of over 80%. As the northern façades pose very little risk to overheating it can be considered beneficial to orient the new build's glazing mostly on this façade to increase daylight levels.

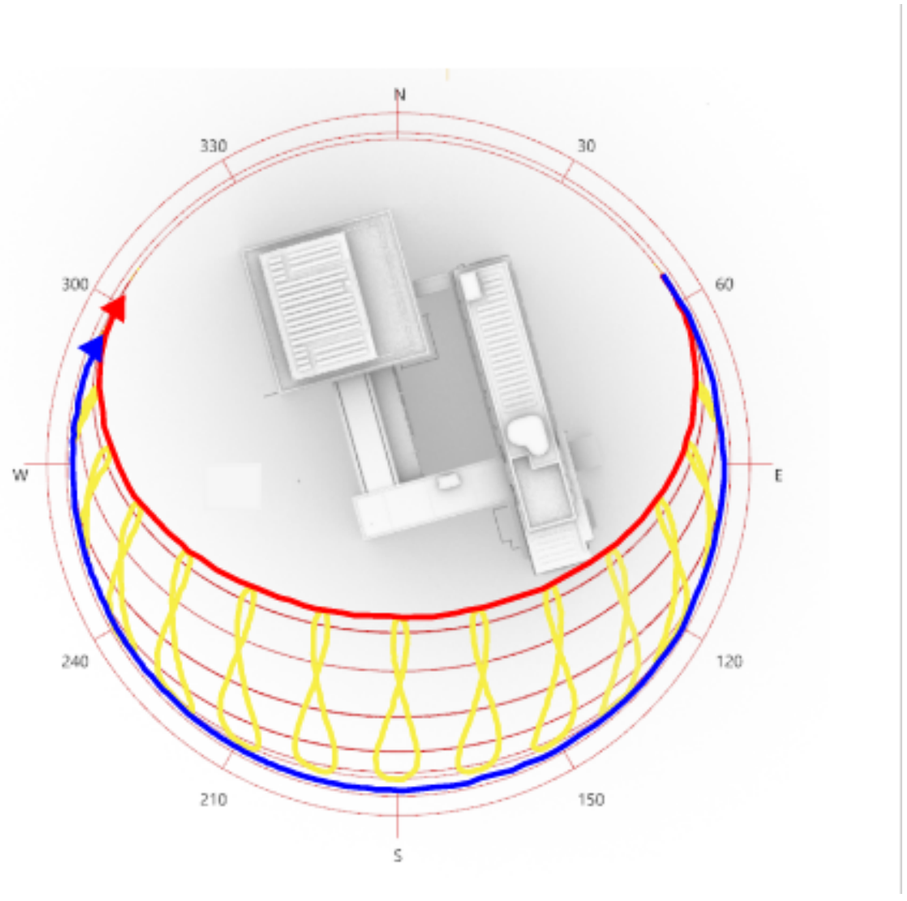


Figure 2—2 Sun path view over site (plan view)

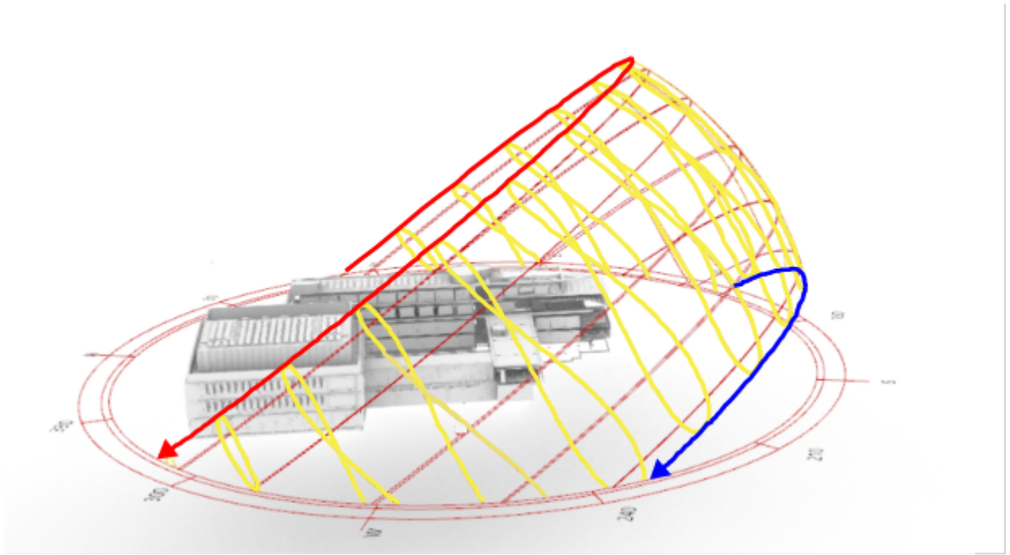


Figure 2—3 Sun path view from west side

Figure 2—3 Shows the sun path from the west. It can be seen that the south will receive most of the solar radiation throughout the year. Therefore, in order to maximise PV potential, they will need to be placed facing south and should not be overshaded from the south.

2.2 Temperature and Humidity

Figure 2—4 shows the dry-bulb and wet-bulb temperature distribution over the course of the typical winter in London, during the buildings' occupied hours. And Figure 2—5 shows the same distribution between March and November.

From

Figure 2—**4** it can be seen that in the winter months the outside air temperature well below the comfortable range, with over 39 hours spent at 10 degrees. This shows that natural ventilation is unsuitable during the winter months. In Figure 2—5 it can be seen that on some days the temperatures exceed 30◦C, indicating that comfort cooling for the hottest days of the year will be necessary.

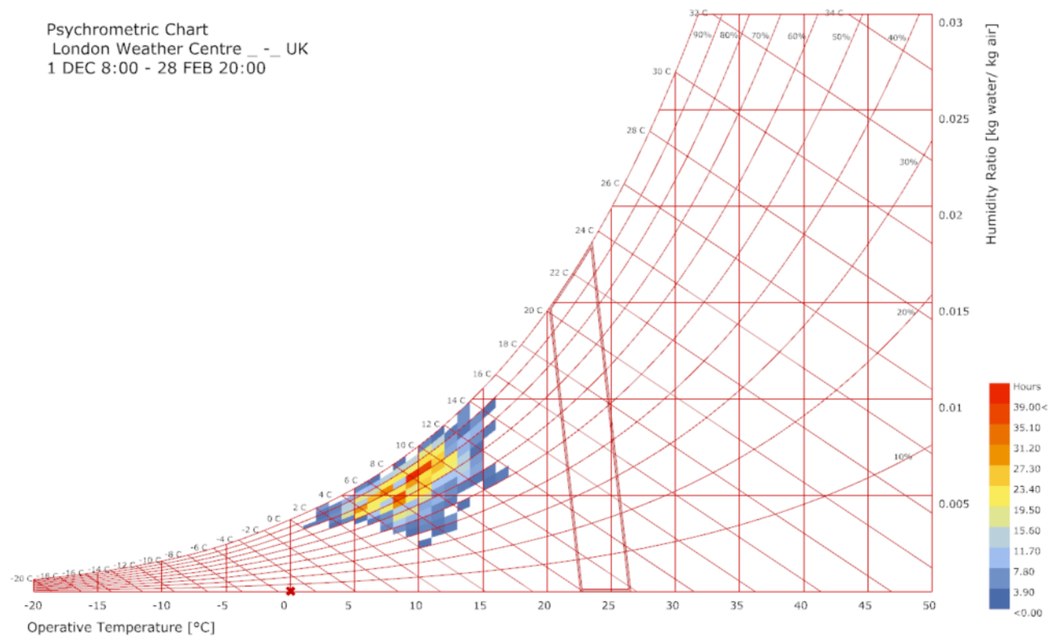


Figure 2—4 Psychometric chart -Typical winter in London during occupied hours

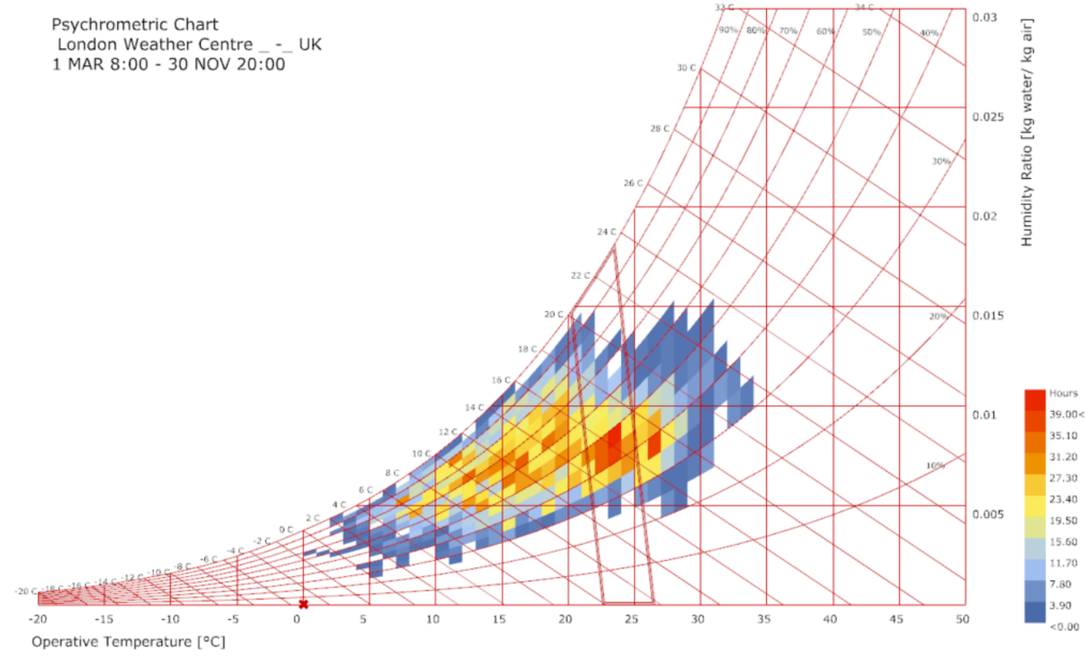


Figure 2—5 Psychometric chart – March to November during occupied hours

Figure 2—6 below shows the psychometric chart for a future summer in 2080. The chart shows that a significant number of hours will be spent above 30 degrees Celsius in 2080.

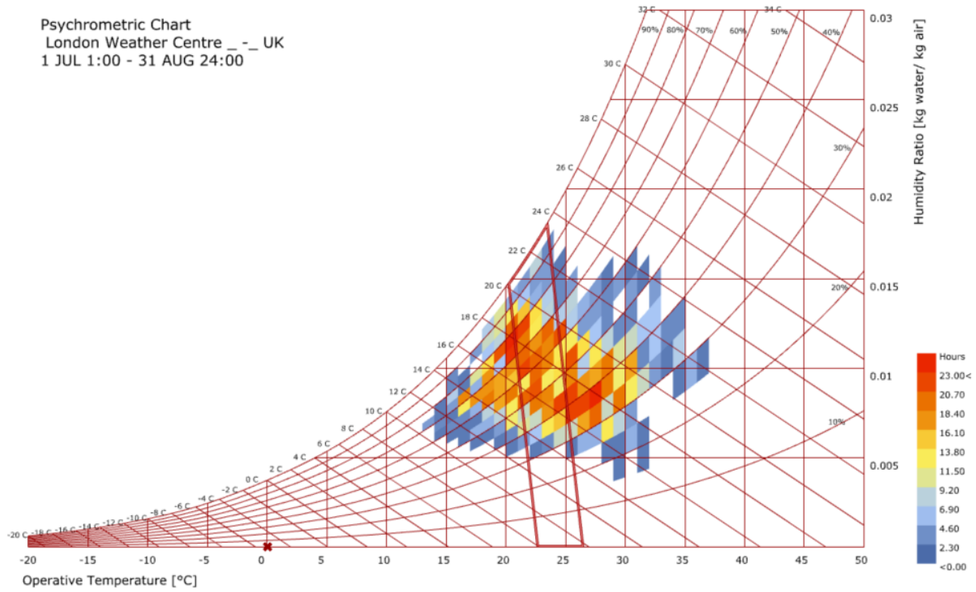


Figure 2—6 Psychometric chart – London summer 2080.

2.3 Wind

Figure 2—7 shows the wind rose for London over the course of a full year. A wind rose graphically displays the typical distribution of wind speeds and directions over a specified location. Whilst this wind rose shows that there is a significant wind direction bias in the south-south westerly direction it can also be seen that there is a generally consistent steady breeze throughout the year.

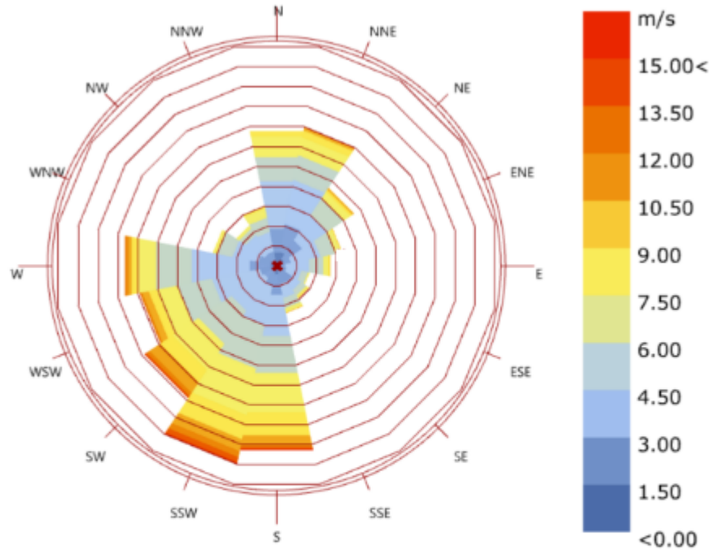


Figure 2—7 London Wind Rose

However, although the wind speeds are high enough to support natural ventilation, they do not appear to be sufficient for the use of wind turbines, which typically require continuous wind speeds of at least 15m/s to operate effectively.

2.4 Rainfall

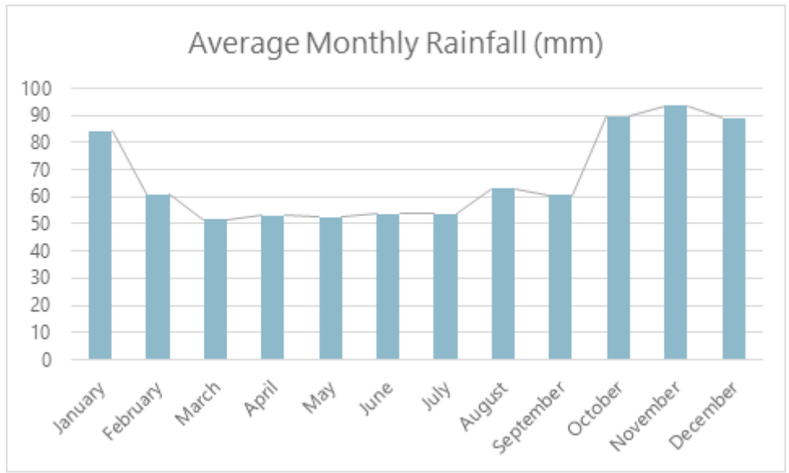


Figure 2—8 30 year monthly average rainfall in London

Figure 2—8 shows the monthly average rainfall, based on 30-year averages (1990-2020) as recorded by the Met Office.

It can be seen that there is a generally steady level of rainfall throughout the entire year, with increased rainfall between October and January. This could potentially be exploited for rainwater harvesting, which can then be used for purposes such as irrigation.

2.5 Site Opportunities and Constraints

The previous sections shows that the weather conditions of the site provide many opportunities for the proposed development, particularly for the use of solar PV.

The PV potential is somewhat restricted by the limited roof space, as the annexe building roof needs to be used as heating and cooling plant space. This is explored in further detail in Section 3.7.

This development presents an opportunity to salvage and retain a heritage building. This provides a chance to improve the overall efficiency and operational carbon by introducing energy saving measures and state of the art MEP equipment. Updating MEP equipment may also improve the wellbeing of building occupants as, the internal environment can be redesigned to modern standards A further benefit to refurbishing an old building is that this will save on embodied carbon when compared to a new build.

However, the heritage nature of the building also presents some constraints. The listed nature of the facades prevents major interventions such as altering glazing ratios, however opportunities such as upgrading glazing to double, or triple glazing is possible. Nevertheless, the high glazing ratios mean that solar heat gain and conductive heat loss through the western and eastern façade remain a challenge. This will inhibit the energy efficiency of the building.

3 Building Physics Energy Strategy

3.1 General Energy Strategy

The New Annex and Existing Civic Centre have an energy strategy that reflects the client targets and is in line with local policy; whilst developing a number of key measures to achieve a low energy and carbon building.

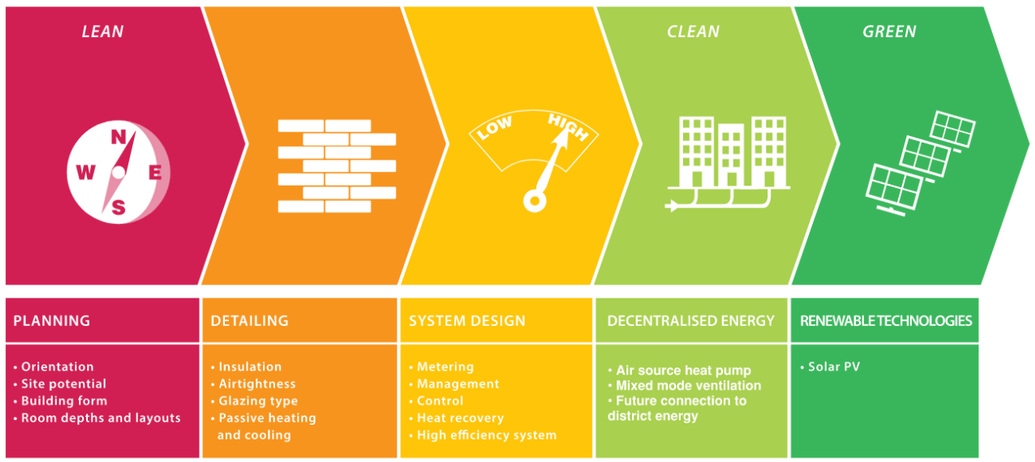


Figure 3—1 Haringey Energy Hierarchy

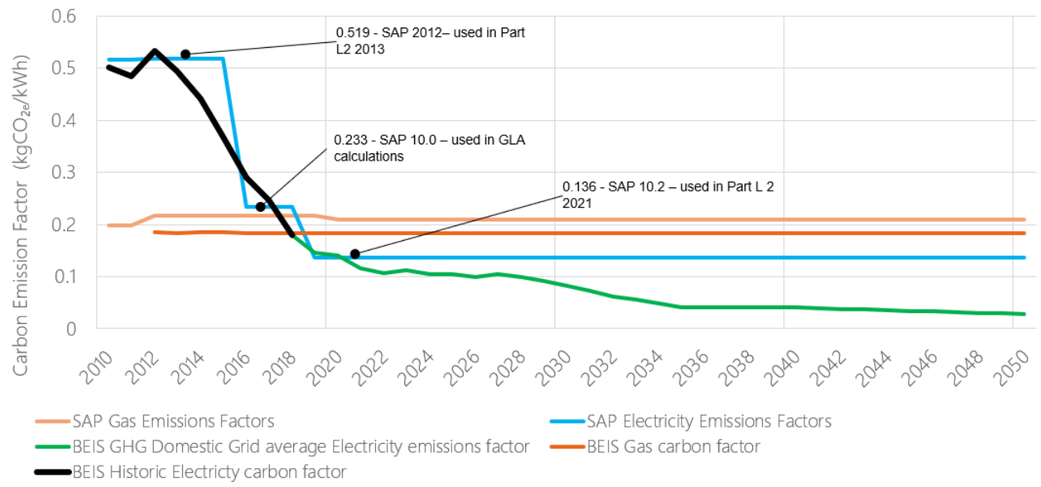
The key measures within the design strategy for the development to reducing carbon emissions in operation are set out below. By implementing this strategy, the development is compliant with the Building Regulations Part L notional building through Lean measures alone and exceeds the on-site carbon reduction target of 35% through supplementary Clean and Green measures.

Energy hierarchy step	Design measures
Lean	Façade configuration and specification designed to balance winter passive solar gains but avoid summer overheating
	Building fabric specification lower than Part L notional building and targeting LETI standards in the new building
	Low air permeability targeted
Clean	Future District Network connections installed in the systems
Green	Installation of Air Source Heat Pumps for space heating, cooling and domestic hot water Photovoltaic arrays proposed on roof areas wherever feasible for renewable electricity generation
Net Zero	Residual regulated carbon emissions will be offset as per GLA London plan to achieve net zero regulated emissions
Be Seen	The metering strategy for all buildings will be designed in line with building regulations and GLA's 'Be Seen' guidance to ensure the building energy consumption can be interrogated and controlled

The existing building is being refurbished, reducing overall whole life carbon and retaining the heritage of the area. The New annex is being built to meet sustainable targets through the fabric, system and PV strategy. Both buildings are fully electric.

3.2 Carbon Factors

As per the GLA assessment guidance issued in 2021, SAP 10 carbon factors will be reported against as well as Building regulations Part L2013 SAP 2012 carbon factors. Due to the new Building regulations Part L 2021, these carbon factors will be used for planning and compliance and performance assessments.



3.3 Fabric Performance

3.3.1 Existing Civic Centre

The refurbishment of the existing civic centre includes additional servicing and treatment provision in certain areas therefore under approved document Part L2 the fabric is required to be upgraded to meet minimum standards. These standards are found in Approved document Part L 2021 Exceptions may be listed areas and should be discussed with the heritage officer.

Table 3—1 Existing Civic Centre Fabric Performance

Element	Minimum Building Regulation ADL 2B Requirement	Reference in AD Part L2
	▪ New Element	
Windows and Rooflights	1.8 W/m²K for the whole unit	Table 3
Curtain Wall	See reference	Clause 4.28
Pedestrian Doors (More than 60% glazed)	1.8 W/m²K	Table 3
Roof and smoke extract ventilation	3.5 W/m²K	Table 3
External Wall	0.28 W/m²K	Table 4
Flat Roof	0.18 W/m²K	Table 4

Element	Minimum Building Regulation ADL 2B Requirement	Reference in AD Part L2
Floors	0.22 W/m²K	Table 4
	▪ Renovation of thermal element*	
Wall – cavity insulated	0.55 W/m²K	Table 5 (b)
Wall – external or internal insulation	0.30 W/m²K	Table 5 (b)
Flat Roof	0.22 W/m²K	Table 5 (b)
Floors	0.18 W/m²K	Table 5 (b)
	▪ Retained thermal element**	
Wall – cavity insulated	0.70 W/m²K	Table 5 (a)
Wall – external or internal insulation	0.70 W/m²K	Table 5 (a)
Flat Roof	0.70 W/m²K	Table 5 (a)
Floors	0.35 W/m²K	Table 5 (a)

*Renovation categories

- New external cladding
- Internal dry-lining
- Striping down and rebuilding
- Replacing waterproof membrane

**Retained categories

- Material changes of use
- Included in the new thermal line
- Proposed consequential improvements

The glazing and roof are all assumed to be being upgraded. Because there is no external access to the basement, the basement soffit does not need to be insulted for Part L purposes. Not insulating the soffit is acceptable as still complies with Part L and there will not be a big penalty to pay for in terms of operation energy. This is due to MEP systems allowing for some additional heat loss when sizing the heat emitters on the ground floor above the basement.
The west basement wall, bordering the ventilation shaft, should be considered for additional insulation as this may have external access through the ventilation.

For the rest of the wall elements, comments on these are listed in Table 3—2. Ideally, they are all upgraded however these comments balance the heritage challenges.

Table 3—2 Fabric upgrade elements

Element	Sustainability comments
EWS01 - Brickwork with 65mm Cavity	This is the hardest area to upgrade. Where the activity of the space with this façade is a stair core or circulation, the lack of upgrade is more acceptable as they are transient spaces.
EWS02 - Precast Concrete Cladding on 215mm Solid Brickwork	This façade is primarily the civic chamber around the glazing, the top level and the link bridge. The civic chamber is mostly glazed, providing the glazing has a good efficient framing this façade upgrade will have minimal impact. For the top level and link bridge façade, every effort should be made to upgrade as it is a larger area of the space and the heat loss will be greater.
EWS03 - Precast concrete with integrated feature glazing	These are small areas of the façade so will have less impact. However, if the glazing can be replaced or include secondary glazing it will boost the comfort in the civic chamber.
EWS04 - Reinforced concrete wall	Generally this façade is for plant location and therefore upgrades will have minimal impact from a sustainability point of view.
EWS05 - Render on 215mm Solid Brickwork	This includes the end of the link section of the existing building. Every effort should be made to upgrade this area due to the exposed nature of the space and that it is a meeting room.
EWS06 - Brickwork with concrete upstand	Any insulation here that is possible should be included as these are the occupied spaces for most of the day. Thermal bridging should be considered here as much as possible.
EWS07 - Precast Concrete Cladding on concrete upstand	On the west façade, any insulation here that is possible should be included as these are the occupied spaces for most of the day. Thermal bridging should be considered here as much as possible. The smaller areas will have less impact.

Buro Happold request clarity on the practical feasibility of these fabric performance upgrades can be achieved, if these are not feasible, the building will consume more energy and may require additional MEP services installations.

3.3.2 New Annexe

The new Annex is targeting fabric performance in line with the UKGBC and LETI guidance. Achieving these passive design fabric measures will ensure a reduction over Part L 2021 of the Building Regulations through energy efficiency alone. Good practice building fabric specification can significantly reduce the heating and cooling demands and loads of the building.

Table 3—3 New Annexe Fabric Performance

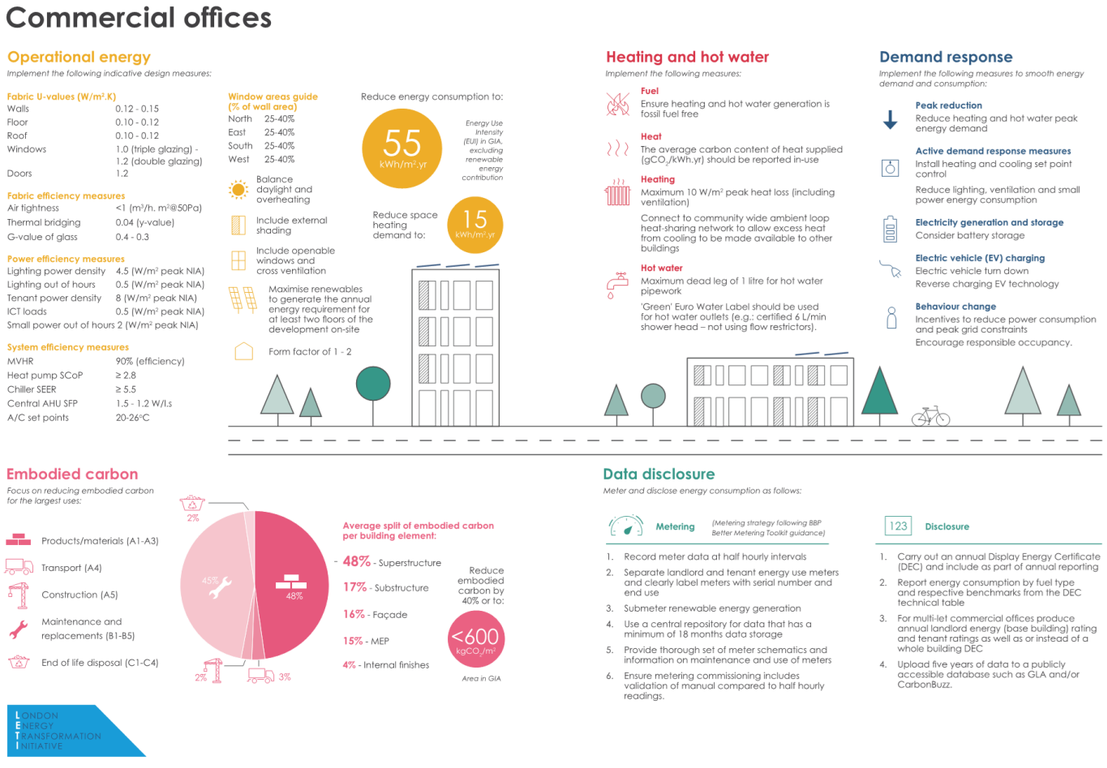
Element	Targeted value	Unit
Exposed and ground floors	0.10	W/m²K
Roof	0.11	W/m²K
External Wall	0.15	W/m²K
Windows (U-Value)	1.21	W/m²K
Windows and rooflights (G-Value)	0.29	
Air permeability	2.5	m³/hr/m² @50Pa
Thermal bridging	Y=0.04	

As well as the fabric performance, the building orientation and form has been developed to maximise passive design benefits.

The glazing ratio targeted is maximum 40% in order to achieve a balance between daylight and comfort. The open plan annex design allows for access to daylight from all sides. Continuity is provided around the façade with the glazing design and the large picture windows in the stage 3 design increase views and daylight on all orientations.

LETI or Low Energy Transformation Initiative (LETI) has published a series of important guidance on actions and targets to enable new developments achieve the carbon reduction targets set by the London Plan and local boroughs. There is no LETI guidance specifically for this project; however, we refer to that for offices for this project.

The Operational energy design measures include (a) maximum lighting power density of 4.5 W/m2, (b) minimum ventilation system heat recovery efficiency of 90%, (c) minimum heat pump seasonal Coefficient Of Performance (SCOP – Heat Pump efficiency) of 2.8 and (d) Air Handling Unit (AHU) Specific Fan Power 1.5W/l/s. The MEP installations will meet or improve on these requirements in the New Annex. The LETI guidance and ethos is driving the MEP services design.



3.4 MEP System design

3.4.1 Ventilation

Centralised Air Handling Units have been proposed as the ventilation solution for all office type areas, with Fan Coil Units to provide additional cooling when required. The diagram below shows a typical schematic overview of the system.

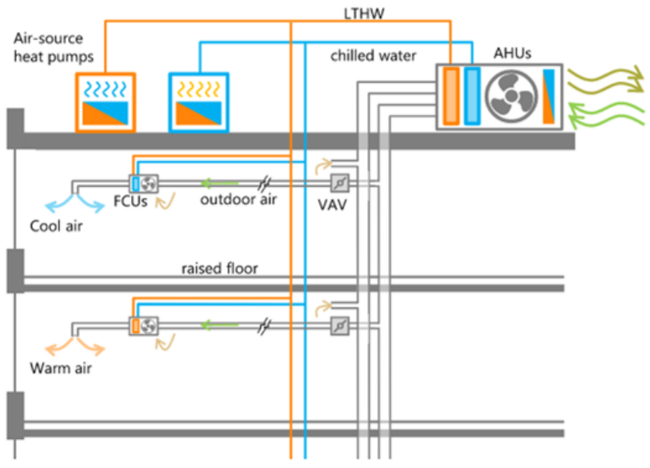


Figure 3—2 FCU system layout with fresh air supply

The ventilation strategies for each area have been further developed considering several factors including heritage constraints, spatial co-ordination, architectural aspirations, stakeholder feedback, operational energy and carbon emissions.

The heritage value of the existing building has been a continued theme which informs the design. An example of this is within the existing building we have proposed higher specific fan powers (SPW) in order to reduce size of ductwork distribution and Air Handling Unit configuration.

Although both buildings are in principal mechanical ventilated throughout, there are opening windows in many of the office areas. Refer to the architects' report and elevations for details of these. By providing opening windows this will allow end users direct access to outside air. Both buildings are too deep plan for single sided ventilation and the existing building has high glazing ratios. This means that both air quality and air temperature conditions would be compromised without a mechanical ventilation system.

3.4.2 Heating

Trench heaters will provided in the open plan office areas, and larger meeting rooms. Radiators will be used to provide heating to the link block meeting rooms as well as Back of House areas. Heat pumps are generating the heat feeding into these systems.

3.4.2.1 Building Management System

The BMS control system shall integrate all Mechanical, Electrical and Public health components through a single platform providing control, visibility, reporting and continuous tuning of these systems. The BMS control system will be based on a TREND system and include all IQ Vision interconnectivity and devices.

Detailed and specific control routines will be provided for each plant and equipment. The conservation of energy and carbon, end user satisfaction, planned and reactive maintenance will all be considered within each operation.

BMS graphics will be provided and follow the same layout and form as the schematics for intuitive cross referencing for the Facilities Management team.

3.4.3 Domestic Hot water

The showers on the ground floor of the new annex are served by a water source heat pump with 900L of storage. Toilets and tea points elsewhere are served by electric point of use hot water heaters with small local storage adding up to 590L in total.

3.4.4 System efficiency

The system efficiencies of the building are informed by LETI guidance for commercial offices. Although space constraints in the existing building prevent enhancing the heat pump efficiency to the LETI target, it is nonetheless a significant improvement.

System	Civic Centre Efficiency	Annexe Efficiency
Centralised AHUs SFP	1.60 W/l/s	1.30 W/l/s
Toilet Ventilation MVHR units SFP	1.60 W/l/s	1.30 W/l/s
Heat recovery efficiency	80%	80%
Fan Coil Unit Efficiency	0.20 W/l/s	0.18 W/l/s
Chiller Efficiency – SEERs	3.30 (TBC)	4.65
Heat Pump Efficiency – SCOPs	2.10 (TBC)	3.50

The existing building systems are more restricted due to heritage factors and existing space and design. However, these values are being pushed to be as efficient as possible where the space will allow.

3.5 District energy networks

Future connectivity to the London Borough of Haringey district heating systems is facilitated through a space allocation for a plate heat exchanger and allocation for additional distribution pump sets. We note that the operating temperatures of any future incoming district heating will likely impact the distribution pipework and heat emitter selections.

The site is in proximity to the new Wood Green District energy network. However, this is not due to be available for the building's operation and therefore there is no plan to connect to it as the infrastructure is not in place. There is capacity for future connection.

3.6 Electric efficiency

The lighting efficiencies and lux levels entered in the IES VE energy models for Part L and Operational Energy are as given in the table below. Efficient LED lighting will be installed throughout.

Table 3—4 Lighting efficiencies for energy models

Building	Area	Area illuminance Lux	Luminaire efficacy	Controls
New Annex	Open plan offices	400	130	time clock absence, daylight dimming
	Meeting rooms	400	130	absence detection
	Reception desk	500	154	manual
	breakout area	200	137	presence
	circulation/ lobby/ corridors	200	120	time-clock, presence, daylight dimming in wing circ
	toilets	200	137	presence
	showers	200	137	presence
	staircases	150	150	time-clock, presence
	plant rooms	250	176	manual
Existing civic centre	Open plan offices	400	100	time clock absence, daylight dimming
	Meeting rooms	400	100	absence detection
	Reception desk	500	80	manual
	breakout area	200	100	presence
	circulation/ lobby/ corridors	200	100	time-clock, presence, daylight dimming in wing circ
	toilets	200	100	presence
	staircases	150	100	time-clock, presence
	plant rooms	250	100	manual
	Civic chamber	300	80	time clock absence, daylight dimming

3.7 Renewable energy

Following the LZC study at stage 2, Solar Photovoltaics were decided as the most appropriate renewable energy solution for this development.

In order to reduce CO_2 emissions as far as practically possible, the PV cells extent needs to be maximised. The PV extent must be sensitive to planning limits and conservation requirements. The architect has outlined areas that are acceptable within these constraints; this is shown in Figure 3—3.

To align heritage and sustainability, all areas must be low profile (e.g. with 12 degree tilt) to ensure reduced visibility from sensitive sight lines. Some PV is positioned in a canopy over the roof plant, which will be supported by a secondary steel frame.

The Part L carbon analysis includes for the renewable benefit of all given areas below. The area of panels has been based on the Bauder Solar System design, specifically the JA Solar JAM60-S20-385Wp modules, with usable area calculated based on shape and size of array, following the Bauder Solar system design. Based on this system, there is an array of 368 panels across the whole development with a kilowatt peak power of about 140kWp. Our initial calculations show this achieving an output around 122,367 kWh per annum

Details of the PV contribution can be found in

Table 3—5 and Table 3—6.

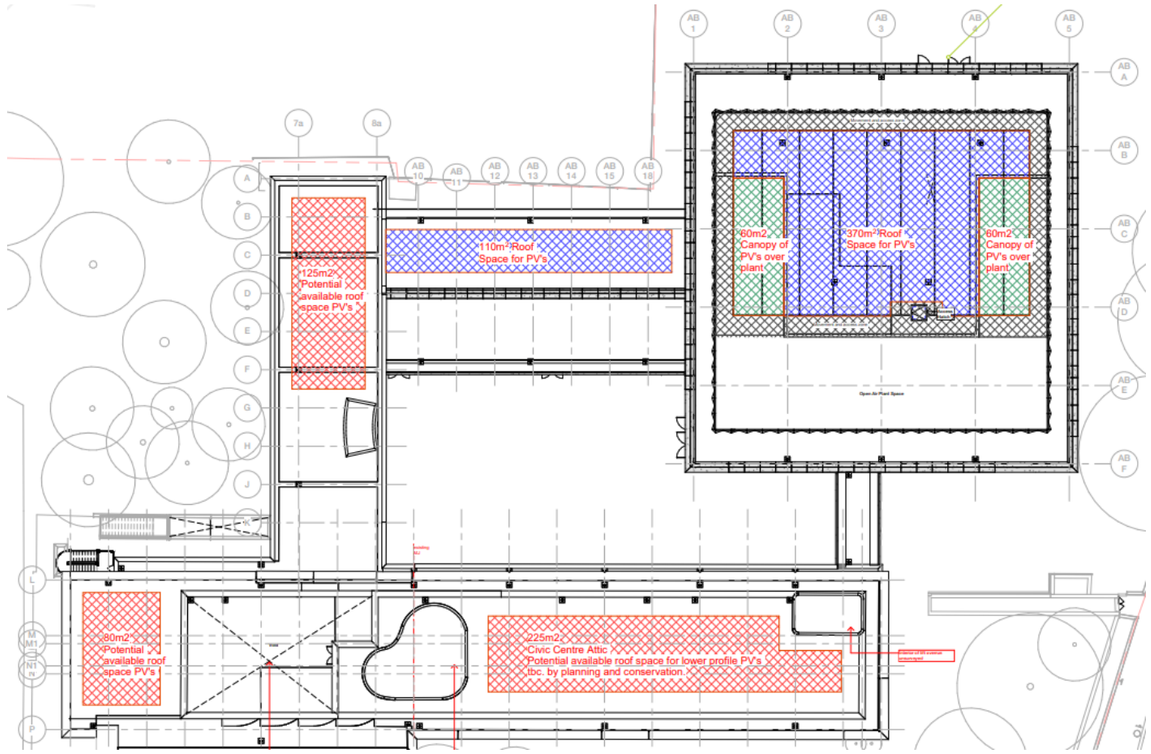


Figure 3—3 Architectural layout of Solar PV areas

Table 3—5 PV details

Location	Orientation	Area total (m^2)	Assumed area of panels (m^2)	Number of panels	Panel Tilt	Panel efficiency	Panel (Wp)	Array power (kWp)
New Annex Main roof	S	370	222	119	12 deg	20.7%	385	45.8
New Annex Plant canopy north	S	60	46.1	24	12 deg	20.7%	385	9.2
New Annex Plant canopy south	S	60	46.1	24	12 deg	20.7%	385	9.2
New Annex Wing Roof	W	110	84.5	45	12 deg	20.7%	385	17.3
Existing Civic Centre Link Roof	S	125	96.1	51	12 deg	20.7%	385	19.6
Existing Civic Centre south array	S	80	61.5	33	12 deg	20.7%	385	12.7
Existing Civic Centre north array	W	225	135	72	12 deg	20.7%	385	27.7
Total Number of Panels	**368**							
Total Power required	**141.7 kWp**							

Table 3—6 Stage 3 PV contribution

	Assessed floor area (m2)	Energy Production from PV (kWh/m2)	Energy Production from PV (kWh)
Existing Civic Centre	5,572	9.2	50,979
New Annex	5,207	13.7	71,388
Total			**122,367**

4 Part L results

4.1 Overview

The Building Regulations Part L governs the conservation of fuel and power in both new construction and refurbishment of the UK building stock. Compliance with Building Regulations is a regulatory requirement for all new developments, and carbon emissions of a development comparative to compliance with Part L is the key performance indicator for many carbon targets, including those set out in the London Plan.

The Haringey civic centre is a grade II listed building undergoing a major refurbishment connecting to a new building.

The relevant Part L document is ADL V2: Building Regulation Approved Document Part L Volume 2: Buildings other than dwellings

The project has been measured against the current Part L (2021). In line with the New London Plan policy S12, a Lean, Clean and Green (and Seen) strategy has been developed to achieve an improvement over Part L (2021)

- **Be LEAN**: use less energy and manage demand during construction and operation.
- **Be CLEAN**: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly.
- **Be GREEN**: generate, store and use renewable energy on-site.
- **be SEEN:** monitor, verify and report on energy performance.

4.2 New Annex

- Intermediate targets for the new building are:
- A minimum on-site reduction of at least 35%,
- A minimum 15% through energy efficiency measures.

4.2.1 Results for the New Annex

Table 4—1 Part L carbon results for new annex

	Notional Baseline	Be Lean - Heat Pumps (SCOP: 2.64)	Be Clean - Heat Pumps (SCOP: 3.5)	Be Green - Heat Pumps and PV
	kgCO₂/m²/year	*kgCO₂/m²/year*	*kgCO₂/m²/year*	*kgCO₂/m²/year*
Heating	0.20	0.27	0.27	0.20
Cooling	0.66	0.70	0.70	0.78
Auxiliary	1.18	0.91	0.91	0.92
Lighting	2.06	1.38	1.38	1.38
DHW	0.66	0.89	0.89	0.76
PV				-1.74
Total	4.76	4.14	4.14	2.30
Percentage improvement over notional baseline		**13%**		**52%**

The more stringent requirements of Part L (2021) are currently difficult to meet through passive and clean measures alone. However, the building does achieve a 13% improvement over the notional building through these measures. When including the displaced carbon due to the addition of a PV system, and the efficient system design, the building achieves a substantial 52% improvement over the Part L baseline.

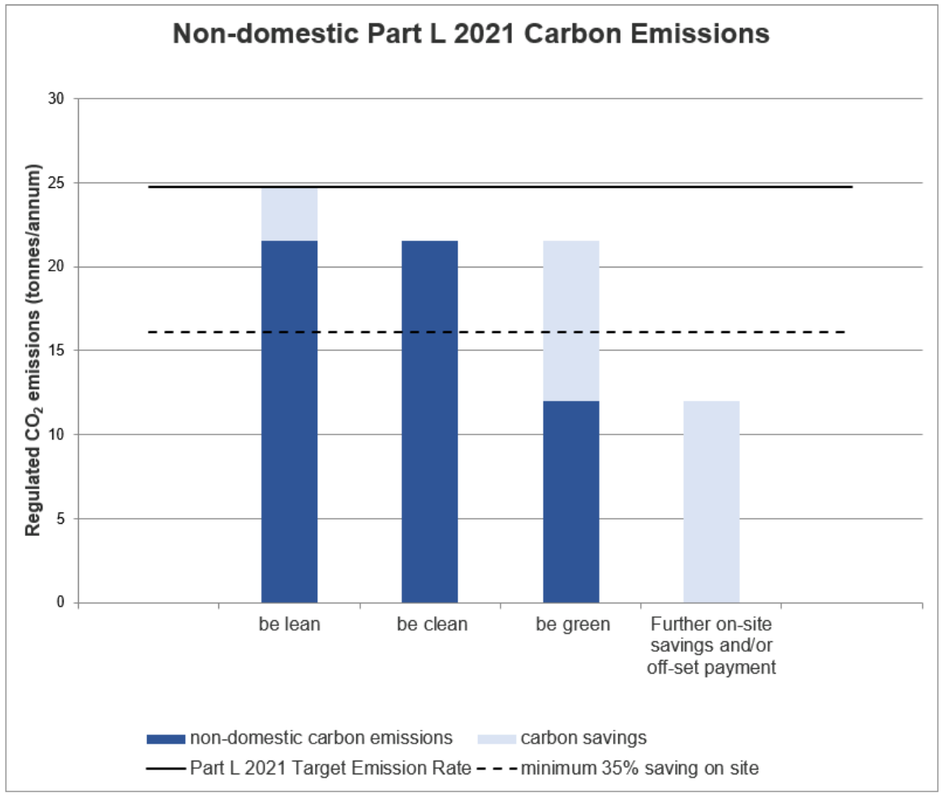


Figure 4—1 Part L results for new annex

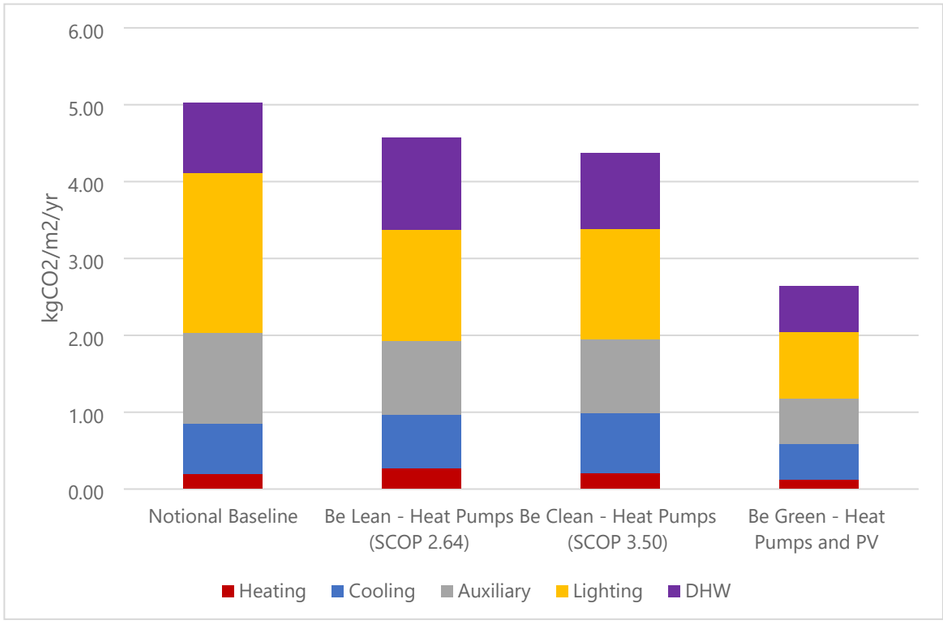


Figure 4—2 Part L results by end use for new annex

Whilst it is demonstrated that the zero-carbon target cannot be fully achieved on-site, we expect the final shortfall should be provided, in agreement with the borough via an off-site measure provided that an alternative proposal is identified, and delivery is certain. This is a preferred option to a cash in lieu contribution to the borough's carbon offset fund.

A cash in-lieu payment if £34,132 would be required, based on a £95 price per carbon tonne, in order to offset the remainder of the carbon emissions for the new build.

4.2.2 Cooling demand

Table 4—2 Cooling demand

	Area weighted cooling demand (MJ/m^2)	Total cooling demand (MJ/year)
Actual	114.9	598,284
Notional	126	656,082

4.3 Existing Civic Centre

The London Plan energy assessment guidance requires an estimation of the existing building CO_2 emissions and for the refurbishment to be compared in performance.

The existing baseline has been calculated using notional standards, existing building layout and form and estimated U values based on a façade survey conducted in 2021.

The refurbishment measures, as detailed in this report, include the following:

- Upgraded fabric components
- Upgraded lighting
- Change in layout
- Improved systems and energy strategy for new layout areas
- Addition of PV on the roof

The following table shows the significant improvement that the refurbishment is currently achieving, mainly due to the heating and lighting improvements.

Table 4—3 Part L results for existing building

	Existing Building	Refurbished building
Heating	10.39	3.5
Cooling	3.48	0.60
Auxiliary	6.81	1.54
Lighting	9.53	1.62
DHW	1.45	0.23
PV		-1.16
Total	31.66	6.33
Percentage improvement over existing building following refurbishment measures		**80%**

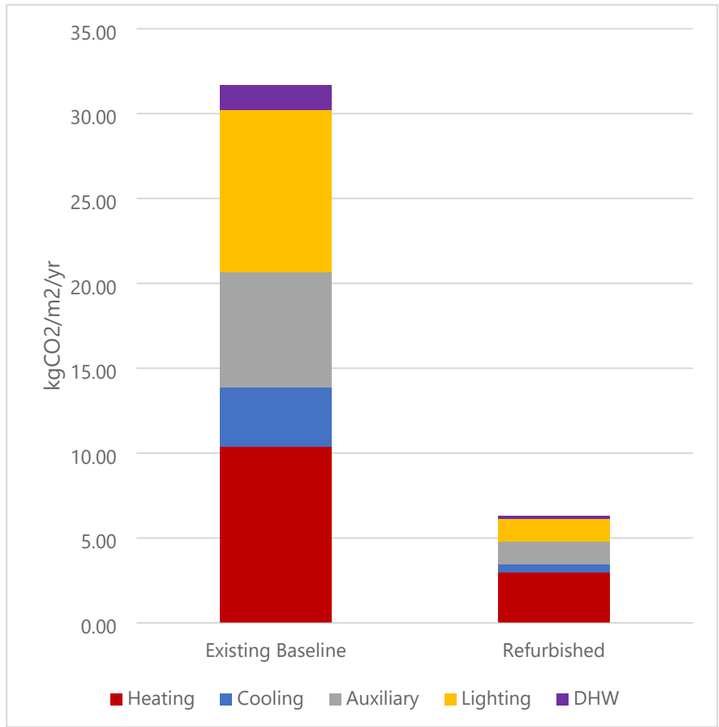


Figure 4—3 Part L results for existing building

4.4 Ventilation and Thermal overheating mitigation

A separate thermal comfort report has been produced for planning to assess the comfort temperatures over a range of future weather files in order to achieve the comfort criteria for planning requirements and BREEAM Hea04 credits. Not only does this analysis assist in our BREEAM overall score, it is also key in showing how the development can operate at future climate scenarios in adverse thermal temperatures.

The design since Stage 2 has reduced glazing ratio and therefore solar gain into the open plan office. There have also been additional shading measures incorporated into the façade, especially along the South façade. All spaces pass Criterion 3.

Table 4—4 Glazing Ratios

	South Façade	East Façade	North Façade	West Façade
Glazing Ratio	**33.3%**	**34.7%**	**33.2%**	**37.3%**

5 Operational Energy calculations

5.1 Overview

Buro Happold has carried out a prediction of operational energy consumption using advance simulation modelling in accordance with CIBSE TM54 requirements for the Haringey Civic Centre buildings located at 255 High Rd, London N22 8LE. This also follows the GLA Be Seen requirement of reporting on EUI.

Both buildings are fully electric and fossil fuel free. The targets that Haringey Civic Centre is seeking to achieve are an EUI of 90kWh/m^2 in the annexe building and 225kWh/m^2 in the existing civic centre when refurbished.

5.1.1 The energy consumption estimate

The findings of the operational energy modelling show a predicted EUI of 80-103kWh/m^2 for the annexe building and 147-186 kWh/m^2 for the existing Civic Centre. This range includes an allowance for non-ideal operation of the building during occupancy.

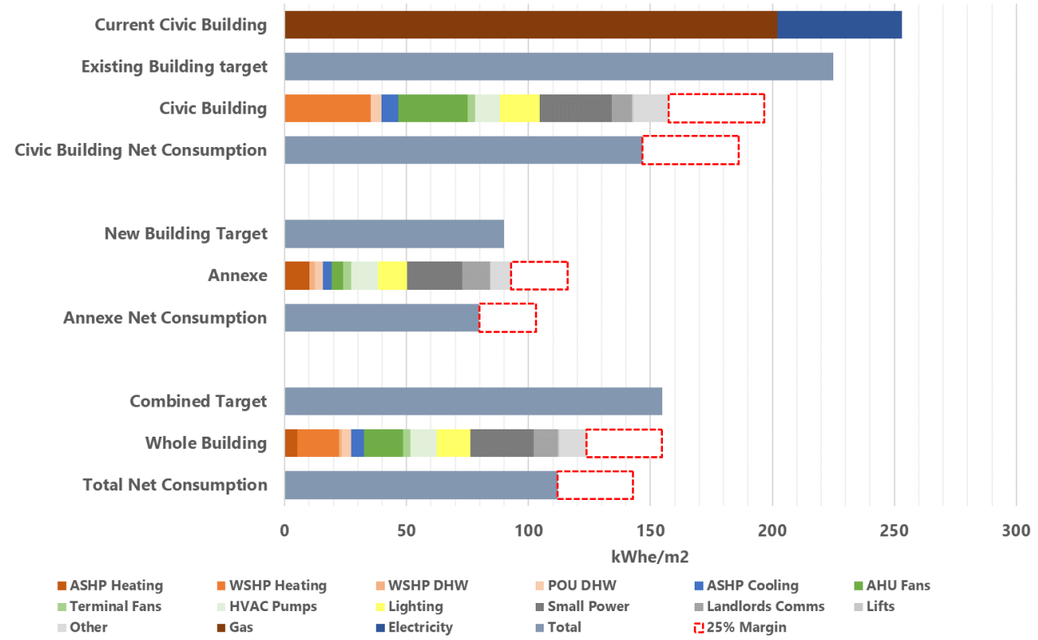


Figure 5—1 Estimated Annual Energy Consumption

5.1.2 The Assumptions

Key assumptions associated with the outcome of this work are:

- Energy consumption associated with small power and comms room equipment were the largest consumers of energy. A diversified small power load of around 11W/m2 has been assumed based on typical office use. Small power usage will be key to achieving the energy targets in operation
- Seasonal efficiencies of central plant have been assumed at this stage. Plant efficiency curves will be integrated to allow fine tuning of the design during RIBA Stage 4
- Pump energy consumption has been estimated based on typical building performance. This will be developed in more detail as the design develops in RIBA Stage 4
- Zoning of the building so that only areas in use outside of the normal operating hours are supplied, and the ability of the central plant to turn down at low load will be critical in maintaining operational energy efficiency.
- The further development of description of controls operation in RIBA Stage 4, informed by the energy model, will allow the contractor to set up the building and building operator to operate the building efficiently.
- It should be noted that plant located in the Annexe does serve the Civic Building so it is expected that the Annexe may exceed the new building targets as a result of additional consumption associated with the ASHPs and water pumping.
- An additional lift may be added to the annex design, which would add an additional operational energy load. This is not currently in the Stage 3 design and therefore not included.

5.2 Introduction

The purpose of this section is to:

- Summarise what is included in the estimate and describe how each element was calculated
- Summarise the results of the estimate
- Demonstrate the estimate is a realistic representation of how the building will perform in operation

Design drawings and documents have been referenced, and information that can be found in these documents have not been repeated in this report. This report describes where interpretation, assumption or approximation of design information has been used in the estimate.

More detailed information for each element of the estimate is available on request.

The estimate was calculated using energy modelling software IES VE 2022.1.2.0 (Hotfix 2) and HVAC systems were modelled in detail using Apache Systems.

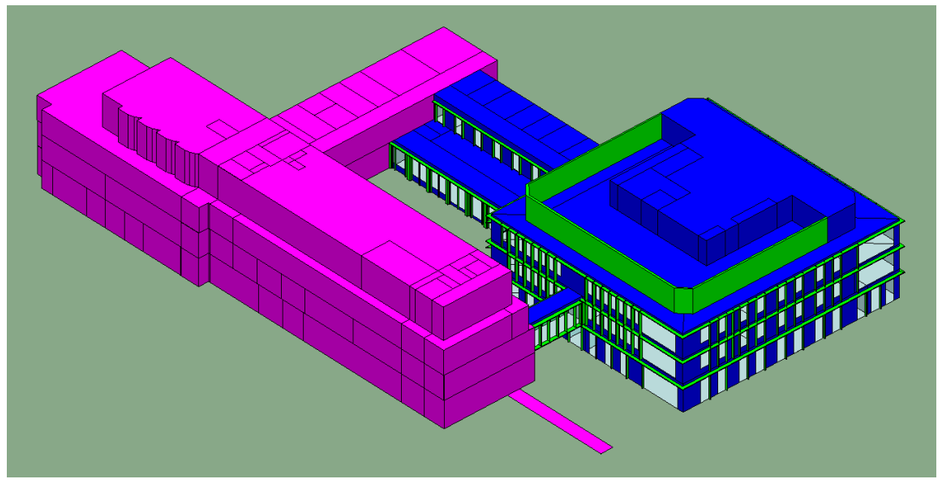


Figure 5—2 IES VE energy model site geometry – annex view

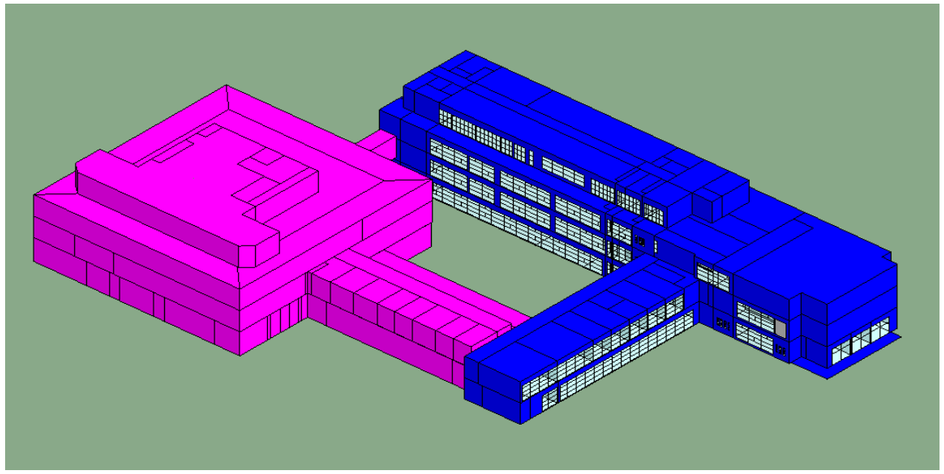


Figure 5—3 IES VE energy model site geometry – civic centre view

5.3 Input data and assumptions

Further detail on all inputs and assumptions can be found in Appendix D.

5.3.1 Estimating energy using a simulation

The energy consumption estimate for the building has been made using a simulation model for all major plant in conjunction with separate Excel spreadsheet calculations for elements that cannot be represented in the energy modelling package and for minor energy consuming elements. Supplementary calculations have been used for the following major elements:

- Lift energy consumption has been calculated independently of the model and has been based on latest manufacturer inputs.
- Hot water energy consumption for both the annexe and existing Civic Centre has been calculated independently based on the heating and storage systems and expected usage based on occupancy.
- Auxiliary fan power from FCU and MVHR units has been calculated independently according to proposed scheduling.

5.3.2 HVAC software simulation package and model

The dynamic energy simulation modelling software IES Virtual Environment, version 2022.1.2.0 has been used for this analysis to provide an hourly energy demand prediction for the building. The following software components have been utilised:

- **ModelIT** – defining the building geometry, its façade shading features, and the surrounding buildings
- **Apache** – defining the building fabric properties accounting for total U-value including thermal bridging, glazing properties including the total Solar Heat Gain Coefficient (SHGC), and internal gains
- **Suncast** – to model direct solar gain into the building through windows and rooflights accounting for shading from the building form and surroundings
- **MacroFlo** – for calculating bulk air flow between zones

The software has been validated through ANSI/ASHRAE Standard 140, Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs.

5.3.3 Climate data

CIBSE Test Reference Year (TRY) weather data for London has been used in the Stage 3 analysis. The TRY 2020 weather data represents the average month selected from 2010 – 2039.

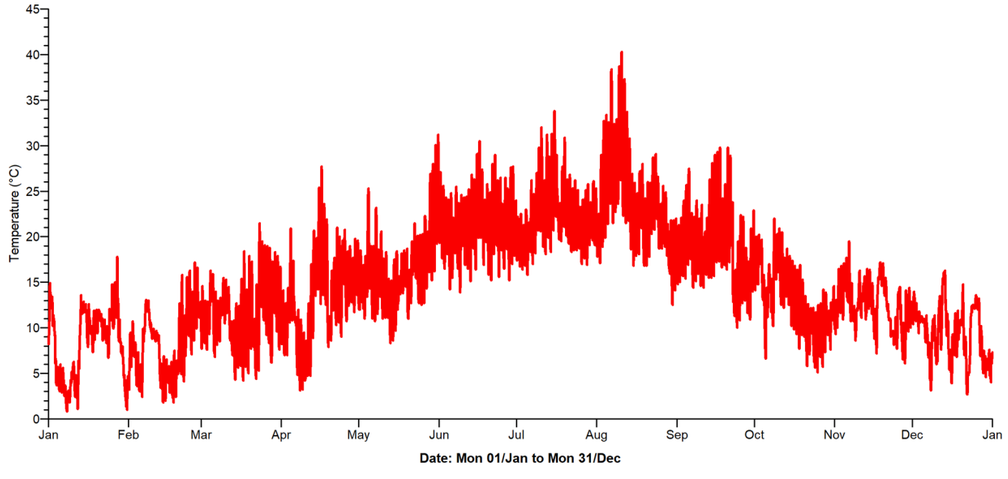


Figure 5—4 TRY 2020 weather files used in the baseline model

5.3.4 The building

The annexe consists of 4 storeys primarily containing open plan offices and meeting rooms with additional facilities such as showers for office staff. This building is connected via two walkways to the existing Civic Centre. The Civic Centre also contains large open plan offices as well as a welcome area for visitors to the large Civic Chamber. There is also a basement present containing the plant equipment for the Civic Centre. Appendix A references the architectural drawings forming the basis of the model and the office NIA calculation. A visual representation of the building model is shown in Figure 5—5 and shows the external shading features included in the following forms:

- Fins and window reveals are considered as part of the structure and have been incorporated as shading devices.
- Adjacent buildings have been incorporated as simplified geometric blocks
- Glazing modelled includes the frame with thermal properties assigned to glass and frame to represent the whole unit.
- Building façade U-values have been set based on the RIBA Stage 3 design.

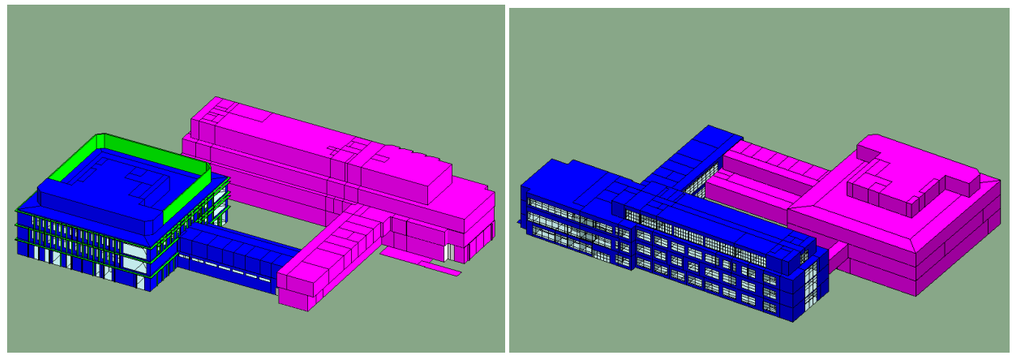


Figure 5—5 Energy model geometry – building

5.3.5 Internal gains

Thermal templates have been set up for the following space types and applied to all rooms within the building:

- Office space
- Reception
- Corridors
- Stairs
- Plant rooms

Internal heat gains have been modelled to follow the RFI schedules of occupancy and equipment present in each space.

5.3.5.1 Occupancy gains

For plant-sizing an occupancy density of 1 person per 8m^2 has been used for the offices and meeting spaces. Heat gains from occupants has assumed to have a sensible heat gain of 75W/person and latent heat gain of 55W/person.

5.3.5.2 Lighting

Average lighting power density for each space type was calculated from the RIBA Stage 3 lighting calculations and applied to the relevant templates as it will have impact of the cooling and heating demand.

The energy used by tenant office lighting has not been included in this estimate as it focuses only on base build energy.

5.3.5.3 Equipment

The MEP design uses 25W/m^2 for sizing of office cooling and electrical services. Office equipment was set at 25W/m^2 for 100% on the profile in the operational energy model with a 50% diversification factor.

A blanket equipment power density of 5W/m^2 has been applied to all WCs, circulation and stairs operating on the same profile as the office space. The energy use for this equipment has been included in the energy rating calculation to cover various pieces of electrical equipment throughout the building.

Other equipment power consumption and heat gains to specific plant and technical rooms have been applied are used to estimate the common landlord area power consumptions.

- FM room (5 W/m2 100% during occupancy 80% when unoccupied)
- LV Switchgear (5 W/m2, profile based on building electrical demand, no electrical consumption)
- HV Switchgear (5 W/m2, profile based on building electrical demand, no electrical consumption)
- COMMs (9kW, 100% during occupancy, 50% when unoccupied with 0.75 diversification)

5.3.6 Mechanical systems

The mechanical services model includes the following systems:

- The office heating and cooling has been modelled as a fan coil unit system and radiator network served by a central air source heat pump (ASHP) in the annexe building. This is boosted to a higher temperature by a water source heat pump to serve the existing Civic Centre.
- The fresh air ventilation system has been modelled in Apache as central air handling units matching the RIBA Stage 3 design information.
- Domestic hot water (DHW) for the showers is generated centrally via a water source heat pump utilising the LTHW system as a heat source.
- DHW for handwash basins in WCs is delivered using instantaneous electric hot water.

5.3.6.1 Domestic hot water

Domestic hot water (DHW) usage has been estimated based on:

- Handwashing and building cleaning based on 2l/person/day using the office occupancy profile
- Building cleaning based on 175 litres per day with all usage after office hours
- Showering for 15% of the building occupancy, 7 minutes per shower, with usage split into three concentrated periods in before office hours, lunchtime and after office hours
- Line losses and storage losses have been allowed for.

The energy use of the second-stage, water-to-water heat pump was calculated using manufacturers efficiency data. The heating load was included in the energy use calculation for the main central plant (air-to-water heat pumps).

5.3.7 Lifts

The vertical transportation within the building has considered the lifts as detailed in the RIBA Stage 3 design, using CIBSE Guide D and ISO 25745-2 methods were utilised to estimate the lift energy use.

- 2No passenger lifts in the Civic Centre, medium usage
- 1 No passenger lift in the annexe, medium usage

5.4 Onsite renewable energy generation

Solar Photovoltaics (PV) are included in this project and have been calculated using IES simulation. They use the relevant weather files and shading factors to account for the PV panels present on both the annexe and Civic Centre which are metred separately. The onsite generation was calculated in IES-VE using the inputs from the design in terms of orientation, tilt angle and shading factor provided in the vendor's calculations.

A summary of the PV generation in accordance with the PV system specification is given in section 3.7 of this report.

Table 5—1 PV generation

Month	Annexe Generation (MWh)	Civic Building Generation (MWh)	Exported (MWh)
January	-1.4119	-1.2362	
February	-2.8295	-1.8974	
March	-5.008	-3.7458	
April	-7.3351	-5.2292	
May	-9.1727	-6.8461	
June	-10.2297	-7.8094	
July	-9.3769	-7.5375	
August	-8.9217	-6.5223	
September	-6.4828	-4.6443	
October	-3.7768	-2.8162	
November	-1.9747	-1.3657	
December	-1.3748	-0.9691	
Total	-67.8946	-50.6192	None assumed to be exported

5.5 Simulation Results

5.5.1 Estimated energy use

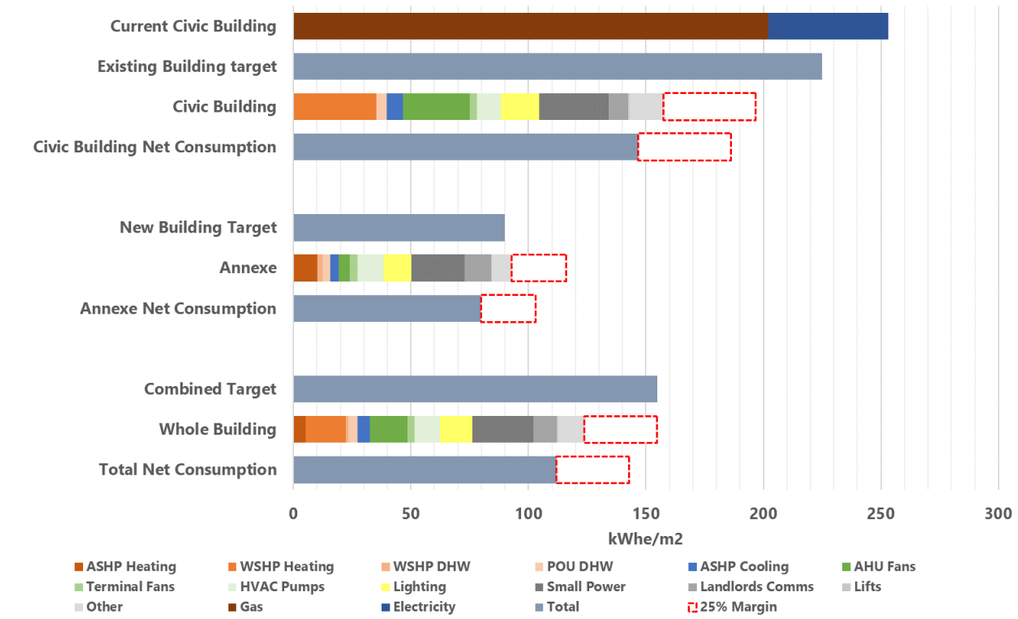


Figure 5—6 Energy consumption estimate

The Current Civic Centre energy use is based on data obtained from the DEC of the existing building. The Net Consumption bars include reduction in energy from onsite solar PV. Detailed results can be found in Appendix E.

5.5.2 Operational costs

A rough estimate of the associated operational costs has been made. This is an estimate and does not necessarily reflect the rates at which the client will pay, nor does it include standing charges.

Table 5—2 Estimated operational costs

	Whole Building
Energy End Use range (MWh)	1,166 - 1,490
Estimated operational annual costs range*	£293k - £375k

*costs based on 25.13p per kWh from Table 3.4.2 BEIS Gas and electricity prices in the non-domestic sector

5.6 Disclaimer

Computer simulation provides an estimate of performance. This estimate is based on simplifications that do not and cannot fully represent all of the intricacies of performance once built. As a result, simulation results only represent an interpretation of the potential performance. No guarantee or warrantee of performance in practice can be based on simulation results alone.

Appendix A Drawings and specifications used

The operational energy TM54 model was based on the Stage 3 drawings, reports, and specifications provided by the project architect Hawkins Brown.
The mechanical, electrical and public health specifications and information was based on the Stage 3 MEP report and MEP Basis of Design.

Appendix B EUI Inputs

B.1 Building GIA calculations

The analysis has considered the Gross Internal Area (GIA) of the buildings.

Table 5—3 Floor areas

Floor Area (m2)	Civic Building	Annexe	Total
Measured Area	5,505	4,871	10,376
Modelled Area	5,477	4,947	10,424

The modelled area exceeded the drawing area by less than 1% and therefore no correction to the model energy consumption prediction has been applied.

B.2 Operational hours calculated

Energy use intensity is expected to be dependent on the hours of occupancy, and the following operational hours have been assumed.

Table 5—4 Operational hours

Building	Weekday Operating Hours	Weekend Operating Hours
Civic Centre	08:30 – 22:00	10:00-17:00 Saturdays only
Annexe	08:30-18:00	Closed

Appendix C Building fabric performance

C.1 Thermal performance

The building fabric performance of the annexe has been determined using the LETI guidelines in order to reduce the heating and cooling demands of the building. The refurbishment to the civic centre includes additional servicing and treatment provisions in certain areas to meet the minimum standards set out in Part L.

Table 5—5 Building fabric performance

Building Element	Target Value	Units
Annexe Building		
Exposed and ground floors	0.10	W/m2K
Roof	0.11	W/m2K
External Wall	0.15	W/m2K
Windows (U-Value)	1.21	W/m2K
Windows (G-value)	0.29	
Air permeability	0.15	ach
Thermal Bridging	10%	
Existing Civic Centre – New Elements		
Windows	1.8	W/m2K
Windows (G-Value)	0.4	
Doors	1.8	W/m2K
Roof and smoke extract ventilation	3.5	W/m2K
External Wall	0.28	W/m2K
Flat Roof	0.18	W/m2K
Floors	0.22	W/m2K
Existing Civic Centre – Renovated Elements		
Wall – cavity insulated	0.55	W/m2K
Wall – external or internal insulation	0.30	W/m2K
Flat roof	0.22	W/m2K
Floors	0.18	W/m2K
Existing Civic Centre – Retained Elements		
Wall – cavity insulated	0.70	W/m2K
Wall – external or internal insulation	0.70	W/m2K
Flat Roof	0.70	W/m2K
Floors	0.35	W/m2K

C.2 Infiltration

Building air permeability has been assumed to achieve 3.0 m^3/hr per m^2 of façade @ 50 Pa. To represent this air permeability in the energy model, the infiltration rate has been set at 0.290 l/s per m^2 façade area – results in an overall air change rate of 0.15ach, concentrated in the perimeter zones.
Infiltration has also been added to the following spaces:

- Mechanical/electrical and wet plants 0.15 ach
- Reception 1.0 ach
- All perimeter zones 0.15 ach
- All other zones 0.15 ach

Appendix D Model Assumptions

The internal loads used to calculate heat gains and energy consumption are as follows

Table 5—6 Internal loads

	Lighting Power Density (W/m^2)		Equipment Power Density (W/m^2)		Occupancy Density (m^2/person)	
	Cooling/vent Sizing	Operation at 100% on profile*	Cooling/vent Sizing	Operation at 100% on profile**	Cooling/vent Sizing	Operation at 100% on profile
Office	10	4.89	25	11	8	10
Reception	10	8.85	5	5	10	10
WCs	-	4.51	-	5	-	-
Corridors	-	5.18	-	5	-	-
Stairs	-	5.28	-	5	-	-
Plant rooms	-	2.64	-	5	-	-
Car Park	-	1.07	-	0	-	-

D.1 Occupancy

The building design criteria allows for 1 person per 8m2 occupancy within the upper floor offices, however for the purposes of the model 1 person per 10m2 occupancy density has been used.
Heat gains from occupants has been based on CIBSE Guide A with a sensible heat gain of 90W/person and latent heat gain of 50W/person.

D.2 Equipment

The building design criteria allows for 25W/m2 of on-floor equipment loads within the office tenancies, however for the purposes of the baseline model they have been based on an average 11 W/m2.

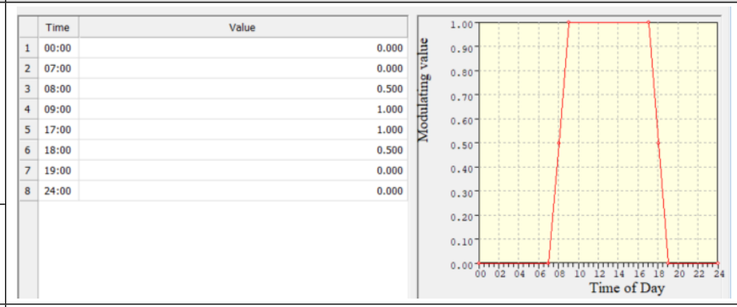
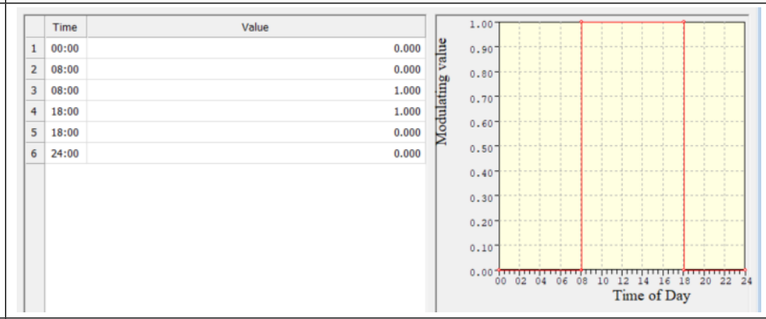
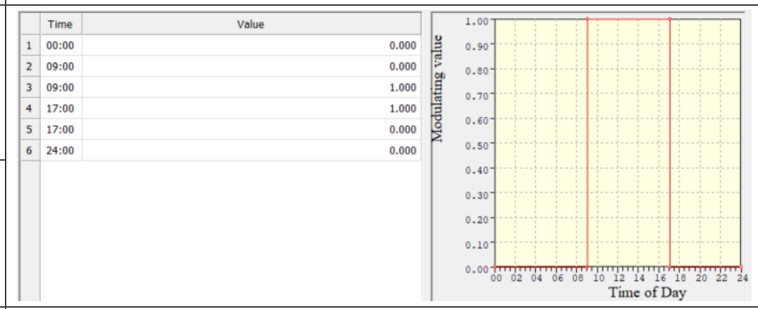
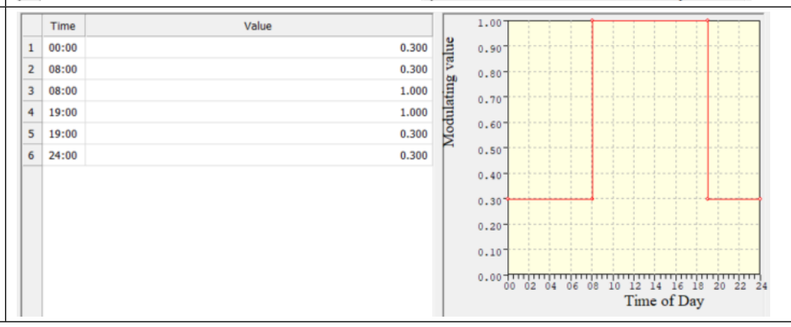
D.3 Internal Lighting

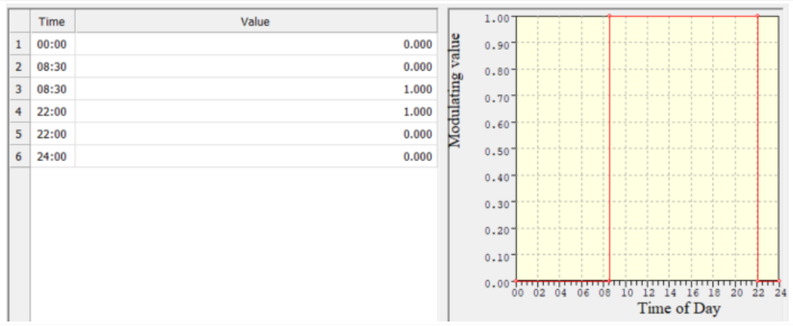
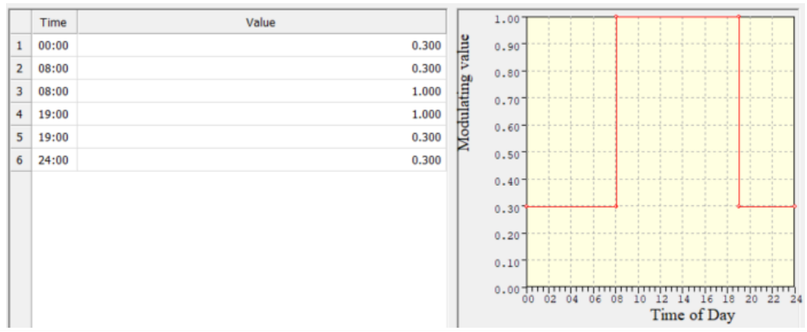
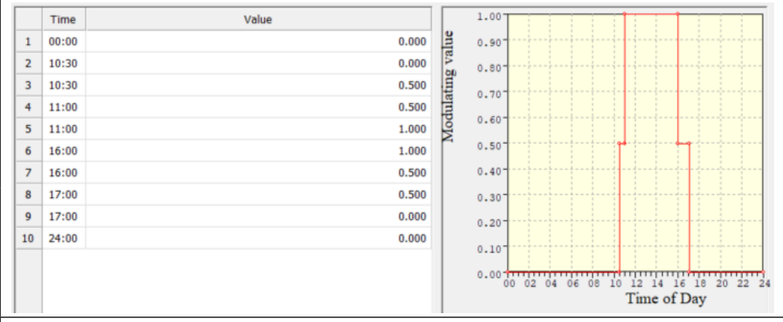
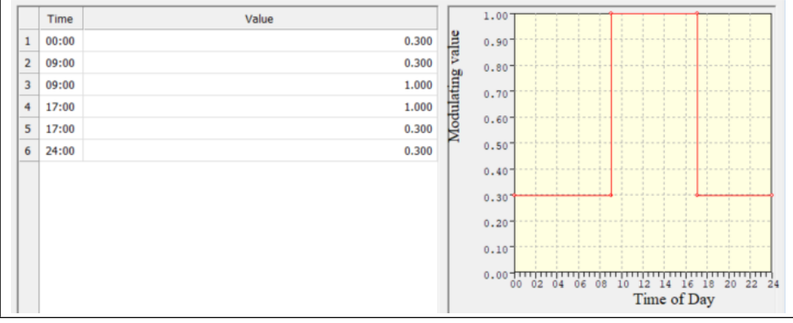
Average lighting power density for each space type was calculated from the RIBA Stage 3 lighting calculations and applied to the relevant templates, along with the lighting control strategy.
The energy used by tenant office lighting has not been used in the estimate.

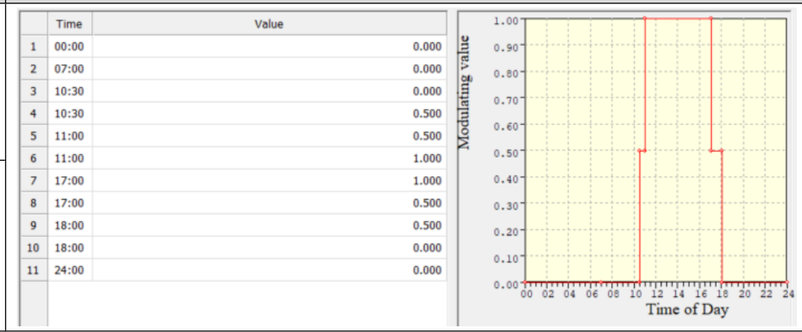
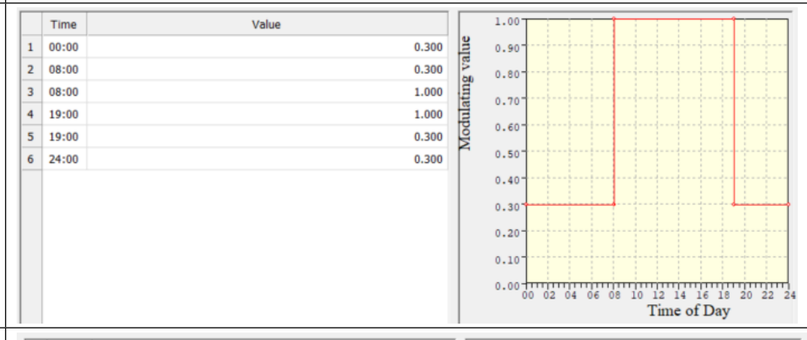
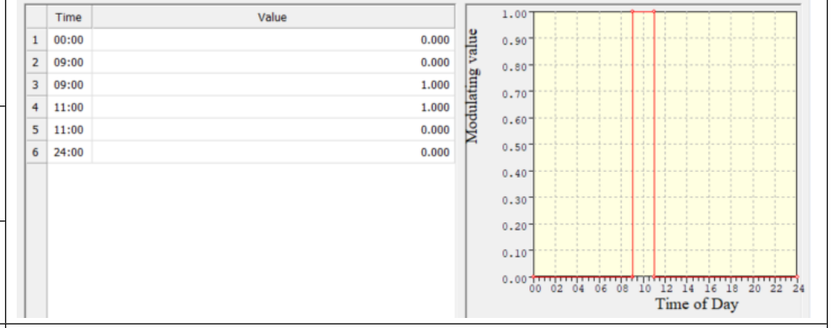
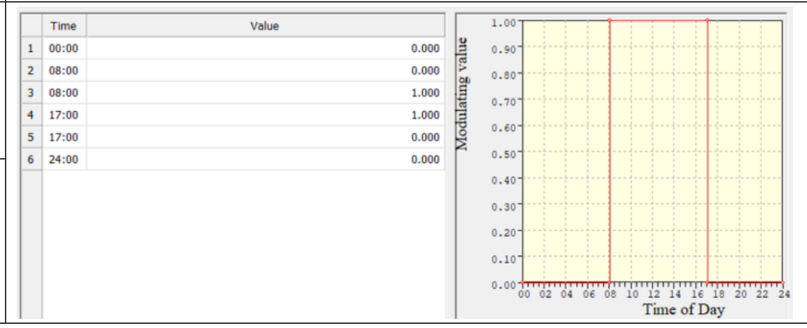
D.4 Schedules

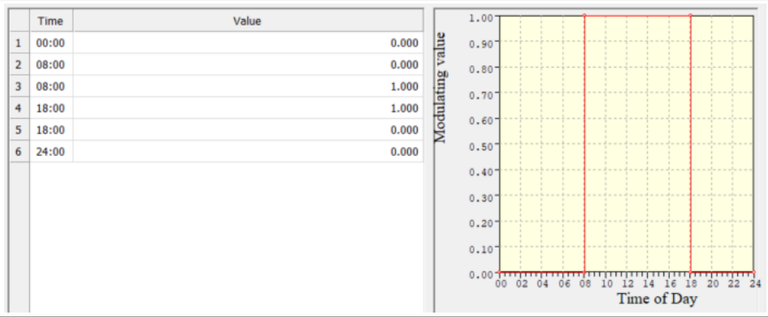
The following occupancy, lighting, equipment operation have been used in the model for all office spaces.

Table 5—7 Internal gains profiles

Space Type	Profile Category	Profile
Office	Occupancy	
		Time / Value 1 00:00 0.000 2 07:00 0.000 3 08:00 0.500 4 09:00 1.000 5 17:00 1.000 6 18:00 0.500 7 19:00 0.000 8 24:00 0.000 Modulating value Time of Day
	Equipment	
	Lighting	
		Time / Value 1 00:00 0.000 2 08:00 0.000 3 08:00 1.000 4 18:00 1.000 5 18:00 0.000 6 24:00 0.000 Modulating value Time of Day
Lobby/Reception	Occupancy	
		Time / Value 1 00:00 0.000 2 09:00 0.000 3 09:00 1.000 4 17:00 1.000 5 17:00 0.000 6 24:00 0.000 Modulating value Time of Day
	Equipment	
	Lighting	
		Time / Value 1 00:00 0.300 2 08:00 0.300 3 08:00 1.000 4 19:00 1.000 5 19:00 0.300 6 24:00 0.300 Modulating value Time of Day

Space Type	Profile Category	Profile
Welcome Area (Weekday)	Occupancy	
	Equipment	
	Lighting	
Welcome Area (Weekend)	Occupancy	
	Equipment	
	Lighting	

Space Type	Profile Category	Profile
Meeting Rooms	Occupancy	
	Equipment	
	Lighting	
Civic Chamber	Occupancy	
	Equipment	
	Lighting	
Study Rooms	Occupancy	
	Equipment	

Space Type	Profile Category	Profile
	Lighting	

	Time	Value
1	00:00	0.000
2	08:00	0.000
3	08:00	1.000
4	18:00	1.000
5	18:00	0.000
6	24:00	0.000

D.5 Domestic hot water

The daily weekday hot-water demand for the offices has been estimated for the showering facilities and handwashing and cleaning within the toilet cores.

The volume of water at the shower outlet temperature of 38°C has been calculated at 3,862 litres a day based on 15% of the buildings population (250 people) taking a shower each day with hot water flow rate of 4 l/min per shower. Water usage was spread over the day with the maximum at the start of the day, some usage around lunchtime, and minimal consumption at the end of the day.

The volume of DHW at the WHB outlet temperature of 41oC for handwashing and office cleaning was assumed to be 2l/person/weekday spread over the day based on the office occupancy profile. The daily DHW usage at weekends was reduced in proportion to the weekend office occupancy.

Table 5—8 DHW usage profiles

Time period	Shower Profile Weekday	Toilets Profile Weekday	Cleaners DHW Profile Weekday	Toilets DHW Profile Sunday
0000-0100	0%	0%	0%	0%
0100-0200	0%	0%	0%	0%
0200-0300	0%	0%	0%	0%
0300-0400	0%	0%	0%	0%
0400-0500	0%	0%	0%	0%
0500-0600	0%	0%	0%	0%
0600-0700	25%	0%	0%	0%
0700-0800	25%	0%	0%	0%
0800-0900	25%	10%	0%	0%
0900-1000	0%	10%	0%	0%
1000-1100	0%	10%	0%	0%
1100-1200	0%	10%	0%	0%
1200-1300	10%	10%	0%	0%
1300-1400	10%	10%	0%	0%
1400-1500	0%	10%	0%	0%
1500-1600	0%	10%	0%	0%
1600-1700	0%	10%	0%	0%
1700-1800	5%	10%	0%	0%
1800-1900	0%	10%	0%	0%
1900-2000	0%	10%	0%	0%
2000-2100	0%	10%	0%	0%
2100-2200	0%	10%	0%	0%
2200-2300	0%	10%	0%	0%
2300-2400	0%	10%	0%	0%

D.6 Air and water source heat pumps

As detailed performance data was not available for the heat pumps the following conservative seasonal efficiencies have been assumed.

Table 5—9 ASHP and WSH seasonal efficiencies

	Heating
Annexe ASHP	3.5
Civic Building combined ASHP & WSHP	2.5

Heat pumps are expected to have a similar lifespan to a gas boiler and should be regularly checked and maintained.

D.7 Water source heat pump

The domestic hot water for the showers is provided using a water-to-water heat pump that draws heat from the LTHW circuit. The part-load profile was obtained from the manufacturer and was used in the energy estimate.

Table 5—10 water source heat pump part load profile

Load (%)	100	90	80	70	60	50	40	30	20	10
COP (kW/kW)	4.74	4.74	4.74	4.73	4.73	4.72	4.61	4.42	4.10	3.36

The following components were included in the model

Table 5—11 DHW system assumptions

DHW	Units	Main Building
Fuel		Electricity
Generator		Heat pump delivering water at 70oC from the LTHW circuit at 45oC
Storage Capacity	Litres	900
Storage loss factor	kWh/l/day	3.7
Secondary circulation pipe losses	W/m	8
Secondary circulation pipe length	m	50

Pump power consumption was calculated outside of the model based on the predicted hourly DHW demand from the model.

D.8 Mechanical Ventilation

The AHU operating assumptions used in the model are detailed below.

Table 5—12 AHU operational assumptions

AHU		Maximum Duty (m3/s)	Max. Demand in Normal Mode (kW)	Weekday on	Weekday Off	Saturday On	Saturday Off
AHU/B1/01	Supply	3.1	2.7	08:30	22:00	10:00	20:00
	Extract	3.1	2.38	08:30	22:00	10:00	20:00
AHU/B1/02	Supply	2.3	2.13	08:30	22:00		
	Extract	2.3	1.62	08:30	22:00		
AHU/B1/03	Supply	6.5	6.12	08:30	22:00		
	Extract	6.5	4.72	08:30	22:00		
AHU/00/01	Supply	6.5	6.12	08:30	22:00	10:00	20:00
	Extract	6.5	4.72	08:30	22:00	10:00	20:00
AHU/03/01	Supply	6.5	6.12	08:30	22:00	10:00	20:00
	Extract	6.5	4.72	08:30	22:00	10:00	20:00
AHU/L3/02	Supply	5.4	4.74	08:30	22:00		
	Extract	5.4	3.93	08:30	22:00		
AHU/L3/03	Supply	0.9	1.61	08:30	18:00		
	Extract	0.9	1.27	08:30	18:00		
AHU/L3/04	Supply	0.9	1.61	08:30	18:00		
	Extract	0.9	1.27	08:30	18:00		
AHU/L3/05	Supply	0.9	1.61	08:30	18:00	10:00	20:00
	Extract	0.9	1.27	08:30	18:00	10:00	20:00
AHU/L3/06	Supply	0.56	0.5	08:30	18:00	10:00	20:00
	Extract	0.8	0.72	08:30	18:00	10:00	20:00
HRU/B1/01	Supply	0.5	0.45	08:30	22:00		
	Extract	0.5	0.45	08:30	22:00		
HRU/L0/01	Supply	0.56	0.5	08:30	22:00	10:00	20:00
	Extract	0.8	0.72	08:30	22:00	10:00	20:00
HRU/L0/02	Supply	0.5	0.45	08:30	18:00		
	Extract	0.5	0.45	08:30	18:00		
HRU/L0/03	Supply	0.56	0.5	08:30	18:00		
	Extract	0.8	0.72	08:30	18:00		
HRU/L1/01	Supply	0.5	0.45	08:30	22:00	10:00	20:00
	Extract	0.5	0.45	08:30	22:00	10:00	20:00
HRU/L3/01	Supply	0.56	0.5	08:30	22:00		
	Extract	0.8	0.72	08:30	22:00		
HRU/L3/01	Supply	0.5	0.45	08:30	22:00		
	Extract	0.5	0.45	08:30	22:00		

In addition, energy consumption of fans not specifically modelled were included in the estimate.

Table 5—13 Miscellaneous system fan assumptions

Fan reference	System	Air Volume (l/s)	Motor size (W)	Max SFP (W/l/s)	Energy consumption (W)	Annual run hours	Annual Energy (kWh)
EF.00.01	Waste Store	No information					Excluded

D.9 Pumps

For the calculation of pumping energy, a pump power density of 1.8W/m2 has been allowed. The power density will need to be specifically calculated at RIBA Stage 4

D.10 Vertical transportation

The vertical transportation strategy includes 3 Passenger lifts installed in the building. The lift cycle reference energy has been assumed as category 3. The Lift energy has been calculated using CIBSE guide D and ISO 25745-2 (2015) and based on the manufacturer data as below:

Table 5—14 Lift energy consumption data

	Annex	Civic 1	Civic 2	Total
Number of Lifts	1	1	1	3
Usage Category	3	3	3	
Lift Type	Traction	Traction	Traction	
Rated Load	1250	1250	1250	
Rated Speed	1.6	1.6	1.6	
Travel distance	12.5	14	14	
Number of Floors	4	5	5	
Counterbalancing	50%	50%	50%	
Acceleration	0.6	0.6	0.6	
Jerk	1.4	1.4	1.4	
Door operation time	8	8	8	
short cycle one way travel distance	8	10	10	
Idle mode power	180	180	180	
standby power after 5 mins	160	160	160	
standby power after 30 mins	100	100	100	
operating days per year	365	365	365	
Reference cycle running energy consumption	15	15	15	
Short Cycle running energy consumption	10	10	10	
Trips per day	300	300	300	
Average travel distance	6.1	6.9	6.9	
Average running energy per metre	0.6	0.6	0.6	
Lookup for fraction of travel distance	4	4	4	
Start Stop Energy Consumption	0.556	-1.250	-1.250	
Running energy average cycle with empty car	7.92	6.08	6.08	
Daily running energy	1,100	844	844	
Load factor	0.93	0.93	0.93	
Average Car Load (% of rated load)	4.5	4.5	4.5	
running time per day	1.24	1.28	1.28	
time to travel average distance	14.923	15.383	15.383	
non running time per day	22.76	22.72	22.72	
Idle	36	36	36	
5 min standby	31	31	31	
30 min standby	33	33	33	

	Annex	Civic 1	Civic 2	Total
Daily non running energy consumption	3,354	3,349	3,349	
Total energy consumption per day	4,454	4,193	4,193	
Total energy consumption per year	1,625,766	1,530,317	1,530,317	
Performance level for running	0.48	0.33	0.33	
Specific running energy for reference cycle	0.48	0.43	0.43	
Energy Efficiency Class	C	C	C	
Running Performance Level	1	1	1	
Idle/Standby Efficiency Level	3	3	3	
Total lift power consumption (kWh/year)	1,626	1,530	1,530	4,686

D.11 External Lighting

Electricity used from the façade external lighting has been excluded.

D.12 Solar photovoltaic panels (PV)

PV panels have been incorporated into the model in accordance with the PV system specification.

Table 5—15 PV generation

Month	Annexe Generation (MWh)	Civic Building Generation (MWh)	Exported (MWh)
January	-1.4119	-1.2362	
February	-2.8295	-1.8974	
March	-5.008	-3.7458	
April	-7.3351	-5.2292	
May	-9.1727	-6.8461	
June	-10.2297	-7.8094	
July	-9.3769	-7.5375	
August	-8.9217	-6.5223	
September	-6.4828	-4.6443	
October	-3.7768	-2.8162	
November	-1.9747	-1.3657	
December	-1.3748	-0.9691	
Total	-67.8946	-50.6192	None assumed to be exported

Appendix E Detailed results

E.1 End use categories

The end use categories of building energy consumption are described below.

Table 5—16 Energy end use category definitions

End Use	Description
Hot Water Production	Electrical energy consumption of heat pumps generating ULTHW water to serve radiators, door curtains, underfloor heating, and AHU and FCU cooling coils
Chilled Water Production	Electrical energy consumption of heat pumps generating CHW to serve AHU and FCU cooling coils
Packaged AC (split or VRF)	Ground floor security room VRF heating and cooling, Comms room split cooling
HVAC Fans (FCU)	
HVAC Fans (Landlords)	Office AHU fans
HVAC Pumps	This includes the LTHW and CHW primary and secondary pumps as well as DHW primary and secondary pumps, MCW boosters, and irrigation pumps
Common Area Lighting (exclude car parks)	Lighting energy consumption of landlords and shared spaces
Common Area Power	Power consumption covering all landlord areas including Comms, BMS, Fire alarms and other landlord systems
Tenants Lighting	Lighting energy consumption within the office tenant areas
Tenants Power	Power consumption of tenants equipment
Lifts (excluding lift motor room ventilation and cooling)	This includes all 6 lifts serving the building
Miscellaneous Ventilation (fans to unconditioned spaces)	Miscellaneous landlords ventilation and extract systems including refuse store
Domestic Hot Water (heating, trace heating, and pumping)	The energy consumption of the DHW system to generate the DHW and covers losses associated with the DHW cylinders and secondary circulation pipework
On site PV Generation	The electricity generated by the roof mounted PV system
Other	This includes electricity from miscellaneous unidentified sources that have not been broken out by end use. Examples are water booster pumps, BMS system power consumption etc.

E.2 Energy consumption breakdown

Energy consumption breakdown for each model is summarised below.

Table 5—17 Summary of energy consumption breakdown by end use

Energy End Use (kWh/m2)	Whole Building	Annexe	Civic Building
ASHP Heating	5.3	10.2	0.0
ASHP/WSHP Heating	16.9	0.0	35.3
WSHP DHW	1.1	2.2	0.0
POU DHW	3.9	3.3	4.5
ASHP Cooling	5.2	3.5	7.0
AHU Fans	16.1	4.9	28.3
Terminal Fans	3.1	3.1	3.1
HVAC Pumps	10.7	11.2	10.1
Lighting	14.0	11.7	16.4
Small Power	26.0	22.8	29.4
Landlords Comms	9.9	11.3	8.4
Lifts	0.5	0.3	0.6
Other	11.3	8.4	14.3
25% Margin	31.0	23.2	39.3
On site Generation (PV)	-11.8	-13.0	-10.6
Total	142.9	103.1	186.1
Target	154.7	90.0	225.0

Appendix F BRUKL Documents

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Haringey Civic Centre New Annex Lean

As designed

Date: Thu Mar 09 14:16:53 2023

Administrative information

Building Details

Address: 255 High Road, London, N22 8LE

Certifier details

Name: Imogen Snell

Telephone number:

Address: , ,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.19

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.19

BRUKL compliance module version: v6.1.e.0

Foundation area [m²]: 1329.43

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	4.76	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	4.14	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	52.23	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	45.53	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.15	0.15	00000023:Surf[0]
Floors	0.18	0.1	0.1	00000004:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.11	0.11	02000027:Surf[1]
Windows** and roof windows	1.6	1.21	1.21	00000018:Surf[0]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.06	1.06	00000048:Surf[0]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

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

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

* 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. *** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
$m^3/(h.m^2)$ at 50 Pa	8	2.5

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

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- A6_FCUs

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	2.64	5.2	0	1.3	0.8
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

2- A1_Heating single pipe rads

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	2.64	-	0.2	-	-
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					NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

1- AX_DHW Building

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	1	0.013
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	**System type in the Approved Documents**
A	Local supply or extract ventilation units
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 balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter

NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

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	2.3	2	0.5	0.5	0.4	1	**Zone**	**Standard**
00 - Meeting Room 01	-	-	-	-	-	-	-	0.2	-	-	N/A
00 - Meeting Room 02	-	-	-	-	-	-	-	0.2	-	-	N/A
02 - meeting room 04	-	-	-	-	-	-	-	0.2	-	-	N/A
02 - meeting room 05	-	-	-	-	-	-	-	0.2	-	-	N/A
02 - Office perimeter E01	-	-	-	-	-	-	-	0.2	-	-	N/A
02 - Office perimeter N01	-	-	-	-	-	-	-	0.2	-	-	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	2.3	2	0.5	0.5	0.4	1	Zone	Standard
00 - Draft Lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - meeting room	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - meeting room	-	-	-	-	-	-	-	0.2	-	-	N/A
00 - Office perimeter E01	-	-	-	-	-	-	-	0.2	-	-	N/A
00 - Office perimeter E02	-	-	-	-	-	-	-	0.2	-	-	N/A
00 - Office peirmeter E03	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Office perimeter E01	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Office perimeter N01	-	-	-	-	-	-	-	0.2	-	-	N/A
00 - Meeting Room 03	-	-	-	-	-	-	-	0.2	-	-	N/A
00 - Office 01	-	-	-	-	-	-	-	0.2	-	-	N/A
00 - Meeting Room Wing W01	-	-	-	-	-	-	-	0.2	-	-	N/A
00 - Meeting Room Wing.01	-	-	-	-	-	-	-	0.2	-	-	N/A
00 - Office Perimeter S01	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Meeting Room Wing 01	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Meeting Room Wing 02	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Meeting Room Wing 03	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Meeting Room Wing 04	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Meeting Room Wing 05	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Meeting Room Wing 06	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Meeting Room Wing 07	-	-	-	-	-	-	-	0.2	-	-	N/A
00 - Office Wing	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Meeting Room 01	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Meeting Room 02	-	-	-	-	-	-	-	0.2	-	-	N/A
01- Office perimeter W01	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Office Central 02	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Meeting Room Wing 08	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Office perimeter S01	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Office perimeter S02	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Office Central 01	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Study Room 01	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Booth 01	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Booth 02	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Study Room 02	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Furniture Storage	-	-	-	-	-	-	-	0.2	-	-	N/A
00 - Circulation Wing Perimeter E01	-	-	-	-	-	-	-	0.2	-	-	N/A
00 - IT/tech store	-	-	-	-	-	-	-	0.2	-	-	N/A
00 - Office perimeter N01	-	-	-	-	-	-	-	0.2	-	-	N/A
02 - Booth 02	-	-	-	-	-	-	-	0.2	-	-	N/A
02 - Study Room 02	-	-	-	-	-	-	-	0.2	-	-	N/A
02 - Study Room 01	-	-	-	-	-	-	-	0.2	-	-	N/A
02 - Booth 01	-	-	-	-	-	-	-	0.2	-	-	N/A
02 - Office perimeter W01	-	-	-	-	-	-	-	0.2	-	-	N/A
02 - Office perimeter S01	-	-	-	-	-	-	-	0.2	-	-	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	2.3	2	0.5	0.5	0.4	1	Zone	Standard
02 - meeting room 01	-	-	-	-	-	-	-	0.2	-	-	N/A
02 - meeting room 02	-	-	-	-	-	-	-	0.2	-	-	N/A
02 - Office central 01	-	-	-	-	-	-	-	0.2	-	-	N/A
02 - Office central 02	-	-	-	-	-	-	-	0.2	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
00 - Meeting Room 01	NO
00 - Meeting Room 02	NO
00 - Protected Lobby 02	NO
00 - Stairs 01	NO
00 - Showers 01	NO
00 - Showers 02	NO
00 - Showers 03	NO
00 - Showers 04	NO
00 - Showers 05	NO
00 - Break water tank	NO
00 - Refuse Store	NO
00 - Lobby	NO
00 - Acc. Showers	NO
00 - Protected Lobby 01	NO
00 - protected lobby	NO
02 - Comms Room	NO
02 - stairs 01	NO
02 - toilet 01	NO
02 - toilet 02	NO
02 - toilet 03	NO
02 - toilet 04	NO
02 - toilet 05	NO
02 - toilet 06	NO
02 - toilet 07	NO
02 - WC lobby 01	NO
02 - toilet 08	NO
02 - toilet 09	NO
02 - toilet 10	NO
02 - toilet 11	NO
02 - toilet 12	NO
02 - store	NO
02 - stairs 02	NO
02 - meeting room 04	NO
02 - meeting room 05	NO
02 - protected lobby 01	NO
02 - protected lobby 02	NO
02 - Office perimeter E01	NO
02 - Office perimeter N01	NO

Shell and core configuration

Zone	Assumed shell?
00 - Toilet 13	NO
00 - Toilet 12	NO
00 - Toilet 11	NO
00 - Toilet 10	NO
00 - Toilet 09	NO
00 - WC 01	NO
00 - Circulation 01	NO
00 - WC 02	NO
00 - WC 03	NO
00 - WC 04	NO
00 - Stairs 02	NO
00 - Circulation 02	NO
00 - protected lobby	NO
00 - LV room	NO
00 - FM room	NO
00 - Comms Room	NO
00 - Protected Lobby 03	NO
00 - Draft Lobby	NO
01 - comms room	NO
01 - stairs	NO
01 - protected lobby	NO
01 - meeting room	NO
01 - meeting room	NO
01 - protected lobby	NO
01 - cupboard	NO
01 - WC	NO
01 - WC	NO
01 - WC	NO
01 - WC	NO
01 - WC	NO
01 - WC	NO
01 - WC	NO
01 - WC	NO
01 - WC	NO
01 - WC	NO
01 - WC	NO
01 - WC	NO
01 - cupboard	NO
01 - WC Circulation	NO
01 - stairs	NO
03 - plant	NO
03 - escape stair	NO
03 - protected lobby	NO
00 - Office perimeter E01	NO
00 - Office perimeter E02	NO
00 - Office peirmeter E03	NO
00 - Circulation 03	NO
00 - WC lobby 02	NO

Shell and core configuration

Zone	Assumed shell?
01 - Office perimeter E01	NO
01 - Office perimeter N01	NO
00 - Postroom (Security desk)	NO
00 - protected lobby	NO
00 - Acc. WC	NO
00 - Meeting Room 03	NO
00 - Changing Room	NO
00 - Office 01	NO
00 - Drying Space	NO
00 - Showers 06	NO
00 - Showers 07	NO
00 - Showers 08	NO
00 - Storage	NO
00 - Hot Water Tank	NO
00 - Meeting Room Wing W01	NO
00 - Meeting Room Wing.01	NO
00 - Office Perimeter S01	NO
01 - Meeting Room Wing 01	NO
01 - Meeting Room Wing 02	NO
01 - Meeting Room Wing 03	NO
01 - Meeting Room Wing 04	NO
01 - Meeting Room Wing 05	NO
01 - Meeting Room Wing 06	NO
01 - Meeting Room Wing 07	NO
01 - Circulation Bridge	NO
00 - Office Wing	NO
00 - Study Room	NO
00 - Plant Space	NO
01 - Meeting Room 01	NO
01 - Meeting Room 02	NO
01- Office perimeter W01	NO
01 - Office Central 02	NO
01 - Meeting Room Wing 08	NO
01 - Circulation Wing Perimeter E01	NO
01 - Office perimeter S01	NO
01 - Office perimeter S02	NO
01 - Office Central 01	NO
01 - Study Room 01	NO
01 - Booth 01	NO
01 - Booth 02	NO
01 - Study Room 02	NO
01 - Furniture Storage	NO
00 - Circulation Wing Perimeter E01	NO
00 - IT/tech store	NO
00 - Office perimeter N01	NO
02 - Booth 02	NO
02 - Study Room 02	NO

Shell and core configuration

Zone	Assumed shell?
02 - Study Room 01	NO
02 - Booth 01	NO
02 - Office perimeter W01	NO
02 - Office perimeter S01	NO
02 - meeting room 01	NO
02 - meeting room 02	NO
02 - Office central 01	NO
02 - Office central 02	NO

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
00 - Meeting Room 01	130	-	-
00 - Meeting Room 02	130	-	-
00 - Protected Lobby 02	120	-	-
00 - Stairs 01	150	-	-
00 - Showers 01	137	-	-
00 - Showers 02	137	-	-
00 - Showers 03	137	-	-
00 - Showers 04	137	-	-
00 - Showers 05	137	-	-
00 - Break water tank	156	-	-
00 - Refuse Store	150	-	-
00 - Lobby	120	-	-
00 - Acc. Showers	120	-	-
00 - Protected Lobby 01	120	-	-
00 - protected lobby	120	-	-
02 - Comms Room	156	-	-
02 - stairs 01	150	-	-
02 - toilet 01	137	-	-
02 - toilet 02	137	-	-
02 - toilet 03	137	-	-
02 - toilet 04	137	-	-
02 - toilet 05	137	-	-
02 - toilet 06	137	-	-
02 - toilet 07	137	-	-
02 - WC lobby 01	120	-	-
02 - toilet 08	137	-	-
02 - toilet 09	137	-	-
02 - toilet 10	137	-	-
02 - toilet 11	137	-	-
02 - toilet 12	137	-	-
02 - store	150	-	-
02 - stairs 02	150	-	-
02 - meeting room 04	130	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
02 - meeting room 05	130	-	-
02 - protected lobby 01	120	-	-
02 - protected lobby 02	120	-	-
02 - Office perimeter E01	130	-	-
02 - Office perimeter N01	130	-	-
00 - Toilet 13	137	-	-
00 - Toilet 12	137	-	-
00 - Toilet 11	137	-	-
00 - Toilet 10	137	-	-
00 - Toilet 09	137	-	-
00 - WC 01	137	-	-
00 - Circulation 01	120	-	-
00 - WC 02	137	-	-
00 - WC 03	137	-	-
00 - WC 04	137	-	-
00 - Stairs 02	150	-	-
00 - Circulation 02	150	-	-
00 - protected lobby	120	-	-
00 - LV room	156	-	-
00 - FM room	130	-	-
00 - Comms Room	156	-	-
00 - Protected Lobby 03	120	-	-
00 - Draft Lobby	120	-	-
01 - comms room	156	-	-
01 - stairs	150	-	-
01 - protected lobby	120	-	-
01 - meeting room	130	-	-
01 - meeting room	130	-	-
01 - protected lobby	120	-	-
01 - cupboard	130	-	-
01 - WC	137	-	-
01 - WC	137	-	-
01 - WC	137	-	-
01 - WC	137	-	-
01 - WC	137	-	-
01 - WC	137	-	-
01 - WC	137	-	-
01 - WC	137	-	-
01 - WC	137	-	-
01 - WC	137	-	-
01 - WC	137	-	-
01 - cupboard	130	-	-
01 - WC Circulation	150	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
01 - stairs	150	-	-
03 - plant	156	-	-
03 - escape stair	150	-	-
03 - protected lobby	120	-	-
00 - Office perimeter E01	130	-	-
00 - Office perimeter E02	130	-	-
00 - Office peirmeter E03	130	-	-
00 - Circulation 03	120	-	-
00 - WC lobby 02	120	-	-
01 - Office perimeter E01	130	-	-
01 - Office perimeter N01	130	-	-
00 - Postroom (Security desk)	130	-	-
00 - protected lobby	120	-	-
00 - Acc. WC	137	-	-
00 - Meeting Room 03	130	-	-
00 - Changing Room	120	-	-
00 - Office 01	130	-	-
00 - Drying Space	130	-	-
00 - Showers 06	120	-	-
00 - Showers 07	120	-	-
00 - Showers 08	120	-	-
00 - Storage	130	-	-
00 - Hot Water Tank	156	-	-
00 - Meeting Room Wing W01	130	-	-
00 - Meeting Room Wing.01	130	-	-
00 - Office Perimeter S01	130	-	-
01 - Meeting Room Wing 01	130	-	-
01 - Meeting Room Wing 02	130	-	-
01 - Meeting Room Wing 03	130	-	-
01 - Meeting Room Wing 04	130	-	-
01 - Meeting Room Wing 05	130	-	-
01 - Meeting Room Wing 06	130	-	-
01 - Meeting Room Wing 07	130	-	-
01 - Circulation Bridge	120	-	-
00 - Office Wing	130	-	-
00 - Study Room	130	-	-
00 - Plant Space	156	-	-
01 - Meeting Room 01	130	-	-
01 - Meeting Room 02	130	-	-
01- Office perimeter W01	130	-	-
01 - Office Central 02	130	-	-
01 - Meeting Room Wing 08	130	-	-
01 - Circulation Wing Perimeter E01	120	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
01 - Office perimeter S01	130	-	-
01 - Office perimeter S02	130	-	-
01 - Office Central 01	130	-	-
01 - Study Room 01	130	-	-
01 - Booth 01	130	-	-
01 - Booth 02	130	-	-
01 - Study Room 02	130	-	-
01 - Furniture Storage	130	-	-
00 - Circulation Wing Perimeter E01	120	-	-
00 - IT/tech store	130	-	-
00 - Office perimeter N01	130	-	-
02 - Booth 02	130	-	-
02 - Study Room 02	130	-	-
02 - Study Room 01	130	-	-
02 - Booth 01	130	-	-
02 - Office perimeter W01	130	-	-
02 - Office perimeter S01	130	-	-
02 - meeting room 01	130	-	-
02 - meeting room 02	130	-	-
02 - Office central 01	130	-	-
02 - Office central 02	130	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00 - Meeting Room 01	N/A	N/A
00 - Meeting Room 02	N/A	N/A
02 - meeting room 04	N/A	N/A
02 - meeting room 05	N/A	N/A
02 - Office perimeter E01	NO (-65%)	NO
02 - Office perimeter N01	NO (-66.8%)	NO
00 - FM room	N/A	N/A
00 - Draft Lobby	NO (-57.7%)	NO
01 - meeting room	N/A	N/A
01 - meeting room	N/A	N/A
00 - Office perimeter E01	NO (-79.7%)	NO
00 - Office perimeter E02	NO (-83.2%)	NO
00 - Office peirmeter E03	NO (-43.7%)	NO
01 - Office perimeter E01	NO (-65.6%)	NO
01 - Office perimeter N01	NO (-74%)	NO
00 - Meeting Room 03	N/A	N/A
00 - Office 01	NO (-80.3%)	NO
00 - Meeting Room Wing W01	NO (-75.3%)	NO
00 - Meeting Room Wing.01	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00 - Office Perimeter S01	NO (-32.2%)	NO
01 - Meeting Room Wing 01	NO (-95.5%)	NO
01 - Meeting Room Wing 02	NO (-95.4%)	NO
01 - Meeting Room Wing 03	NO (-96.4%)	NO
01 - Meeting Room Wing 04	NO (-95.3%)	NO
01 - Meeting Room Wing 05	NO (-95.4%)	NO
01 - Meeting Room Wing 06	NO (-96.4%)	NO
01 - Meeting Room Wing 07	NO (-96.4%)	NO
00 - Office Wing	NO (-54%)	NO
01 - Meeting Room 01	NO (-42.8%)	NO
01 - Meeting Room 02	NO (-42%)	NO
01- Office perimeter W01	NO (-37.8%)	NO
01 - Office Central 02	NO (-82.4%)	NO
01 - Meeting Room Wing 08	N/A	N/A
01 - Office perimeter S01	NO (-79%)	NO
01 - Office perimeter S02	NO (-52.9%)	NO
01 - Office Central 01	NO (-85.6%)	NO
01 - Study Room 01	N/A	N/A
01 - Booth 01	N/A	N/A
01 - Booth 02	N/A	N/A
01 - Study Room 02	N/A	N/A
01 - Furniture Storage	N/A	N/A
00 - Circulation Wing Perimeter E01	NO (-61.6%)	NO
00 - IT/tech store	NO (-40.6%)	NO
00 - Office perimeter N01	NO (-59.1%)	NO
02 - Booth 02	N/A	N/A
02 - Study Room 02	N/A	N/A
02 - Study Room 01	N/A	N/A
02 - Booth 01	N/A	N/A
02 - Office perimeter W01	NO (-48.8%)	NO
02 - Office perimeter S01	NO (-60.9%)	NO
02 - meeting room 01	N/A	N/A
02 - meeting room 02	N/A	N/A
02 - Office central 01	NO (-67.4%)	NO
02 - Office central 02	NO (-80.1%)	NO

Regulation 25A: Consideration of high efficiency 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?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m²]	5207	5207
External area [m²]	6524.5	6524.5
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	1646.29	2027.59
Average U-value [W/m²K]	0.25	0.31
Alpha value* [%]	25.46	10

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
100	**Offices and Workshop Businesses**
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	1.74	1.3
Cooling	5.85	5.48
Auxiliary	6.72	8.71
Lighting	10.09	15.14
Hot water	6.61	4.89
Equipment*	52.56	52.56
TOTAL**	**31**	**35.53**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	97.4	104.44
Primary energy [kWh_{PE}/m²]	45.53	52.23
Total emissions [kg/m²]	4.14	4.76

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	74.2	0	8.8	0	0.7	2.36	0	2.64	0
	Notional	49.9	0	5	0	0.6	2.78	0	----	----
[ST] Fan coil systems, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	15.2	114.9	1.9	8.1	7.8	2.21	3.96	2.64	5.2
	Notional	15.2	126	1.5	7.6	10.5	2.78	4.63	----	----
[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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Haringey Civic Centre New Annex Clean

As designed

Date: Thu Mar 09 14:35:21 2023

Administrative information

Building Details

Address: 255 High Road, London, N22 8LE

Certifier details

Name: Imogen Snell

Telephone number:

Address: , ,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.19

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.19

BRUKL compliance module version: v6.1.e.0

Foundation area [m²]: 1329.43

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	4.76	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	4.14	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	52.23	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	45.53	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.15	0.15	00000023:Surf[0]
Floors	0.18	0.1	0.1	00000004:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.11	0.11	02000027:Surf[1]
Windows** and roof windows	1.6	1.21	1.21	00000018:Surf[0]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.06	1.06	00000048:Surf[0]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

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

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

* 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. *** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
$m^3/(h.m^2)$ at 50 Pa	8	2.5

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

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- A6_FCUs

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	2.64	5.2	0	1.3	0.8
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

2- A1_Heating single pipe rads

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	2.64	-	0.2	-	-
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					NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

1- AX_DHW Building

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	1	0.013
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	**System type in the Approved Documents**
A	Local supply or extract ventilation units
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 balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter

NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

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	2.3	2	0.5	0.5	0.4	1	**Zone**	**Standard**
00 - Meeting Room 01	-	-	-	-	-	-	-	0.2	-	-	N/A
00 - Meeting Room 02	-	-	-	-	-	-	-	0.2	-	-	N/A
02 - meeting room 04	-	-	-	-	-	-	-	0.2	-	-	N/A
02 - meeting room 05	-	-	-	-	-	-	-	0.2	-	-	N/A
02 - Office perimeter E01	-	-	-	-	-	-	-	0.2	-	-	N/A
02 - Office perimeter N01	-	-	-	-	-	-	-	0.2	-	-	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	2.3	2	0.5	0.5	0.4	1	Zone	Standard
00 - Draft Lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - meeting room	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - meeting room	-	-	-	-	-	-	-	0.2	-	-	N/A
00 - Office perimeter E01	-	-	-	-	-	-	-	0.2	-	-	N/A
00 - Office perimeter E02	-	-	-	-	-	-	-	0.2	-	-	N/A
00 - Office peirmeter E03	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Office perimeter E01	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Office perimeter N01	-	-	-	-	-	-	-	0.2	-	-	N/A
00 - Meeting Room 03	-	-	-	-	-	-	-	0.2	-	-	N/A
00 - Office 01	-	-	-	-	-	-	-	0.2	-	-	N/A
00 - Meeting Room Wing W01	-	-	-	-	-	-	-	0.2	-	-	N/A
00 - Meeting Room Wing.01	-	-	-	-	-	-	-	0.2	-	-	N/A
00 - Office Perimeter S01	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Meeting Room Wing 01	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Meeting Room Wing 02	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Meeting Room Wing 03	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Meeting Room Wing 04	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Meeting Room Wing 05	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Meeting Room Wing 06	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Meeting Room Wing 07	-	-	-	-	-	-	-	0.2	-	-	N/A
00 - Office Wing	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Meeting Room 01	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Meeting Room 02	-	-	-	-	-	-	-	0.2	-	-	N/A
01- Office perimeter W01	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Office Central 02	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Meeting Room Wing 08	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Office perimeter S01	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Office perimeter S02	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Office Central 01	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Study Room 01	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Booth 01	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Booth 02	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Study Room 02	-	-	-	-	-	-	-	0.2	-	-	N/A
01 - Furniture Storage	-	-	-	-	-	-	-	0.2	-	-	N/A
00 - Circulation Wing Perimeter E01	-	-	-	-	-	-	-	0.2	-	-	N/A
00 - IT/tech store	-	-	-	-	-	-	-	0.2	-	-	N/A
00 - Office perimeter N01	-	-	-	-	-	-	-	0.2	-	-	N/A
02 - Booth 02	-	-	-	-	-	-	-	0.2	-	-	N/A
02 - Study Room 02	-	-	-	-	-	-	-	0.2	-	-	N/A
02 - Study Room 01	-	-	-	-	-	-	-	0.2	-	-	N/A
02 - Booth 01	-	-	-	-	-	-	-	0.2	-	-	N/A
02 - Office perimeter W01	-	-	-	-	-	-	-	0.2	-	-	N/A
02 - Office perimeter S01	-	-	-	-	-	-	-	0.2	-	-	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	2.3	2	0.5	0.5	0.4	1	Zone	Standard
02 - meeting room 01	-	-	-	-	-	-	-	0.2	-	-	N/A
02 - meeting room 02	-	-	-	-	-	-	-	0.2	-	-	N/A
02 - Office central 01	-	-	-	-	-	-	-	0.2	-	-	N/A
02 - Office central 02	-	-	-	-	-	-	-	0.2	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
00 - Meeting Room 01	NO
00 - Meeting Room 02	NO
00 - Protected Lobby 02	NO
00 - Stairs 01	NO
00 - Showers 01	NO
00 - Showers 02	NO
00 - Showers 03	NO
00 - Showers 04	NO
00 - Showers 05	NO
00 - Break water tank	NO
00 - Refuse Store	NO
00 - Lobby	NO
00 - Acc. Showers	NO
00 - Protected Lobby 01	NO
00 - protected lobby	NO
02 - Comms Room	NO
02 - stairs 01	NO
02 - toilet 01	NO
02 - toilet 02	NO
02 - toilet 03	NO
02 - toilet 04	NO
02 - toilet 05	NO
02 - toilet 06	NO
02 - toilet 07	NO
02 - WC lobby 01	NO
02 - toilet 08	NO
02 - toilet 09	NO
02 - toilet 10	NO
02 - toilet 11	NO
02 - toilet 12	NO
02 - store	NO
02 - stairs 02	NO
02 - meeting room 04	NO
02 - meeting room 05	NO
02 - protected lobby 01	NO
02 - protected lobby 02	NO
02 - Office perimeter E01	NO
02 - Office perimeter N01	NO

Shell and core configuration

Zone	Assumed shell?
00 - Toilet 13	NO
00 - Toilet 12	NO
00 - Toilet 11	NO
00 - Toilet 10	NO
00 - Toilet 09	NO
00 - WC 01	NO
00 - Circulation 01	NO
00 - WC 02	NO
00 - WC 03	NO
00 - WC 04	NO
00 - Stairs 02	NO
00 - Circulation 02	NO
00 - protected lobby	NO
00 - LV room	NO
00 - FM room	NO
00 - Comms Room	NO
00 - Protected Lobby 03	NO
00 - Draft Lobby	NO
01 - comms room	NO
01 - stairs	NO
01 - protected lobby	NO
01 - meeting room	NO
01 - meeting room	NO
01 - protected lobby	NO
01 - cupboard	NO
01 - WC	NO
01 - WC	NO
01 - WC	NO
01 - WC	NO
01 - WC	NO
01 - WC	NO
01 - WC	NO
01 - WC	NO
01 - WC	NO
01 - WC	NO
01 - WC	NO
01 - WC	NO
01 - cupboard	NO
01 - WC Circulation	NO
01 - stairs	NO
03 - plant	NO
03 - escape stair	NO
03 - protected lobby	NO
00 - Office perimeter E01	NO
00 - Office perimeter E02	NO
00 - Office peirmeter E03	NO
00 - Circulation 03	NO
00 - WC lobby 02	NO

Shell and core configuration

Zone	Assumed shell?
01 - Office perimeter E01	NO
01 - Office perimeter N01	NO
00 - Postroom (Security desk)	NO
00 - protected lobby	NO
00 - Acc. WC	NO
00 - Meeting Room 03	NO
00 - Changing Room	NO
00 - Office 01	NO
00 - Drying Space	NO
00 - Showers 06	NO
00 - Showers 07	NO
00 - Showers 08	NO
00 - Storage	NO
00 - Hot Water Tank	NO
00 - Meeting Room Wing W01	NO
00 - Meeting Room Wing.01	NO
00 - Office Perimeter S01	NO
01 - Meeting Room Wing 01	NO
01 - Meeting Room Wing 02	NO
01 - Meeting Room Wing 03	NO
01 - Meeting Room Wing 04	NO
01 - Meeting Room Wing 05	NO
01 - Meeting Room Wing 06	NO
01 - Meeting Room Wing 07	NO
01 - Circulation Bridge	NO
00 - Office Wing	NO
00 - Study Room	NO
00 - Plant Space	NO
01 - Meeting Room 01	NO
01 - Meeting Room 02	NO
01- Office perimeter W01	NO
01 - Office Central 02	NO
01 - Meeting Room Wing 08	NO
01 - Circulation Wing Perimeter E01	NO
01 - Office perimeter S01	NO
01 - Office perimeter S02	NO
01 - Office Central 01	NO
01 - Study Room 01	NO
01 - Booth 01	NO
01 - Booth 02	NO
01 - Study Room 02	NO
01 - Furniture Storage	NO
00 - Circulation Wing Perimeter E01	NO
00 - IT/tech store	NO
00 - Office perimeter N01	NO
02 - Booth 02	NO
02 - Study Room 02	NO

Shell and core configuration

Zone	Assumed shell?
02 - Study Room 01	NO
02 - Booth 01	NO
02 - Office perimeter W01	NO
02 - Office perimeter S01	NO
02 - meeting room 01	NO
02 - meeting room 02	NO
02 - Office central 01	NO
02 - Office central 02	NO

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
00 - Meeting Room 01	130	-	-
00 - Meeting Room 02	130	-	-
00 - Protected Lobby 02	120	-	-
00 - Stairs 01	150	-	-
00 - Showers 01	137	-	-
00 - Showers 02	137	-	-
00 - Showers 03	137	-	-
00 - Showers 04	137	-	-
00 - Showers 05	137	-	-
00 - Break water tank	156	-	-
00 - Refuse Store	150	-	-
00 - Lobby	120	-	-
00 - Acc. Showers	120	-	-
00 - Protected Lobby 01	120	-	-
00 - protected lobby	120	-	-
02 - Comms Room	156	-	-
02 - stairs 01	150	-	-
02 - toilet 01	137	-	-
02 - toilet 02	137	-	-
02 - toilet 03	137	-	-
02 - toilet 04	137	-	-
02 - toilet 05	137	-	-
02 - toilet 06	137	-	-
02 - toilet 07	137	-	-
02 - WC lobby 01	120	-	-
02 - toilet 08	137	-	-
02 - toilet 09	137	-	-
02 - toilet 10	137	-	-
02 - toilet 11	137	-	-
02 - toilet 12	137	-	-
02 - store	150	-	-
02 - stairs 02	150	-	-
02 - meeting room 04	130	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
02 - meeting room 05	130	-	-
02 - protected lobby 01	120	-	-
02 - protected lobby 02	120	-	-
02 - Office perimeter E01	130	-	-
02 - Office perimeter N01	130	-	-
00 - Toilet 13	137	-	-
00 - Toilet 12	137	-	-
00 - Toilet 11	137	-	-
00 - Toilet 10	137	-	-
00 - Toilet 09	137	-	-
00 - WC 01	137	-	-
00 - Circulation 01	120	-	-
00 - WC 02	137	-	-
00 - WC 03	137	-	-
00 - WC 04	137	-	-
00 - Stairs 02	150	-	-
00 - Circulation 02	150	-	-
00 - protected lobby	120	-	-
00 - LV room	156	-	-
00 - FM room	130	-	-
00 - Comms Room	156	-	-
00 - Protected Lobby 03	120	-	-
00 - Draft Lobby	120	-	-
01 - comms room	156	-	-
01 - stairs	150	-	-
01 - protected lobby	120	-	-
01 - meeting room	130	-	-
01 - meeting room	130	-	-
01 - protected lobby	120	-	-
01 - cupboard	130	-	-
01 - WC	137	-	-
01 - WC	137	-	-
01 - WC	137	-	-
01 - WC	137	-	-
01 - WC	137	-	-
01 - WC	137	-	-
01 - WC	137	-	-
01 - WC	137	-	-
01 - WC	137	-	-
01 - WC	137	-	-
01 - WC	137	-	-
01 - cupboard	130	-	-
01 - WC Circulation	150	-	-