City Airport Development Programme (CADP1)

Condition 61: Energy Assessment

ATKINS

March 2018

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List of abbreviations

ABBREVIATION	FULL FORM
AD L2A	Approved Document L2A
AD L2B	Approved Document L2B
AHU	Air Handling Unit
CADP1	City Airport Development Programme
CHP	Combined Heat and Power
CO_2	Carbon Dioxide
DHW	Domestic Hot Water
EEC	East Energy Centre
ETE	East Terminal Extension
GLA	Greater London Authority
LCA	London City Airport
NCM	National Calculation Methodology
NEP	New East Pier
NO_x	Nitrogen Oxides
PV	Photovoltaic Panel
SEER	Seasonal Energy Efficiency Ratio
SFP	Specific Fan Power
STC	Standard Test Conditions
TCRF	Taxi and Car Rental Facilities
UES	Updated Environmental Statement
WEC	West Energy Centre
WTE	West Terminal Extension

Executive summary

This assessment has been prepared to satisfy the requirements of Condition 61 of the City Airport Development Programme (CADP1) planning permission (13/01228/FUL).

In order to reduce carbon dioxide emissions to meet the targets as set in CADP1 Condition 61 and to achieve a minimum carbon dioxide emission reduction of 25% below the base line set by Building Regulation Part L 2010, the following measures have been included in the CADP1 design. The proposed measures are consistent with and meet the requirements of Condition 61 and are summarised (in accordance with the London Plan 2011 energy hierarchy) as follows:

"Be Lean"

- Passive reduction of combined space heating and cooling via a highly-insulated, low air leakage envelope;
- Optimised glazing and shading combination to facilitate access to daylight whilst reducing the impact of solar gains.
- Air handling units (AHUs) with a SFP of 1.65 W/l/s and with facility for heat recovery and free cooling with efficient fan motors.
- Centralised, high efficiency, ultra-low NO_x gas fired condensing boilers and air-cooled chillers.
- Luminaire selection to achieve a high efficacy across the buildings together with provision of photoelectric controls in zones with access to daylight and occupancy sensing where appropriate to the use of the space.

"Be Clean"

- A site wide heat network with one CHP led plant (Ener-G E230 or equivalent) with thermal output of 357 $kW_{(th)}$ and an electric output of 229 $kW_{(el)}$, coupled with thermal storage and lag / peak ultra-low NO_x boilers. In addition, there will be space and connectivity provision for a further future CHP unit to serve part of the future hotel energy load.
- Allowance for valved and capped connections in the main LTHW header and space for heat exchangers to provide facility for future connectivity to district heating.

"Be Green"

- Minimum of c. 847m^2 of photovoltaics on the roof of the terminal buildings

Additionally, the CADP1 design aims to reduce the demand for cooling, mitigate the risk of overheating and reduce fuel consumption via energy efficient systems as per adopted "Be Lean" measures. The Building Regulation United Kingdom Part L (BRUKL) reports attached to Appendix A shows details of results of the compliance analysis.

The above energy efficiency measures incorporated in the CADP1 design and included in the Energy Assessment below are sufficient to meet the requirements of Condition 61 relative to the Part L 2010 benchmark in the London Plan 2011. Improvements achieved and benefits include change from a CCHP to a CHP system, consolidation of heating generation and CHP plant in the EEC (thereby removing the need for interim phase heating plant in the WEC), which has resulted in increased thermal efficiency and removed the need for Dock Source Heat Pumps (thereby prioritising CHP), and reduction in PV area to meet the target carbon reduction requirements.

The area of PV proposed is subject to refinement at detailed design & installation stage – the minimum required is circa 847 m^2 however the exact area delivered may differ to ensure flexibility in achieving the required reductions whilst also allowing for flexibility in installation. Therefore an area of between 847m^2 and 1170m^2 is allowed for in this assessment achieving between 25-27.5% carbon emissions overall. This approach is generally consistent with the previously approved Energy Strategy with some updates as outlined in this document.

1. Introduction

Background

1.1. The City Airport Development Programme (CADP1) planning application (13/01228/FUL) was granted planning permission by the Secretaries of State for Communities and Local Government and Transport in July 2016 following an appeal and public inquiry which was held in March/April 2016.

1.2. On 5th January 2017, the London Borough of Newham (LBN) approved some minor non-material design changes to the appearance of the western and southern elevations of the Western Terminal Extension (WTE). A further non-material amendment (17/02865/NONMAT) to the CADP1 permission was approved on 27 September 2017 for minor amendments to the terminal buildings and associated service yard, East Pier, forecourt and decked car park. The approved minor amendments have been incorporated into the details provided to satisfy this condition.

1.3. CADP1 Condition 61 requires that:

a) *No relevant phase of the Development shall commence until an Energy Assessment for that phase has been submitted to and approved in writing by the Local Planning Authority.*
b) *Each relevant Energy Assessment(s) shall demonstrate how a minimum reduction in carbon dioxide emission of 25% over the Target Emission Rate (TER) outlined in the national Building Regulations.*
c) *The relevant Energy Assessment as approved pursuant to (a) above shall be implemented prior to the relevant phase of the Development being brought into use or operation and the recommendations of the approved assessment retained for the duration of the phase.*

Reason: To ensure the development makes the fullest contribution to minimising carbon dioxide emissions in accordance with the Mayor of London's energy hierarchy

1.4. The Airport submitted a Construction Phasing Plan to LBN pursuant to Condition 4 of the CADP1 permission in February 2017. It was proposed to build out CADP1 as a single uninterrupted period of construction over 5 years split into two distinct phases. Consistent with terminology used in the Updated Environmental Statement (UES), the two phases were referred to as the 'Interim Works' and the 'Completed Works' – each delivering different parts of the CADP1 infrastructure. The Interim Works would be delivered first and would be immediately followed by the Completed Works. This Construction Phasing Plan was approved by LBN in March 2017 (ref. 17/00500/AOD) and the details pursuant to Condition 61 for the 'Interim Works' were also approved at the same time (ref.17/00533/AOD) which achieved the necessary reductions of 25%.

1.5. Ahead of the commencement of construction of CADP1, the Airport's Delivery Partner has identified a number of programme efficiencies and improvements to the 5-year build which would reduce the duration of the construction programme by around 1 year and deliver the full CADP1 infrastructure in an accelerated single phase (Accelerated Construction Plan).

1.6. This Energy Assessment has been updated and optimised to reflect the single phase build proposed by the *Accelerated Construction Plan*. The two main improvements over the previously approved assessment are:

- To provide the new Combined Heat and Power (CHP) and boiler heating plant in a single centralised location within the Eastern Energy Centre (EEC). This removes the previous need for an interim CHP and boiler heating plant in the West Energy Centre (WEC) to be commissioned as part of the Interim Works and then decommissioned as part of the Completed Works. It is now proposed that the WEC will instead house electrical, water services and fire protection plant and equipment (see 2.12 below for more details).

- Additionally, the previously planned CCHP unit to serve the terminal will instead be replaced with a more efficient, larger capacity CHP unit, therefore removing the need to build out and operate the dock source heat pumps. This is consistent with the requests of the Greater London Authority (GLA) to prioritise CHP over dockside heat pumps (see 2.17 below).

1.7. The two improvements above require some minor design changes to the WEC and EEC elevations and roofscapes. These have been submitted to LBN under separate cover of a Section 96a application in parallel with this submission. Additionally, a Deed of Variation to the Section 106 Agreement is proposed to reflect the proposal to provide centralised system in the EEC instead of the WEC. Further details of both are provided at 2.15 & 2.16 below.

1.8. This Assessment seeks approval of details pursuant to Condition 61 for the infrastructure delivered by the Accelerated Construction Plan. It should be noted that the WEC and EEC are exempt from the energy efficiency requirements, since they are engineering services plant and equipment centres. However they are both included for completeness due to the mechanical & electrical energy systems proposed as part of the overall energy strategy for the CADP1 development.

1.9. This Assessment provides an update to the previously approved documents:

- the original Energy and Low Carbon Strategy submitted in July 2013 (reference 13/01228/FUL (CADP1),
- the Energy and Low Carbon Strategy Addendum submitted in March 2014,
- the correspondence with the London Borough of Newham (LBN) responding to energy queries, dated 7 July 2014; and
- the Update to the Energy and Low Carbon Strategy submitted in August 2015.

1.10. At the request of LBN Officers, new text added to the previously approved details (17/00533/AOD) has been distinguished in blue text in this document

2. Energy Hierarchy

Introduction

2.1. The following section looks at the various strategies and methods used to ensure the CADP1 development design is compliant with the requirements of Condition 61 and the associated energy hierarchy and carbon targets of London Plan (2011). This will focus on:

- Demand reduction (Be Lean);
- Cooling and Overheating Assessment;
- Centralised Heating infrastructure (Be Clean); and
- Renewable energy (Be Green).

Demand Reduction (Be Lean)

2.2. For all CADP buildings, reduction of energy demand has been achieved by a “fabric first” approach. The passive design measures for the terminal buildings include:

- Passive reduction of space heating and cooling via a highly-insulated envelope (to the building fabric standards summarised in Table 2-1).
- A low air leakage building envelope designed to achieve an air permeability of 5 $m^3/(m^2 \cdot h)$ at 50 Pa.
- The glazing has been specified to facilitate access to daylight whilst reducing the impact of solar gains. The solar and visible light transmittance of the glazing has been optimised in combination with external shading in the form of perforated mesh screens and perforated mesh fins. The glazing ratio for each building is summarised in Table 2-2.

Table 2-2Table 2-1 Fabric performance standards

Element	U value (W/m²·K)	Minimum U value (W/m²·K) AD L2A
External Wall	0.20	0.35
Roof	0.15	0.25
Insulated Ground Floor Slab	0.18	0.25
Exposed Floor - Upper Soffit	0.18	0.25
External Window (typical)	1.2 (inc. frame)	2.2
Glazed pedestrian doors	1.4 (inc. frame)	2.2

Table 2-2 Building glazing ratios[1]

Building	Glazing Ratio (%)
West Terminal Extension	9
East Terminal Extension	46
New East Pier	28

2.3. The energy efficiency measures for heating, ventilation and cooling (HVAC) systems include:

- Air handling units (AHUs) with a Specific Fan Power (SFP) of 1.65 W/l/s, heat recovery to pre-heat air in winter and free cooling facility to reduce energy demand in the summer.
- Centralised, high efficiency, low NO_x gas fired boilers (93% efficiency) as lag /peak heat generators.
- Centralised, high efficiency air cooled chillers with a seasonal efficiency (SEER) of 4.19.

2.4. The energy efficiency measures for lighting systems include:

- An average installed luminaire efficacy of 85 lumens per circuit Watt achieved across the buildings.
- Provision, in zones with access to daylight, for photoelectric controls by which the output of the lighting system will be regulated in response to the daylight level to reduce both the lighting load and the cooling load in summer.
- Provision for occupancy sensing, where appropriate to the use of the space.

2.5. The cumulative impact of the energy demand reduction measures on the regulated emissions savings is detailed in Table 2-3.

Improvements made since the Update to the Energy and Low Carbon Strategy (2015) include better thermal insulation U values for some building elements (roof & glazing) and higher efficiency boilers to further reduce carbon dioxide emissions at this stage.

Table 2-3 Carbon dioxide emissions savings from energy demand reduction ("be lean")

	Regulated non-domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Savings from energy demand reduction	158	10.6

[1] Glazing ratio is defined as the total glazed area divided by the façade area and multiplied by 100.

Cooling and overheating assessment

2.6. The design approach for the CADP1 aims to reduce the demand for cooling, mitigate the risk of overheating and reduce fuel consumption via energy efficient systems. The energy efficiency measures deployed for reduction of cooling energy of the CADP1 building are summarised below. Additionally, a synthetic indicator that allows comparison between the cooling demand of the notional building and the building as designed[2] is included.

Cooling Demand

2.7. The design of the CADP1 buildings incorporate several measures designed to reduce the demand for cooling. Excessive solar gains have been mitigated through enhanced performance of the glazing and external shading elements in the form of perforated mesh screens and perforated mesh fins. At all stages of the mechanical design, energy efficient systems have been used to minimise any additional heat gains from equipment operation. AHUs will have facility to provide free cooling to reduce energy demand in summer. Energy efficient lighting with photoelectric controls and occupancy sensors reduce gains from electrical lighting.

Active Cooling

2.8. The potential for the use of outside air for free cooling in the form of natural ventilation is discounted due to the high occupancy density and the requirement for a sealed building (due to the adverse external air quality and aircraft noise). As such, comfort cooling is proposed to be provided to the extension buildings where required.

2.9. The HVAC Systems Performance table given in the Part L compliance BRUKL report details the cooling demand of the actual and notional buildings[3] as part of the SBEM analysis. The data is summarised in Table 2-4. The buildings as-designed have a lower cooling demand than the notional building.

Table 2-4 Cooling Demand from "Be Green" BRUKL Report

Average building cooling demand (MJ/m^2)	
Actual	94.7
Notional	182.4

Heating infrastructure (Be Clean)

Connection to local low carbon heat distribution network

2.10. The London Borough of Newham (LBN) are actively seeking to expand heat networks in the Borough. However, the expansion is concentrated around the north and west areas of ExCel London energy centre (quadrants 3-5 in Figure 2-1). There is no availability at the present time of a decentralised heat network supply in the proximity of the LCA development and the proposed CADP1 infrastructure (quadrants 19-22 in figure 2-1)

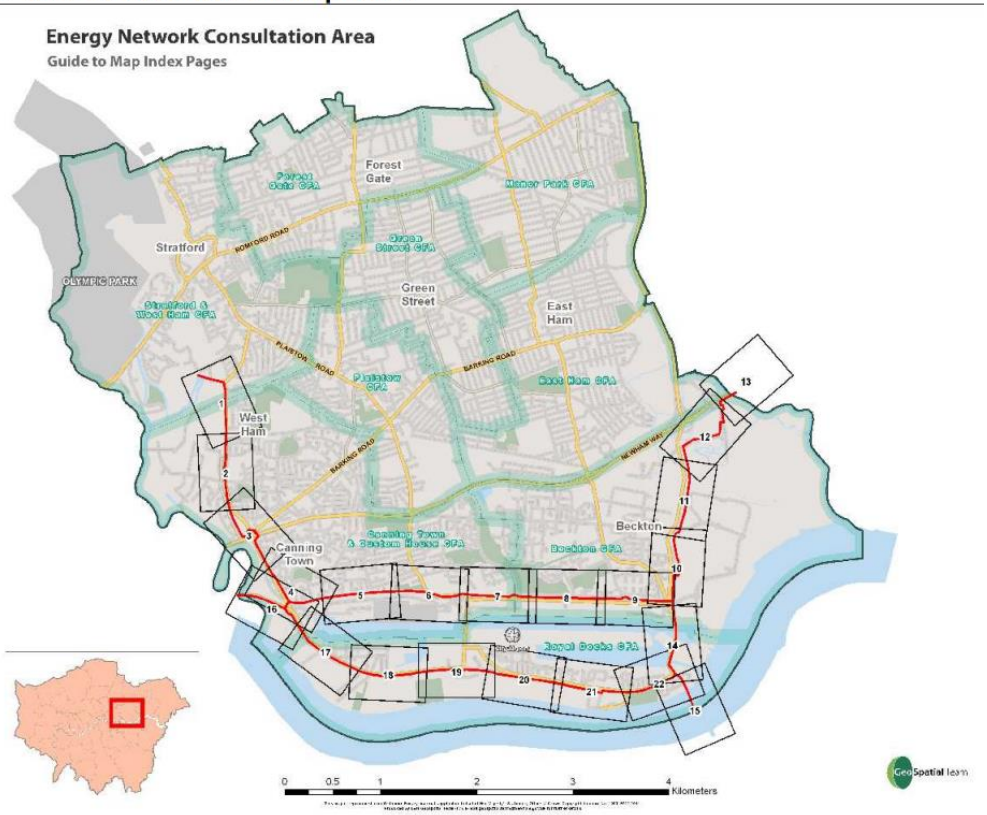
2.11. Atkins, in conjunction with Engie, have investigated the feasibility of a connection to a new District Heating Network. After further consultation in October 2016 Engie confirmed that no new heating network will be developed to serve CADP1 within the timescales when the CADP1 infrastructure will be built out (Appendix B.1). Therefore, connection to a heat network (existing or proposed) is not considered to be feasible at this stage. However, provisions are being made for future connectivity as outlined in section 2.25

Figure 2-1 Heat Network Areas (Extract from LBN District Heat Network LDO)

[2] Please note that the reference floor area is the floor area of the zones with active cooling.

[3] A notional building is the industry recognised term for the hypothetical building generated by the SBEM software to which you compare your building against to check compliance.

Appendix 5 – District Heat Network Map Index



Airport-wide heat networks

2.12. The proposed design includes the implementation of a more centralised airport wide heat network. The approved energy strategy, in the Energy and Low Carbon Strategy, July 2013, proposed heating using plant located in the West Energy Centre (WEC) once the Interim Works were built out. The Energy Assessment for the Interim Works (ref.17/00533/AOD) reflected this approach. Once the Completed Works were then built out it was proposed to then decommission the boilers and mini-CCHP plant in the WEC and transfer the loads to the boilers and C/CHP plant in the East Energy Centre (EEC) once the development was completed.

2.13. However, the proposed Accelerated Construction Plan pursuant to Condition 4 is to build out all the infrastructure in a single phase. It is therefore proposed to install all heating and CHP plant for the CADP1 development new buildings in the EEC only instead of using heating plant in two energy centres (WEC & EEC).

2.14. This consolidation allows an opportunity to further optimise the heating plant selection with larger and more efficient units within the same footprint of the EEC, to have a centralised system for the CADP1 new buildings and avoid the redundant plant to be dismantled in the WEC building. The WEC will therefore provide an allocation for electrical power generating plant, domestic cold water and sprinkler tanks.

2.15. A Section 96a application for minor non-material changes to the elevations and roof of the WEC and EEC buildings has been submitted to LBN under separate cover to reflect the changes to the WEC as a result of providing electrical plant and tanks only, and to the EEC as a result of design refinement for plant access doors and flue arrangements due to some revised plant, equipment and associated layout arrangements. The revised WEC and EEC layouts which drive the required elevational changes have been shown in the indicative plans to illustrate this Energy Assessment at Appendix C4.

2.16. A Deed of Variation to the S106 Agreement is also being progressed to reflect the switch to a centralised system CHP system in the EEC instead of the WEC.

2.17. Consistent with the comments of the GLA letter and Stage 1 Report Update of 25th June 2014 (Reference D&P/3031/01b) noting preference to prioritise use of CHP (second tier of London Plan energy hierarchy: Be Clean) over the use of Dock Source Heat Pumps (third tier of London Plan energy hierarchy : Be Green) the following optimisations have been made to the proposed system:

- C/CHP system prioritised over the use of Dock Source Heat Pump system (which was previously proposed on the new Pier). This has resulted in the selection of more efficient CHP plant to replace the former CCHP technology and omission of the dock source heat pump system (since it is no longer required due to the revised CHP system and maximising its' usage). This amendment has maximised the use of the CHP system and made a much larger contribution to the 'Be Clean' stage, and optimised the benefit and carbon dioxide savings of using a CHP system.
- The CHP system will be connected to thermal storage buffer vessels of 38 m³ storage capacity. This greater carbon dioxide emissions saving benefit at the 'Be Clean' stage has resulted is a smaller requirement at the 'Be Green' stage, which can now be met by photovoltaic PV panels alone as outlined in section 2.28 of this PCC, and hence the Dock Source Heat Pump is no longer required and is proposed to be omitted.

2.18. The proposed heat network will contribute to meeting the demand for heating of the new WTE, ETE and NEP terminal buildings and the demand for domestic hot water of the WTE and ETE buildings (Figure 2-2).

2.19. The new proposed heat generating technologies comprise a combination of low NOx CHP and gas fired boilers to be installed in the EEC building as main core heating centre for the new build parts of the development.

2.20. The CHP has been sized to provide the base load from domestic hot water and a part of the space heating demand. The estimated demand for Domestic Hot Water (DHW) and space heating are shown in Figures 2-3 and 2-4.

Figure 2-2 Connections of buildings to the site wide heat network

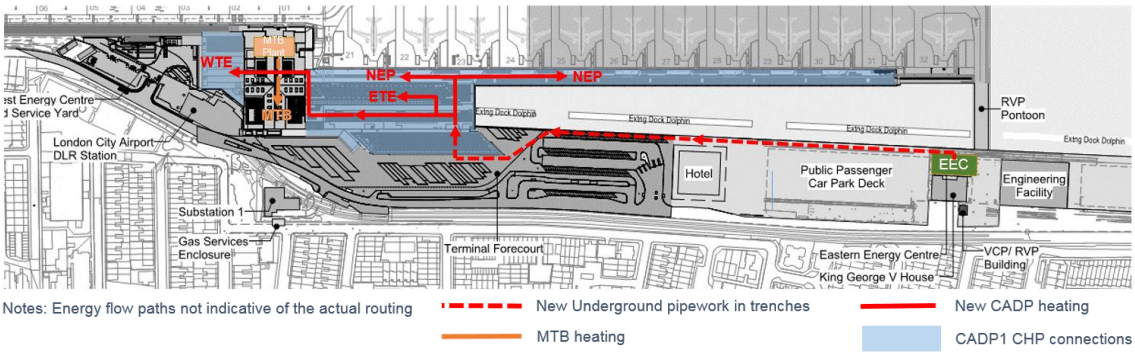


Figure 2-3 Average domestic hot water demand

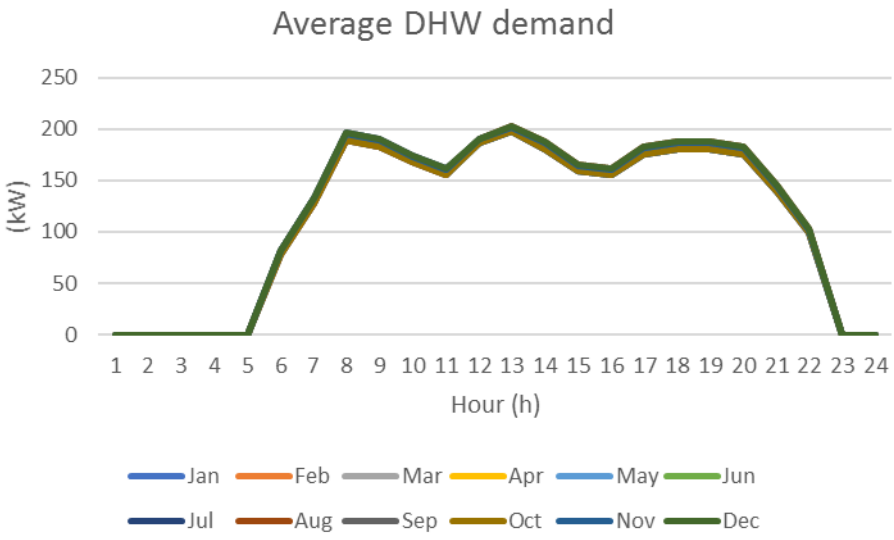
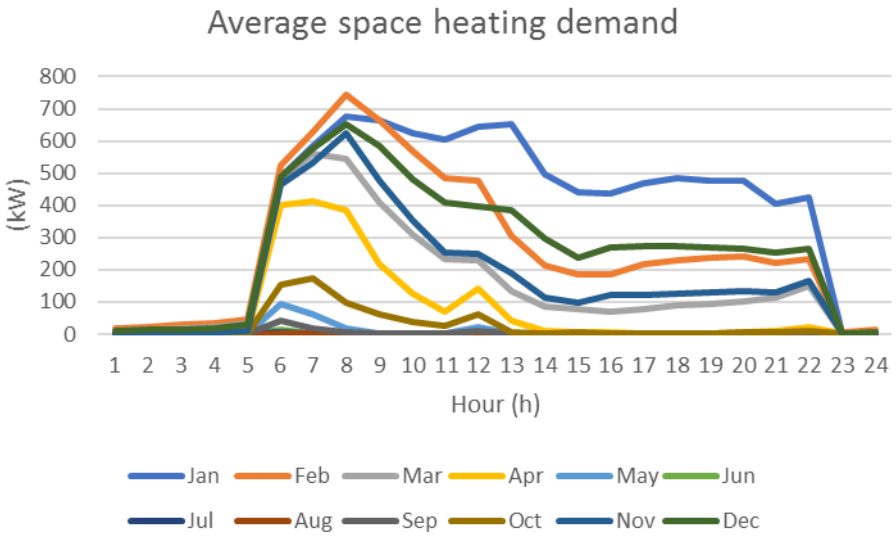


Figure 2-4 Average space heating demand



2.21. The provisionally selected CHP engine (model: Ener-G E230 Low NOx) has a thermal output of 357 $kW_{(th)}$ and an electric output of 229 $kW_{(el)}$ and is coupled with a thermal store and boilers to optimise the use of the CHP unit and provide adequate coverage for base and part peak load periods. The overall demand for heat and domestic hot water and the demand met by the CHP are detailed in Figure 2-5 and Table 2.5.

2.22. The net benefit of the CHP has been quantified using the industry approved software IES, with an estimated total reduction of CO_2 emissions of 148 tonnes/year when the gas input and displaced electricity are considered. Please refer to Appendix D.1 for details of the CHP.

2.23. In selecting a CHP, specific consideration has been given to the site's emissions rates and air quality. The NO_x emissions from the CHP firing are estimated to be 50 mg/Nm^3 at 5% O_2. This is considerably lower than the 95 mg/Nm^3 at 5% O_2 prescribed by the GLA Sustainable Design and Construction Guide for developments in Band B. The low NO_x emissions will be achieved via an in-built or an external catalyst which will reduce the concentration of NO_x compounds in the flue gases. The CHP should be regularly maintained to ensure the emissions limit of 95 mg/Nm^3 at 5%. O_2 is kept throughout the operation of the unit. (The NOx emission for the terminal Energ-E 230 CHP is circa 0.013 g/s).

Figure 2-5 Monthly demand profiles for domestic hot water and space heating

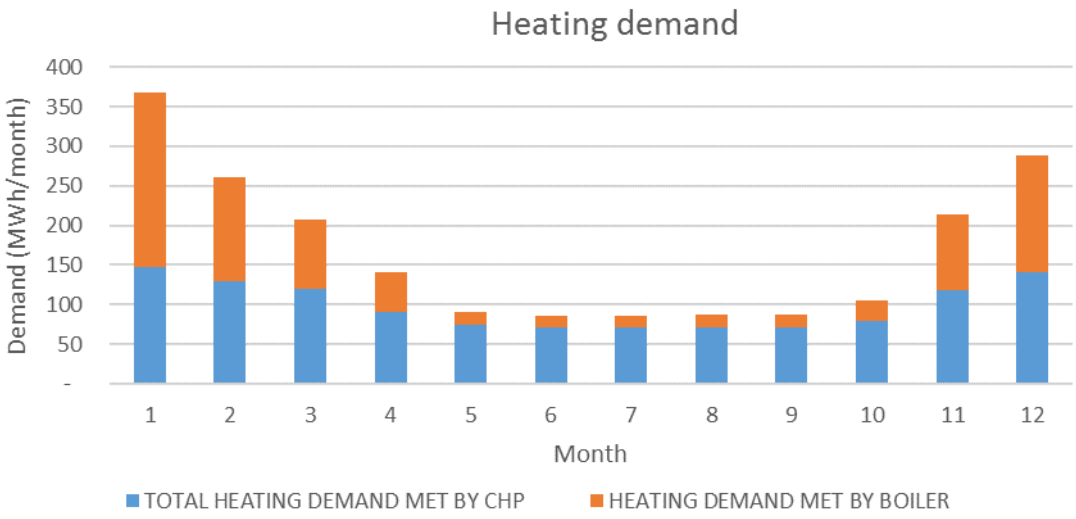
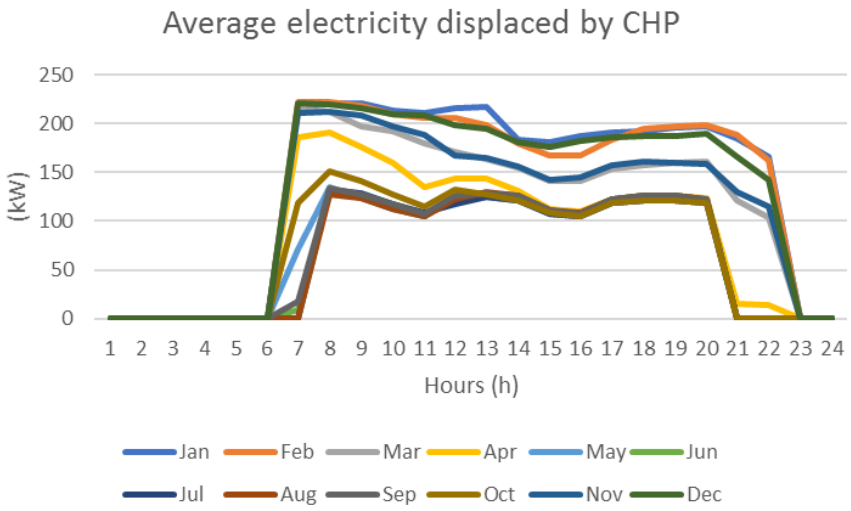


Table 2-5 Annual Demand for space heating and domestic hot water

Demand (MWh/year)	
DHW	1017
Space Heating	1003
Heating demand met by CHP	1185 (59% of total)
Heating demand met by boilers	835 (41% of total)

Figure 2-6 Electricity displaced by the CHP (hourly average for each month))



2.24. The electricity produced by the CHP is estimated to be approximately 798 MWh. The modelling of the CHP estimates that the electricity produced varies between 100 kW and 250 kW. The proposed strategy allows for the integration of the CHP into the airport electrical distribution systems.

2.25. To make allowance for connection to a future district heating network, provision is made for valved and capped connections to the main central heating header located in the EEC and space for a future plate heat exchanger has been considered during spatial planning (confirmed in paragraphs 1 and 2 of Schedule 6 of CADP1 Section 106 Agreement). Layout of the energy centre and schematics of the site wide heat network are shown in Appendix C.4 and Appendix C.2, respectively.

2.26. The implementation of the site wide heat network is estimated to produce total carbon dioxide emissions of 148 tonnes/year

Table 2-6 Carbon dioxide emissions savings from heat network and CHP ("be clean")

	Regulated non-domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Savings from heat network/ and CHP	148	9.9

Renewable energy (Be Green)

2.27. Roof-mounted photovoltaic modules (PV) are proposed to be installed on the external roof areas of the CADP1 buildings to provide further carbon reduction and meet the carbon emission

improvement. Details of the provisional PV layout has been provided under separate cover pursuant to condition 64 and are also shown in Appendix E.

Details of the proposed PV module specification are given in Table 2.7.

2.28. Table 2-7These performance parameters are based on a Sunpower SPR-E20-327-COM module (or equivalent). Please refer to Appendix D.2 for the manufacturer specification for this type of PV module.

Table 2-7 PV performance specification

Sunpower SPR-E20-327-COM module	
PV Cell Type	Monocrystalline
PV Panel Dimensions (mm x mm x mm)	1559 x 1046 x 46
Weight (kg)	186
Max load	Wind 2400 Pa, 244 kg/m² front & back Snow 5400 Pa, 550 kg/m²
Power Output per Panel (W_{max}) @ STC	327
Efficiency (%)	20.3
Voltage (V_{MPP})	54.7
Current (A_{MPP})	5.98
Area per kW_p (m^2/kW_{nom})	4.89
Orientation and vertical inclination of the PV modules	South-facing and 10 degrees respectively
Minimum row spacing (m)	0.8 – 1

2.29. A minimum of 847 m^2 of PV modules is required to meet the 25% carbon emissions improvement, which is expected to provide an electricity output of approximately 142.5 MWh/year assuming they are orientated to the south with an inclination of 10°. In order to better this 25% minimum requirement and allow for some flexibility during the detailed design stage, it is proposed to provide between 847m² to 1170 m^2 array of PV modules, which is expected to provide an electricity output of between 142.5 MWh/year and 196.9 MWh/year. The output is estimated under the assumptions that there will be no significant shading from the surrounding structure and that the inverter efficiency exceeds 96% (refer to Appendix E2 for a preliminary shading study)

Table 2-8 Carbon dioxide emissions savings from renewable energy ("be green")

	Regulated non-domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Savings from renewable energy	78	5.2

3. Low carbon design

3.1. An assessment of carbon emissions for each stage has been undertaken in accordance with the National Calculation Methodology (NCM) and the guidelines specified in the GLA Guidance on preparing energy assessments. The calculated total carbon baseline for the development is 1,490 tonnes/year.

3.2. Additional carbon dioxide emissions associated with unregulated energy are excluded from the 25% improvement required over the Part L baseline. However, the total unregulated energy demand for the site has been calculated at this stage based on the Part L compliance assessment and are approximately 1,396 tonnes/year.

3.3. As illustrated in the preceding sections there are a number of proposed 'Be Lean', 'Be Clean and Be Green' Strategies adopted to provide full compliance with the GLA requirements. The calculated reductions in regulated CO_2 emissions at each stage of the energy hierarchy are reported in the tables and figures below. These include emissions from both the terminal buildings and car hire and taxi feeder building. A separate breakdown of emissions for these buildings is given in Appendix A.

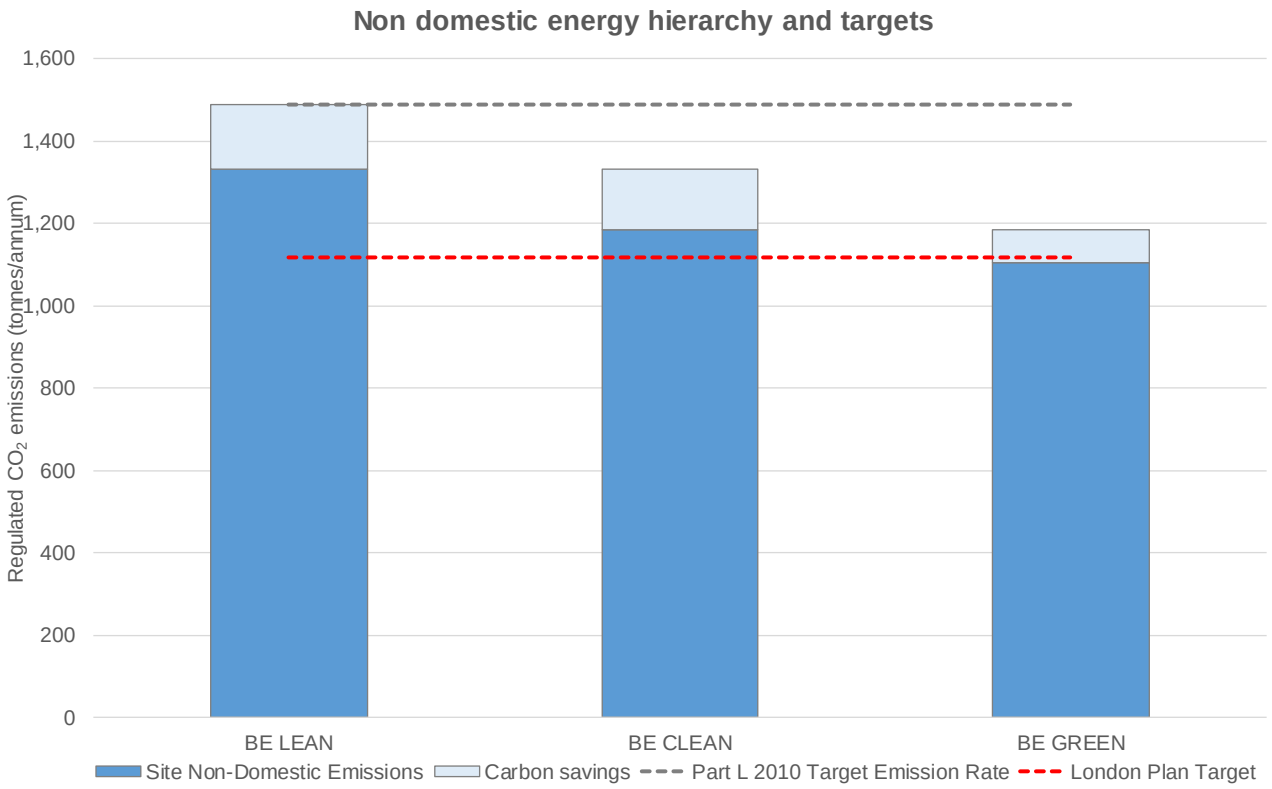
Table 3-1 Carbon dioxide emissions for the non-domestic buildings and whole development

	Carbon dioxide emissions for non-domestic buildings (Tonnes CO_2 per annum)	
	Regulated	**Unregulated**
Baseline: Part L 2010 of the Building Regulations Compliant Development	1,490	1,396
After energy demand reduction	1,332	1,396
After heat network/ CHP	1,184	1,396
After renewable energy	1,107	1,396

Table 3-2 Carbon dioxide emissions savings for the non-domestic buildings and whole development

	Regulated non-domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	**(%)**
Savings from energy demand reduction	158	10.6
Savings from heat network / CHP	148	9.9
Savings from renewable energy	78	5.2
Total Cumulative Savings	384	25.7

Figure 3-1 Energy hierarchy and GLA targets for the non-domestic buildings and whole development



4. Conclusions

4.1. This Assessment demonstrates that the design of the CADP1 infrastructure is sufficient to meet the requirements of Condition 61, achieving a reduction that is better than the 25% target over Part L 2010 by up to 2.5%. This is consistent with the previously approved Energy Strategy.

4.2. The energy efficiency measures adopted to meet the required carbon emission targets for the CADP1 building elements include:

Be Lean" Summary

- Passive reduction of space heating and cooling via a highly-insulated, low air leakage envelope;
- Optimised glazing and shading combination to facilitate access to daylight whilst reducing the impact of solar gains.
- Air handling units (AHUs) with a SFP of 1.65 W/l/s and with facility for heat recovery and free cooling with efficient fan motors.
- Centralised, high efficiency, low NO_x gas fired boilers and air-cooled chillers.
- Luminaire selection to achieve a high efficacy across the buildings and provision of photoelectric controls in zones with access to daylight and occupancy sensing where appropriate to the use of the space.

"Be Clean" Summary

The proposed design includes:

- An airport wide heat network with a proportion of the heat supplied by a CHP unit with a thermal output of 357 $kW_{(th)}$ and an electric output of 229 $kW_{(el)}$. This CHP unit will be installed in the EEC to serve the terminal building extensions and space & connectivity provisions are being allowed for a further CHP unit to be added to the system in future to serve part of the heating load for the future hotel when it is built. (The capacity of this further CHP unit will be confirmed in future when hotel design is developed and its energy loads are known; the unit will serve part of the hotel energy load and is likely to be circa 330-360 kW(th).
- Allowance for valved and capped connections and space for heat exchangers to allow future connectivity to district heating.

"Be Green" Summary

- A total area of PV modules of circa 847 m^2 is required to meet the 25% improvement target; with between 847m^2 to 1170 m^2 proposed (subject to detailed design and installation details) to be installed on the terminal buildings which improves on this 25% target by up to 2.5%.

4.3. A 10.6% reduction in carbon dioxide emissions is achieved via energy demand reduction measures. The use of CHP is predicted to achieve a further 9.9 % reduction. The remaining 5.2% to 7.7% carbon emission reduction is achieved by installing at least 847 m^2 and up to 1170m^2 of PV panels on the WTE, ETE and NEP roof areas.

4.4. The compliance assessment also includes a "Cooling and Overheating assessment". The design for the CADP1 aims to reduce the demand for cooling, mitigate the risk of overheating and reduce fuel consumption via energy efficient systems as per adopted "Be Lean" measures. The Brukl reports attached in Appendix A shows details of compliance by comparison between the actual and the notional buildings.

Appendix A. BRUKL Reports Extracts

A.1. Emissions from the terminal buildings

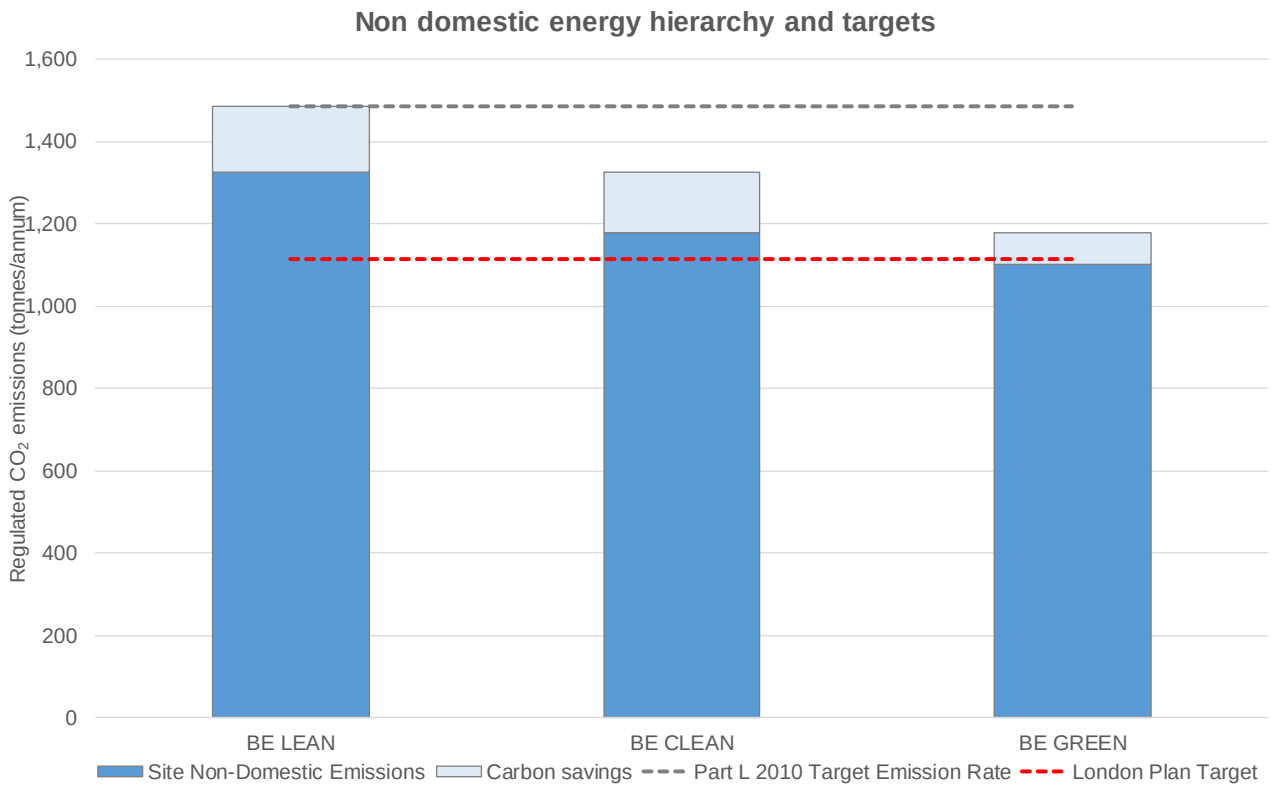
Carbon dioxide emissions for the terminal buildings

	Carbon dioxide emissions for non-domestic buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2010 of the Building Regulations Compliant Development	1,485	1,393
After energy demand reduction	1,327	1,393
After heat network/ CCHP / CHP	1,179	1,393
After renewable energy	1,104	1,393

Carbon dioxide emissions savings for the terminal buildings

	Regulated non-domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Savings from energy demand reduction	158	10.6
Savings from heat network/ CCHP / CHP	148	10.0
Savings from renewable energy	76	5.1
Total Cumulative Savings	158	10.6

Energy hierarchy and GLA targets for the terminal buildings



A.2. BRUKL extract “Be Lean” – Terminal buildings

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L 2010

Project name

LCA CADP CHP Lean — As designed

Date: Mon Jan 15 18:04:57 2018

Administrative information

Building Details

Address: Hartman Road, London, E16 2PX

Certification tool

Calculation engine: Apache

Calculation engine version: 6.4.0.15

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 6.4.0.15

BRUKL compliance check version: v4.1.g.0

Owner Details

Name: London City Airport

Telephone number: Phone

Address: Hartman Road, London, E16 2PX

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

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

1.1	CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	43.2
1.2	Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	43.2
1.3	Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	38.6
1.4	Are emissions from the building less than or equal to the target?	BER =< TER
1.5	Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services should achieve reasonable overall standards of energy efficiency

2.a Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.2	0.2	RM000055:Surf[1]
Floor	0.25	0.18	0.18	RM00004C:Surf[0]
Roof	0.25	0.15	0.15	TL000006:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.27	1.7	L0000051:Surf[3]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	5

2.b Building services

The building services parameters listed below are expected to be checked by the BCO against guidance. No automatic checking is performed by the tool.

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- Heating and Mechanical Ventilation

Heating seasonal efficiency	Cooling nominal efficiency	SFP [W/(l/s)]	HR seasonal efficiency
0.92	-	0	0.7
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

2- VAV System

Heating seasonal efficiency	Cooling nominal efficiency	SFP [W/(l/s)]	HR seasonal efficiency
0.92	4.19	1.65	0.7
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

3- DX System

Heating seasonal efficiency	Cooling nominal efficiency	SFP [W/(l/s)]	HR seasonal efficiency
0.92	6.56	0	0.73
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

4- Fan Coil System

Heating seasonal efficiency	Cooling nominal efficiency	SFP [W/(l/s)]	HR seasonal efficiency
0.92	4.19	1.65	0.7
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

5- Heating and Mechanical Extract

Heating seasonal efficiency	Cooling nominal efficiency	SFP [W/(l/s)]	HR seasonal efficiency
0.92	-	0	0.7
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

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

Local mechanical ventilation and exhaust

Zone	Supply/extract SFP [W/(l/s)]	HR seasonal efficiency	Exhaust SFP [W/(l/s)]
ETE L10 WC (ELEC DHW) 03	-	-	0.45
NEP L10 WC (ELEC DHW) 14	-	-	0.45
NEP L10 WC (ELEC DHW) 15	-	-	0.45
NEP L10 WC (ELEC DHW) 16	-	-	0.45
NEP L10 WC (ELEC DHW) 17	-	-	0.45
NEP L10 WC (ELEC DHW) 18	-	-	0.45
NEP L10 WC (ELEC DHW) 19	-	-	0.45
NEP L10 WC (ELEC DHW) 27	-	-	0.45
NEP L10 WC (ELEC DHW) 28	-	-	0.45
NEP L10 WC (ELEC DHW) 29	-	-	0.45
NEP L20 STORAGE 19	-	-	0.25
NEP L20 STORAGE 25	-	-	0.25
NEP L20 STORAGE 28	-	-	0.25
NEP L20 STORAGE 31	-	-	0.25
NEP L20 STORAGE 34	-	-	0.25
NEP L20 STORAGE 37	-	-	0.25
NEP L20 STORAGE 40	-	-	0.25

Local mechanical ventilation and exhaust

Zone	Supply/extract SFP [W/(l/s)]	HR seasonal efficiency	Exhaust SFP [W/(l/s)]
NEP L20 STORAGE 43	-	-	0.25
NEP L20 STORAGE 46	-	-	0.25
NEP L20 STORAGE 49	-	-	0.25
NEP L20 WC (ELEC DHW) 01	-	-	0.45
NEP L20 WC (ELEC DHW) 02	-	-	0.45
NEP L20 WC (ELEC DHW) 04	-	-	0.45
NEP L20 WC (ELEC DHW) 05	-	-	0.45
NEP L20 WC (ELEC DHW) 06	-	-	0.45
NEP L20 WC (ELEC DHW) 07	-	-	0.45
NEP L20 WC (ELEC DHW) 08	-	-	0.45
NEP L20 WC (ELEC DHW) 09	-	-	0.45
NEP L20 WC (ELEC DHW) 10	-	-	0.45
NEP L20 WC (ELEC DHW) 11	-	-	0.45
NEP L20 WC (ELEC DHW) 12	-	-	0.45
NEP L20 WC (ELEC DHW) 13	-	-	0.45
NEP L20 WC (ELEC DHW) 20	-	-	0.45
NEP L20 WC (ELEC DHW) 21	-	-	0.45
NEP L20 WC (ELEC DHW) 22	-	-	0.45
NEP L20 WC (ELEC DHW) 23	-	-	0.45
NEP L20 WC (ELEC DHW) 24	-	-	0.45
NEP L20 WC (ELEC DHW) 25	-	-	0.45
NEP L20 WC (ELEC DHW) 26	-	-	0.45
NEP L20 WC (ELEC DHW) 30	-	-	0.45
NEP L20 WC (ELEC DHW) 31	-	-	0.45

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
ETE L00 BOH CIRCULATION 05	40	-
ETE L00 BOH CIRCULATION 06	460	-
ETE L00 BOH CIRCULATION 07	50	-
ETE L00 BOH CIRCULATION 49	10	-
ETE L00 BOH CIRCULATION 80	40	-
ETE L00 BOH CIRCULATION 81	50	-
ETE L00 BOH CIRCULATION 82	100	-
ETE L00 CHANGING ROOM 10	280	-
ETE L00 CHECK-IN	2660	-
ETE L00 COMM ROOM 03	80	-
ETE L00 COMM ROOM 04	70	-
ETE L00 COMM ROOM 05	170	-
ETE L00 COMM ROOM 29	220	-
ETE L00 COMM ROOM 30	130	-
ETE L00 F&b 01	160	-
ETE L00 FOH CICULATION 02	120	-
ETE L00 FOH CICULATION 03	270	-
ETE L00 FOH CICULATION 03	1070	-
ETE L00 FOH CICULATION 04	500	-
ETE L00 FOH CICULATION 17	40	-

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
ETE L00 FOH CICULATION 56	350	-
ETE L00 FOH CICULATION 63	360	-
ETE L00 FOH CIRCULATION (GLAS	350X)	-
ETE L00 OFFICE 03	150	-
ETE L00 OFFICE 04	400	-
ETE L00 OFFICE 05	190	-
ETE L00 OFFICE 06	860	-
ETE L00 OFFICE 23	410	-
ETE L00 PLANT ROOM	140	-
ETE L00 RETAIL 01	150	-
ETE L00 RETAIL 02	450	-
ETE L00 STORAGE 01	20	-
ETE L00 STORAGE 02	30	-
ETE L00 WC 01	280	-
ETE L10 BOH CIRCULATION 11	20	-
ETE L10 BOH CIRCULATION 12	20	-
ETE L10 BOH CIRCULATION 13	80	-
ETE L10 BOH CIRCULATION 14	0	-
ETE L10 BOH CIRCULATION 15	0	-
ETE L10 BOH CIRCULATION 16	30	-
ETE L10 BOH CIRCULATION 17	230	-
ETE L10 BOH CIRCULATION 18	370	-
ETE L10 BOH CIRCULATION 19	260	-
ETE L10 BOH CIRCULATION 20	130	-
ETE L10 BOH CIRCULATION 21	500	-
ETE L10 BOH CIRCULATION 22	40	-
ETE L10 BOH CIRCULATION 23	40	-
ETE L10 BOH CIRCULATION 24	40	-
ETE L10 BOH CIRCULATION 25	40	-
ETE L10 BOH CIRCULATION 48	20	-
ETE L10 BOH CIRCULATION 78	130	-
ETE L10 BOH CIRCULATION 79	40	-
ETE L10 CHANGING ROOM 01	140	-
ETE L10 CHANGING ROOM 02	60	-
ETE L10 COMM ROOM 07	80	-
ETE L10 COMM ROOM 08	400	-
ETE L10 COMM ROOM 09	390	-
ETE L10 F&b 03	340	-
ETE L10 F&b 04	330	-
ETE L10 F&b 05	170	-
ETE L10 F&b 06	140	-
ETE L10 F&b 07	1710	-
ETE L10 FOH CICULATION 06	190	-
ETE L10 FOH CICULATION 07	140	-
ETE L10 FOH CICULATION 08	690	-
ETE L10 FOH CICULATION 09	100	-
ETE L10 FOH CICULATION 10	120	-

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
ETE L10 FOH CICULATION 11	30	-
ETE L10 FOH CICULATION 12	50	-
ETE L10 FOH CICULATION 13	60	-
ETE L10 FOH CICULATION 14	40	-
ETE L10 FOH CICULATION 15	60	-
ETE L10 FOH CICULATION 16	20	-
ETE L10 FOH CICULATION 18	460	-
ETE L10 FOH CICULATION 19	0	-
ETE L10 FOH CICULATION 20	20	-
ETE L10 FOH CICULATION 23	70	-
ETE L10 FOH CICULATION 26	50	-
ETE L10 FOH CICULATION 27	140	-
ETE L10 FOH CIRCULATION (COOL) 03	80	-
ETE L10 GATE 01	390	-
ETE L10 KITCHEN 01	310	-
ETE L10 LOUNGE 01	370	-
ETE L10 LOUNGE 02	20	-
ETE L10 LOUNGE 03	210	-
ETE L10 LOUNGE 04	470	-
ETE L10 LOUNGE 05	510	-
ETE L10 LOUNGE 06	840	-
ETE L10 LOUNGE 07	140	-
ETE L10 OFFICE 08	190	-
ETE L10 OFFICE 09	460	-
ETE L10 OFFICE 09	4230	-
ETE L10 RETAIL 04	760	-
ETE L10 RETAIL 05	980	-
ETE L10 RETAIL 06	180	-
ETE L10 RETAIL 07	100	-
ETE L10 RETAIL 08	60	-
ETE L10 STORAGE 04	40	-
ETE L10 STORAGE 05	20	-
ETE L10 STORAGE 06	20	-
ETE L10 STORAGE 07	30	-
ETE L10 STORAGE 08	80	-
ETE L10 STORAGE 09	80	-
ETE L10 STORAGE 10	90	-
ETE L10 STORAGE 11	180	-
ETE L10 WC (ELEC DHW) 03	40	-
ETE L10 WC 02	600	-
ETE L10 WC 03	570	-
ETE L10 WC 04	110	-
ETE L10 WC 05	110	-
ETE L20 BOH CIRCULATION 30	30	-
ETE L20 BOH CIRCULATION 31	20	-
ETE L20 BOH CIRCULATION 32	20	-
ETE L20 BOH CIRCULATION 33	240	-

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
ETE L20 BOH CIRCULATION 34	100	-
ETE L20 BOH CIRCULATION 35	90	-
ETE L20 BOH CIRCULATION 36	80	-
ETE L20 BOH CIRCULATION 37	1000	-
ETE L20 CHANGING ROOM 04	360	-
ETE L20 COMM ROOM 10	50	-
ETE L20 COMM ROOM 11	310	-
ETE L20 KITCHEN 02	190	-
ETE L20 OFFICE 14	240	-
ETE L20 OFFICE 15	240	-
ETE L20 OFFICE 16	260	-
ETE L20 OFFICE 17	310	-
ETE L20 OFFICE 18	30	-
ETE L20 OFFICE 19	170	-
ETE L20 OFFICE 22	7620	-
ETE L20 RETAIL 09	1180	-
ETE L20 STORAGE 13	20	-
ETE L20 STORAGE 14	20	-
ETE L20 STORAGE 15	50	-
ETE L20 STORAGE 16	20	-
ETE L20 STORAGE 17	10	-
ETE L20 WC 07	540	-
ETE L20 WC 08	410	-
NEP L00 FOH CICULATION 28	2490	-
NEP L00 FOH CICULATION 28	340	-
NEP L00 FOH CICULATION 28	340	-
NEP L00 FOH CICULATION 28	200	-
NEP L00 FOH CICULATION 28	110	-
NEP L10 FOH CICULATION 21	300	-
NEP L10 FOH CICULATION 21	1780	-
NEP L10 FOH CICULATION 21	280	-
NEP L10 FOH CICULATION 29	20	-
NEP L10 FOH CICULATION 30	20	-
NEP L10 FOH CICULATION 31	20	-
NEP L10 FOH CICULATION 32	70	-
NEP L10 FOH CICULATION 33	20	-
NEP L10 FOH CICULATION 34	70	-
NEP L10 FOH CICULATION 35	20	-
NEP L10 FOH CICULATION 36	70	-
NEP L10 FOH CICULATION 37	20	-
NEP L10 FOH CICULATION 45	70	-
NEP L10 FOH CICULATION 46	20	-
NEP L10 FOH CICULATION 47	70	-
NEP L10 FOH CICULATION 48	20	-
NEP L10 FOH CICULATION 49	70	-
NEP L10 FOH CICULATION 50	20	-
NEP L10 FOH CICULATION 54	180	-

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
NEP L10 FOH CICULATION 60	70	-
NEP L10 FOH CICULATION 61	70	-
NEP L10 FOH CICULATION 62	70	-
NEP L10 FOH CIRCULATION (COOL)82		-
NEP L10 FOH CIRCULATION (COOL)83		-
NEP L10 FOH CIRCULATION (COOL)84		-
NEP L10 FOH CIRCULATION (COOL)85		-
NEP L10 FOH CIRCULATION (COOL)89		-
NEP L10 FOH CIRCULATION (COOL)92		-
NEP L10 FOH CIRCULATION (COOL)93		-
NEP L10 FOH CIRCULATION (COOL)94		-
NEP L10 FOH CIRCULATION (COOL)95		-
NEP L10 GATE 02	470	-
NEP L10 GATE 03	470	-
NEP L10 GATE 04	470	-
NEP L10 GATE 05	470	-
NEP L10 GATE 06	470	-
NEP L10 GATE 07	470	-
NEP L10 GATE 08	470	-
NEP L10 GATE 09	470	-
NEP L10 GATE 10	470	-
NEP L10 GATE 11	850	-
NEP L10 WC (ELEC DHW) 14	40	-
NEP L10 WC (ELEC DHW) 15	40	-
NEP L10 WC (ELEC DHW) 16	40	-
NEP L10 WC (ELEC DHW) 17	40	-
NEP L10 WC (ELEC DHW) 18	40	-
NEP L10 WC (ELEC DHW) 19	40	-
NEP L10 WC (ELEC DHW) 27	40	-
NEP L10 WC (ELEC DHW) 28	40	-
NEP L10 WC (ELEC DHW) 29	40	-
NEP L20 BOH CIRCULATION 38	50	-
NEP L20 BOH CIRCULATION 39	40	-
NEP L20 BOH CIRCULATION 40	60	-
NEP L20 BOH CIRCULATION 41	30	-
NEP L20 BOH CIRCULATION 42	30	-
NEP L20 BOH CIRCULATION 50	40	-
NEP L20 BOH CIRCULATION 51	30	-
NEP L20 BOH CIRCULATION 52	30	-
NEP L20 BOH CIRCULATION 53	40	-
NEP L20 BOH CIRCULATION 54	30	-
NEP L20 BOH CIRCULATION 55	30	-
NEP L20 BOH CIRCULATION 56	40	-
NEP L20 BOH CIRCULATION 57	30	-
NEP L20 BOH CIRCULATION 58	30	-
NEP L20 BOH CIRCULATION 59	40	-
NEP L20 BOH CIRCULATION 60	30	-

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
NEP L20 BOH CIRCULATION 61	30	-
NEP L20 BOH CIRCULATION 62	40	-
NEP L20 BOH CIRCULATION 63	30	-
NEP L20 BOH CIRCULATION 64	30	-
NEP L20 BOH CIRCULATION 65	40	-
NEP L20 BOH CIRCULATION 66	30	-
NEP L20 BOH CIRCULATION 67	30	-
NEP L20 BOH CIRCULATION 68	40	-
NEP L20 BOH CIRCULATION 69	30	-
NEP L20 BOH CIRCULATION 70	30	-
NEP L20 BOH CIRCULATION 71	40	-
NEP L20 BOH CIRCULATION 72	30	-
NEP L20 BOH CIRCULATION 73	30	-
NEP L20 BOH CIRCULATION 74	40	-
NEP L20 BOH CIRCULATION 75	30	-
NEP L20 BOH CIRCULATION 76	30	-
NEP L20 CHANGING ROOM 05	150	-
NEP L20 CHANGING ROOM 06	120	-
NEP L20 CHANGING ROOM 07	160	-
NEP L20 CHANGING ROOM 08	110	-
NEP L20 COMM ROOM 12	100	-
NEP L20 COMM ROOM 13	80	-
NEP L20 COMM ROOM 14	80	-
NEP L20 COMM ROOM 15	80	-
NEP L20 COMM ROOM 19	430	-
NEP L20 COMM ROOM 20	430	-
NEP L20 COMM ROOM 21	430	-
NEP L20 COMM ROOM 22	430	-
NEP L20 COMM ROOM 23	160	-
NEP L20 COMM ROOM 24	80	-
NEP L20 COMM ROOM 25	110	-
NEP L20 COMM ROOM 26	80	-
NEP L20 COMM ROOM 27	430	-
NEP L20 COMM ROOM 28	430	-
NEP L20 FOH CICULATION 05	360	-
NEP L20 FOH CICULATION 22	20	-
NEP L20 FOH CICULATION 38	20	-
NEP L20 FOH CICULATION 39	20	-
NEP L20 FOH CICULATION 40	20	-
NEP L20 FOH CICULATION 41	20	-
NEP L20 FOH CICULATION 42	20	-
NEP L20 FOH CICULATION 43	20	-
NEP L20 FOH CICULATION 44	20	-
NEP L20 FOH CICULATION 51	20	-
NEP L20 FOH CICULATION 52	20	-
NEP L20 FOH CICULATION 53	210	-
NEP L20 FOH CICULATION 55	180	-

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
NEP L20 FOH CICULATION 57	290	-
NEP L20 FOH CICULATION 58	570	-
NEP L20 FOH CICULATION 59	300	-
NEP L20 FOH CICULATION 59	2300	-
NEP L20 FOH CICULATION 59	300	-
NEP L20 FOH CIRCULATION (COOL	100	-
NEP L20 FOH CIRCULATION (COOL	180	-
NEP L20 FOH CIRCULATION (COOL	100	-
NEP L20 FOH CIRCULATION (COOL	105	-
NEP L20 FOH CIRCULATION (COOL	106	-
NEP L20 FOH CIRCULATION (COOL	100	-
NEP L20 FOH CIRCULATION (COOL	108	-
NEP L20 FOH CIRCULATION (COOL	109	-
NEP L20 FOH CIRCULATION (COOL	120	-
NEP L20 FOH CIRCULATION (COOL	120	-
NEP L20 FOH CIRCULATION (COOL	186	-
NEP L20 FOH CIRCULATION (COOL	180	-
NEP L20 FOH CIRCULATION (COOL	188	-
NEP L20 FOH CIRCULATION (COOL	180	-
NEP L20 FOH CIRCULATION (COOL	120	-
NEP L20 FOH CIRCULATION (COOL	186	-
NEP L20 FOH CIRCULATION (COOL	180	-
NEP L20 FOH CIRCULATION (COOL	188	-
NEP L20 FOH CIRCULATION (COOL	188	-
NEP L20 FOH CIRCULATION (COOL	180	-
NEP L20 OFFICE 20	280	-
NEP L20 STORAGE 18	10	-
NEP L20 STORAGE 19	10	-
NEP L20 STORAGE 20	10	-
NEP L20 STORAGE 21	30	-
NEP L20 STORAGE 25	10	-
NEP L20 STORAGE 26	10	-
NEP L20 STORAGE 27	30	-
NEP L20 STORAGE 28	10	-
NEP L20 STORAGE 29	10	-
NEP L20 STORAGE 30	30	-
NEP L20 STORAGE 31	10	-
NEP L20 STORAGE 32	10	-
NEP L20 STORAGE 33	30	-
NEP L20 STORAGE 34	10	-
NEP L20 STORAGE 35	10	-
NEP L20 STORAGE 36	30	-
NEP L20 STORAGE 37	10	-
NEP L20 STORAGE 38	10	-
NEP L20 STORAGE 39	30	-
NEP L20 STORAGE 40	10	-
NEP L20 STORAGE 41	10	-

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
NEP L20 STORAGE 42	30	-
NEP L20 STORAGE 43	10	-
NEP L20 STORAGE 44	10	-
NEP L20 STORAGE 45	30	-
NEP L20 STORAGE 46	10	-
NEP L20 STORAGE 47	10	-
NEP L20 STORAGE 48	30	-
NEP L20 STORAGE 49	10	-
NEP L20 STORAGE 50	10	-
NEP L20 STORAGE 51	30	-
NEP L20 WC (ELEC DHW) 01	40	-
NEP L20 WC (ELEC DHW) 02	40	-
NEP L20 WC (ELEC DHW) 04	40	-
NEP L20 WC (ELEC DHW) 05	40	-
NEP L20 WC (ELEC DHW) 06	40	-
NEP L20 WC (ELEC DHW) 07	40	-
NEP L20 WC (ELEC DHW) 08	40	-
NEP L20 WC (ELEC DHW) 09	40	-
NEP L20 WC (ELEC DHW) 10	40	-
NEP L20 WC (ELEC DHW) 11	40	-
NEP L20 WC (ELEC DHW) 12	40	-
NEP L20 WC (ELEC DHW) 13	40	-
NEP L20 WC (ELEC DHW) 20	40	-
NEP L20 WC (ELEC DHW) 21	40	-
NEP L20 WC (ELEC DHW) 22	40	-
NEP L20 WC (ELEC DHW) 23	40	-
NEP L20 WC (ELEC DHW) 24	40	-
NEP L20 WC (ELEC DHW) 25	40	-
NEP L20 WC (ELEC DHW) 26	40	-
NEP L20 WC (ELEC DHW) 30	40	-
NEP L20 WC (ELEC DHW) 31	40	-
WTE L00 BAGGAGE	1760	-
WTE L00 BOH CIRCULATION 01	70	-
WTE L00 BOH CIRCULATION 02	50	-
WTE L00 BOH CIRCULATION 03	40	-
WTE L00 BOH CIRCULATION 04	40	-
WTE L00 BOH CIRCULATION 44	90	-
WTE L00 CIRCULATION (FCU)	540	-
WTE L00 COMM ROOM 01	80	-
WTE L00 COMM ROOM 02	80	-
WTE L00 COMM ROOM 16	100	-
WTE L00 COMM ROOM 17	310	-
WTE L00 FOH CICULATION 01	250	-
WTE L00 FOH CICULATION 24	30	-
WTE L00 FOH CICULATION 25	120	-
WTE L00 IMMIGRATION	460	-
WTE L00 OFFICE 01	130	-

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
WTE L00 OFFICE 02	260	-
WTE L00 STORAGE 22	10	-
WTE L00 STORAGE 23	10	-
WTE L00 WC 09	140	-
WTE L00 WC 10	570	-
WTE L10 BOH CIRCULATION 08	0	-
WTE L10 BOH CIRCULATION 09	0	-
WTE L10 BOH CIRCULATION 10	40	-
WTE L10 BOH CIRCULATION 43	50	-
WTE L10 BOH CIRCULATION 45	60	-
WTE L10 BOH CIRCULATION 47	180	-
WTE L10 COMM ROOM 06	310	-
WTE L10 F&b 02	100	-
WTE L10 OFFICE 07	820	-
WTE L10 RETAIL 03	180	-
WTE L10 SECURITY HALL	1890	-
WTE L10 SECURITY PREP AREA	800	-
WTE L10 SECURITY QUEUE AREA	550	-
WTE L10 STORAGE 03	20	-
WTE L10 STORAGE 24	20	-
WTE L20 BOH CIRCULATION 25	110	-
WTE L20 BOH CIRCULATION 25	180	-
WTE L20 BOH CIRCULATION 25	30	-
WTE L20 BOH CIRCULATION 25	40	-
WTE L20 BOH CIRCULATION 25	50	-
WTE L20 BOH CIRCULATION 27	110	-
WTE L20 BOH CIRCULATION 28	70	-
WTE L20 BOH CIRCULATION 29	90	-
WTE L20 BOH CIRCULATION 46	170	-
WTE L20 CHANGING ROOM 03	80	-
WTE L20 CHANGING ROOM 09	440	-
WTE L20 CHILLED STORE	140	-
WTE L20 COMM ROOM 18	300	-
WTE L20 OFFICE 10	160	-
WTE L20 OFFICE 11	1000	-
WTE L20 OFFICE 12	870	-
WTE L20 OFFICE 13	160	-
WTE L20 OFFICE 21	1840	-
WTE L20 STORAGE 12	10	-
WTE L20 WC 06	140	-
WTE L20 WC 11	190	-

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
ETE L00 CHECK-IN	NO (-99.1%)	NO
ETE L00 COMM ROOM 03	N/A	N/A
ETE L00 COMM ROOM 04	N/A	N/A
ETE L00 COMM ROOM 05	N/A	N/A
ETE L00 COMM ROOM 29	N/A	N/A
ETE L00 COMM ROOM 30	N/A	N/A
ETE L00 F&b 01	NO (-94%)	NO
ETE L00 FOH CIRCULATION 02	NO (-3.6%)	NO
ETE L00 FOH CIRCULATION 03	NO (-86.9%)	NO
ETE L00 FOH CIRCULATION 03	NO (-42.4%)	NO
ETE L00 FOH CIRCULATION 04	NO (-1.7%)	NO
ETE L00 FOH CIRCULATION 17	N/A	N/A
ETE L00 FOH CIRCULATION 56	NO (-92.8%)	NO
ETE L00 FOH CIRCULATION 63	NO (-19%)	NO
ETE L00 FOH CIRCULATION (GLA[redacted]+194.1%)		NO
ETE L00 OFFICE 03	N/A	N/A
ETE L00 OFFICE 04	N/A	N/A
ETE L00 OFFICE 05	N/A	N/A
ETE L00 OFFICE 06	N/A	N/A
ETE L00 OFFICE 23	N/A	N/A
ETE L00 RETAIL 01	NO (-93.9%)	NO
ETE L00 RETAIL 02	NO (-94%)	NO
ETE L10 COMM ROOM 07	NO (-81.9%)	NO
ETE L10 COMM ROOM 08	N/A	N/A
ETE L10 COMM ROOM 09	N/A	N/A
ETE L10 F&b 03	NO (-98.5%)	NO
ETE L10 F&b 04	NO (-98.5%)	NO
ETE L10 F&b 05	NO (-88%)	NO
ETE L10 F&b 06	NO (-80.5%)	NO
ETE L10 F&b 07	NO (-9.6%)	NO
ETE L10 FOH CIRCULATION 06	NO (-99.5%)	NO
ETE L10 FOH CIRCULATION 07	NO (-99.3%)	NO
ETE L10 FOH CIRCULATION 08	NO (-95.5%)	NO
ETE L10 FOH CIRCULATION 09	NO (-85.1%)	NO
ETE L10 FOH CIRCULATION 10	NO (-87.3%)	NO
ETE L10 FOH CIRCULATION 11	NO (-81.1%)	NO
ETE L10 FOH CIRCULATION 12	NO (-93.9%)	NO
ETE L10 FOH CIRCULATION 13	NO (-91.2%)	NO
ETE L10 FOH CIRCULATION 14	NO (-93.5%)	NO
ETE L10 FOH CIRCULATION 15	NO (-88.2%)	NO
ETE L10 FOH CIRCULATION 16	NO (-81.9%)	NO
ETE L10 FOH CIRCULATION 18	NO (-6.3%)	NO
ETE L10 FOH CIRCULATION 19	NO (-65.4%)	NO
ETE L10 FOH CIRCULATION 20	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
ETE L10 FOH CICULATION 23	NO (-76.4%)	NO
ETE L10 FOH CICULATION 26	NO (-7.4%)	NO
ETE L10 FOH CICULATION 27	NO (-38.5%)	NO
ETE L10 FOH CIRCULATION (COOL) 03	NO (-84.4%)	NO
ETE L10 GATE 01	NO (-7.9%)	NO
ETE L10 LOUNGE 01	NO (-94.4%)	NO
ETE L10 LOUNGE 02	NO (-91.4%)	NO
ETE L10 LOUNGE 03	NO (-90.2%)	NO
ETE L10 LOUNGE 04	NO (-92.8%)	NO
ETE L10 LOUNGE 05	NO (-89.7%)	NO
ETE L10 LOUNGE 06	NO (-90%)	NO
ETE L10 LOUNGE 07	NO (-81.3%)	NO
ETE L10 OFFICE 08	N/A	N/A
ETE L10 OFFICE 09	NO (-37.6%)	NO
ETE L10 OFFICE 09	YES (+91.9%)	NO
ETE L10 RETAIL 04	NO (-97.8%)	NO
ETE L10 RETAIL 05	NO (-97.8%)	NO
ETE L10 RETAIL 06	N/A	N/A
ETE L10 RETAIL 07	NO (-91.1%)	NO
ETE L10 RETAIL 08	NO (-93.8%)	NO
ETE L20 COMM ROOM 10	N/A	N/A
ETE L20 COMM ROOM 11	N/A	N/A
ETE L20 OFFICE 14	N/A	N/A
ETE L20 OFFICE 15	NO (-25.6%)	NO
ETE L20 OFFICE 16	N/A	N/A
ETE L20 OFFICE 17	N/A	N/A
ETE L20 OFFICE 19	N/A	N/A
ETE L20 OFFICE 22	NO (-47.7%)	NO
ETE L20 RETAIL 09	NO (-36.2%)	NO
NEP L00 FOH CICULATION 28	NO (-30.1%)	NO
NEP L00 FOH CICULATION 28	NO (-30.5%)	NO
NEP L00 FOH CICULATION 28	NO (-98.8%)	NO
NEP L00 FOH CICULATION 28	N/A	N/A
NEP L00 FOH CICULATION 28	N/A	N/A
NEP L10 FOH CICULATION 21	NO (-75.6%)	NO
NEP L10 FOH CICULATION 21	NO (-82.3%)	NO
NEP L10 FOH CICULATION 21	NO (-80%)	NO
NEP L10 FOH CICULATION 29	N/A	N/A
NEP L10 FOH CICULATION 30	N/A	N/A
NEP L10 FOH CICULATION 31	N/A	N/A
NEP L10 FOH CICULATION 32	NO (-76.2%)	NO
NEP L10 FOH CICULATION 33	N/A	N/A
NEP L10 FOH CICULATION 34	NO (-76.2%)	NO
NEP L10 FOH CICULATION 35	N/A	N/A
NEP L10 FOH CICULATION 36	NO (-76.2%)	NO
NEP L10 FOH CICULATION 37	N/A	N/A
NEP L10 FOH CICULATION 45	NO (-76.2%)	NO
NEP L10 FOH CICULATION 46	N/A	N/A
NEP L10 FOH CICULATION 47	NO (-76.2%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
NEP L10 FOH CICULATION 48	N/A	N/A
NEP L10 FOH CICULATION 49	NO (-76.2%)	NO
NEP L10 FOH CICULATION 50	N/A	N/A
NEP L10 FOH CICULATION 54	NO (-95.7%)	NO
NEP L10 FOH CICULATION 60	NO (-76.2%)	NO
NEP L10 FOH CICULATION 61	NO (-76.3%)	NO
NEP L10 FOH CICULATION 62	NO (-76.4%)	NO
NEP L10 FOH CIRCULATION (COOL_NO2	NO (-84.4%)	NO
NEP L10 FOH CIRCULATION (COOL_NO3	NO (-84.2%)	NO
NEP L10 FOH CIRCULATION (COOL_NO4	NO (-84.2%)	NO
NEP L10 FOH CIRCULATION (COOL_NO5	NO (-84.2%)	NO
NEP L10 FOH CIRCULATION (COOL_NO9	NO (-84.2%)	NO
NEP L10 FOH CIRCULATION (COOL_NO22	NO (-84.3%)	NO
NEP L10 FOH CIRCULATION (COOL_NO23	NO (-84.2%)	NO
NEP L10 FOH CIRCULATION (COOL_NO24	NO (-84.2%)	NO
NEP L10 FOH CIRCULATION (COOL_NO25	NO (-84.2%)	NO
NEP L10 GATE 02	NO (-7.1%)	NO
NEP L10 GATE 03	NO (-7.1%)	NO
NEP L10 GATE 04	NO (-5.4%)	NO
NEP L10 GATE 05	NO (-5.4%)	NO
NEP L10 GATE 06	NO (-5.4%)	NO
NEP L10 GATE 07	NO (-5.4%)	NO
NEP L10 GATE 08	NO (-5.4%)	NO
NEP L10 GATE 09	NO (-5.4%)	NO
NEP L10 GATE 10	NO (-7.5%)	NO
NEP L10 GATE 11	NO (-84.7%)	NO
NEP L20 COMM ROOM 12	NO (-100%)	NO
NEP L20 COMM ROOM 13	N/A	N/A
NEP L20 COMM ROOM 14	N/A	N/A
NEP L20 COMM ROOM 15	N/A	N/A
NEP L20 COMM ROOM 19	N/A	N/A
NEP L20 COMM ROOM 20	N/A	N/A
NEP L20 COMM ROOM 21	N/A	N/A
NEP L20 COMM ROOM 22	N/A	N/A
NEP L20 COMM ROOM 23	N/A	N/A
NEP L20 COMM ROOM 24	N/A	N/A
NEP L20 COMM ROOM 25	N/A	N/A
NEP L20 COMM ROOM 26	N/A	N/A
NEP L20 COMM ROOM 27	N/A	N/A
NEP L20 COMM ROOM 28	N/A	N/A
NEP L20 FOH CICULATION 05	NO (-74.4%)	NO
NEP L20 FOH CICULATION 22	N/A	N/A
NEP L20 FOH CICULATION 38	N/A	N/A
NEP L20 FOH CICULATION 39	N/A	N/A
NEP L20 FOH CICULATION 40	N/A	N/A
NEP L20 FOH CICULATION 41	N/A	N/A
NEP L20 FOH CICULATION 42	N/A	N/A
NEP L20 FOH CICULATION 43	N/A	N/A
NEP L20 FOH CICULATION 44	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
NEP L20 FOH CICULATION 51	N/A	N/A
NEP L20 FOH CICULATION 52	N/A	N/A
NEP L20 FOH CICULATION 53	NO (-98.9%)	NO
NEP L20 FOH CICULATION 55	NO (-99.6%)	NO
NEP L20 FOH CICULATION 57	NO (-80.1%)	NO
NEP L20 FOH CICULATION 58	NO (-96%)	NO
NEP L20 FOH CICULATION 59	NO (-94.3%)	NO
NEP L20 FOH CICULATION 59	NO (-41.4%)	NO
NEP L20 FOH CICULATION 59	NO (-49.2%)	NO
NEP L20 FOH CIRCULATION (COOL	NO (-68.9%)	NO
NEP L20 FOH CIRCULATION (COOL	NO (-69.7%)	NO
NEP L20 FOH CIRCULATION (COOL	NO (-68.7%)	NO
NEP L20 FOH CIRCULATION (COOL	NO (-68.7%)	NO
NEP L20 FOH CIRCULATION (COOL	NO (-68.7%)	NO
NEP L20 FOH CIRCULATION (COOL	NO (-68.7%)	NO
NEP L20 FOH CIRCULATION (COOL	NO (-68.7%)	NO
NEP L20 FOH CIRCULATION (COOL	NO (-68.7%)	NO
NEP L20 FOH CIRCULATION (COOL	NO (-68.7%)	NO
NEP L20 FOH CIRCULATION (COOL	NO (-68.7%)	NO
NEP L20 FOH CIRCULATION (COOL	NO (-88.2%)	NO
NEP L20 FOH CIRCULATION (COOL	NO (-88.2%)	NO
NEP L20 FOH CIRCULATION (COOL	NO (-88.2%)	NO
NEP L20 FOH CIRCULATION (COOL	NO (-88.2%)	NO
NEP L20 FOH CIRCULATION (COOL	NO (-68.8%)	NO
NEP L20 FOH CIRCULATION (COOL	NO (-88.2%)	NO
NEP L20 FOH CIRCULATION (COOL	NO (-86.8%)	NO
NEP L20 FOH CIRCULATION (COOL	NO (-88.2%)	NO
NEP L20 FOH CIRCULATION (COOL	NO (-89.7%)	NO
NEP L20 FOH CIRCULATION (COOL	NO (-89.7%)	NO
NEP L20 OFFICE 20	N/A	N/A
WTE L00 BAGGAGE	N/A	N/A
WTE L00 CIRCULATION (FCU)	NO (-91.3%)	NO
WTE L00 COMM ROOM 01	N/A	N/A
WTE L00 COMM ROOM 02	N/A	N/A
WTE L00 COMM ROOM 16	N/A	N/A
WTE L00 COMM ROOM 17	N/A	N/A
WTE L00 FOH CICULATION 01	N/A	N/A
WTE L00 FOH CICULATION 24	N/A	N/A
WTE L00 FOH CICULATION 25	N/A	N/A
WTE L00 IMMIGRATION	N/A	N/A
WTE L00 OFFICE 01	N/A	N/A
WTE L00 OFFICE 02	NO (-90.8%)	NO
WTE L10 BOH CIRCULATION 47	NO (-43%)	NO
WTE L10 COMM ROOM 06	N/A	N/A
WTE L10 F&b 02	N/A	N/A
WTE L10 OFFICE 07	N/A	N/A
WTE L10 RETAIL 03	N/A	N/A
WTE L10 SECURITY HALL	NO (-96.7%)	NO
WTE L10 SECURITY PREP AREA	NO (-98.6%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
WTE L10 SECURITY QUEUE AREA	NO (-93%)	NO
WTE L20 CHILLED STORE	N/A	N/A
WTE L20 COMM ROOM 18	N/A	N/A
WTE L20 OFFICE 10	NO (-86.9%)	NO
WTE L20 OFFICE 11	NO (-54%)	NO
WTE L20 OFFICE 12	N/A	N/A
WTE L20 OFFICE 13	N/A	N/A
WTE L20 OFFICE 21	N/A	N/A

Criterion 4: The performance of the building, as built, should be consistent with the BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	34380.4	34380.4
External area [m²]	51360.7	51360.7
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	5	5
Average conductance [W/K]	15801.3	19176.6
Average U-value [W/m²K]	0.31	0.37
Alpha value* [%]	9.91	10

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Inst.: Hospitals and Care Homes
	C2 Residential Inst.: Residential schools
	C2 Residential Inst.: Universities and colleges
	C2A Secure Residential Inst.
	Residential spaces
	D1 Non-residential Inst.: Community/Day Centre
	D1 Non-residential Inst.: Libraries, Museums, and Galleries
	D1 Non-residential Inst.: Education
	D1 Non-residential Inst.: Primary Health Care Building
	D1 Non-residential Inst.: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs and Theatres
100	**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	8.17	15.48
Cooling	6.7	7.7
Auxiliary	41.14	36.51
Lighting	13.92	24.55
Hot water	29.37	27.49
Equipment*	78.05	78.05
TOTAL**	88.3	111.74

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

Energy Production by Technology [kWh/m²]

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

Energy & CO_2 Emissions Summary

	Actual	Indicative Target
Heating + cooling demand [MJ/m²]	101.81	151.45
Primary energy* [kWh/m²]	218.63	244.62
Total emissions [kg/m²]	38.6	43.2

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	31.1	161.6	10.1	13.5	31	0.85	3.34	0.92	4.19
	Notional	55.8	152.4	18.6	11.2	38.9	0.83	3.79	—	—
[ST] Single-duct VAV, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	26.9	70.6	9.2	6.4	66.2	0.81	3.06	0.92	4.19
	Notional	46.6	132.1	15.5	9.7	52.7	0.83	3.79	—	—
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	12.8	1.2	4	0.1	0	0.9	4.9	0.92	6.56
	Notional	15.4	1.4	5.1	0.1	0	0.83	3.79	—	—
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	91.3	0	29.3	0	48.3	0.86	0	0.92	0
	Notional	108.9	0	36.3	0	43.2	0.83	0	—	—
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	36.4	0	11.7	0	2.5	0.86	0	0.92	0
	Notional	145.2	0	48.4	0	2.5	0.83	0	—	—
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	—	—

Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption
Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER = Cooling system seasonal energy efficiency ratio
Heat gen SSEFF = Heating generator seasonal efficiency
Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

Key Features

The BCD can give particular attention to items with specifications that are better than typically expected.

Building fabric

Element	$U_{i,typ}$	$U_{i,min}$	Surface where the minimum value occours*
Wall	0.23	0.2	RM000056:Surf[1]
Floor	0.2	0.18	RM00004C:Surf[0]
Roof	0.15	0.15	TL000006:Surf[1]
Windows, roof windows, and rooflights	1.5	0.97	RM00000D4:Surf[0]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i,typ}$ = Typical individual element U-values [W/(m²K)] $U_{i,min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5

A.3. BRUKL extract “Be Clean” – Terminal buildings

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L 2010

Project name

LCA CADP CHP Clean

As designed

Date: Mon Jan 15 17:41:05 2018

Administrative information

Building Details

Address: Hartman Road, London, E16 2PX

Certification tool

Calculation engine: Apache

Calculation engine version: 6.4.0.15

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 6.4.0.15

BRUKL compliance check version: v4.1.g.0

Owner Details

Name: London City Airport

Telephone number: Phone

Address: Hartman Road, London, E16 2PX

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

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

1.1	CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	43.4
1.2	Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	43.4
1.3	Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	34.3
1.4	Are emissions from the building less than or equal to the target?	BER =< TER
1.5	Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services should achieve reasonable overall standards of energy efficiency

2.a Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.2	0.2	RM000055:Surf[1]
Floor	0.25	0.18	0.18	RM00004C:Surf[0]
Roof	0.25	0.15	0.15	TL000006:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.27	1.7	L0000051:Surf[3]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	5

2.b Building services

The building services parameters listed below are expected to be checked by the BCO against guidance. No automatic checking is performed by the tool.

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- Heating and Mechanical Ventilation

Heating seasonal efficiency	Cooling nominal efficiency	SFP [W/(l/s)]	HR seasonal efficiency
0.92	-	0	0.7
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

2- VAV System

Heating seasonal efficiency	Cooling nominal efficiency	SFP [W/(l/s)]	HR seasonal efficiency
0.92	4.19	1.65	0.7
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

3- DX System

Heating seasonal efficiency	Cooling nominal efficiency	SFP [W/(l/s)]	HR seasonal efficiency
4.54	6.56	0	0.73
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

4- Fan Coil System

Heating seasonal efficiency	Cooling nominal efficiency	SFP [W/(l/s)]	HR seasonal efficiency
0.92	4.19	1.65	0.7
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

5- Heating and Mechanical Extract

Heating seasonal efficiency	Cooling nominal efficiency	SFP [W/(l/s)]	HR seasonal efficiency
0.92	-	0	0.7
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

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

Local mechanical ventilation and exhaust

Zone	Supply/extract SFP [W/(l/s)]	HR seasonal efficiency	Exhaust SFP [W/(l/s)]
ETE L10 WC (ELEC DHW) 03	-	-	0.45
NEP L10 WC (ELEC DHW) 14	-	-	0.45
NEP L10 WC (ELEC DHW) 15	-	-	0.45
NEP L10 WC (ELEC DHW) 16	-	-	0.45
NEP L10 WC (ELEC DHW) 17	-	-	0.45
NEP L10 WC (ELEC DHW) 18	-	-	0.45
NEP L10 WC (ELEC DHW) 19	-	-	0.45
NEP L10 WC (ELEC DHW) 27	-	-	0.45
NEP L10 WC (ELEC DHW) 28	-	-	0.45
NEP L10 WC (ELEC DHW) 29	-	-	0.45
NEP L20 STORAGE 19	-	-	0.25
NEP L20 STORAGE 25	-	-	0.25
NEP L20 STORAGE 28	-	-	0.25
NEP L20 STORAGE 31	-	-	0.25
NEP L20 STORAGE 34	-	-	0.25
NEP L20 STORAGE 37	-	-	0.25
NEP L20 STORAGE 40	-	-	0.25

Local mechanical ventilation and exhaust

Zone	Supply/extract SFP [W/(l/s)]	HR seasonal efficiency	Exhaust SFP [W/(l/s)]
NEP L20 STORAGE 43	-	-	0.25
NEP L20 STORAGE 46	-	-	0.25
NEP L20 STORAGE 49	-	-	0.25
NEP L20 WC (ELEC DHW) 01	-	-	0.45
NEP L20 WC (ELEC DHW) 02	-	-	0.45
NEP L20 WC (ELEC DHW) 04	-	-	0.45
NEP L20 WC (ELEC DHW) 05	-	-	0.45
NEP L20 WC (ELEC DHW) 06	-	-	0.45
NEP L20 WC (ELEC DHW) 07	-	-	0.45
NEP L20 WC (ELEC DHW) 08	-	-	0.45
NEP L20 WC (ELEC DHW) 09	-	-	0.45
NEP L20 WC (ELEC DHW) 10	-	-	0.45
NEP L20 WC (ELEC DHW) 11	-	-	0.45
NEP L20 WC (ELEC DHW) 12	-	-	0.45
NEP L20 WC (ELEC DHW) 13	-	-	0.45
NEP L20 WC (ELEC DHW) 20	-	-	0.45
NEP L20 WC (ELEC DHW) 21	-	-	0.45
NEP L20 WC (ELEC DHW) 22	-	-	0.45
NEP L20 WC (ELEC DHW) 23	-	-	0.45
NEP L20 WC (ELEC DHW) 24	-	-	0.45
NEP L20 WC (ELEC DHW) 25	-	-	0.45
NEP L20 WC (ELEC DHW) 26	-	-	0.45
NEP L20 WC (ELEC DHW) 30	-	-	0.45
NEP L20 WC (ELEC DHW) 31	-	-	0.45

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
ETE L00 BOH CIRCULATION 05	40	-
ETE L00 BOH CIRCULATION 06	460	-
ETE L00 BOH CIRCULATION 07	50	-
ETE L00 BOH CIRCULATION 49	10	-
ETE L00 BOH CIRCULATION 80	40	-
ETE L00 BOH CIRCULATION 81	50	-
ETE L00 BOH CIRCULATION 82	100	-
ETE L00 CHANGING ROOM 10	280	-
ETE L00 CHECK-IN	2660	-
ETE L00 COMM ROOM 03	80	-
ETE L00 COMM ROOM 04	70	-
ETE L00 COMM ROOM 05	170	-
ETE L00 COMM ROOM 29	220	-
ETE L00 COMM ROOM 30	130	-
ETE L00 F&b 01	160	-
ETE L00 FOH CICULATION 02	120	-
ETE L00 FOH CICULATION 03	270	-
ETE L00 FOH CICULATION 03	1070	-
ETE L00 FOH CICULATION 04	500	-
ETE L00 FOH CICULATION 17	40	-

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
ETE L00 FOH CICULATION 56	350	-
ETE L00 FOH CICULATION 63	360	-
ETE L00 FOH CIRCULATION (GLASS BOX)	[illegible]	-
ETE L00 OFFICE 03	150	-
ETE L00 OFFICE 04	400	-
ETE L00 OFFICE 05	190	-
ETE L00 OFFICE 06	860	-
ETE L00 OFFICE 23	410	-
ETE L00 PLANT ROOM	140	-
ETE L00 RETAIL 01	150	-
ETE L00 RETAIL 02	450	-
ETE L00 STORAGE 01	20	-
ETE L00 STORAGE 02	30	-
ETE L00 WC 01	280	-
ETE L10 BOH CIRCULATION 11	20	-
ETE L10 BOH CIRCULATION 12	20	-
ETE L10 BOH CIRCULATION 13	80	-
ETE L10 BOH CIRCULATION 14	0	-
ETE L10 BOH CIRCULATION 15	0	-
ETE L10 BOH CIRCULATION 16	30	-
ETE L10 BOH CIRCULATION 17	230	-
ETE L10 BOH CIRCULATION 18	370	-
ETE L10 BOH CIRCULATION 19	250	-
ETE L10 BOH CIRCULATION 20	130	-
ETE L10 BOH CIRCULATION 21	500	-
ETE L10 BOH CIRCULATION 22	40	-
ETE L10 BOH CIRCULATION 23	40	-
ETE L10 BOH CIRCULATION 24	40	-
ETE L10 BOH CIRCULATION 25	40	-
ETE L10 BOH CIRCULATION 48	20	-
ETE L10 BOH CIRCULATION 78	130	-
ETE L10 BOH CIRCULATION 79	40	-
ETE L10 CHANGING ROOM 01	140	-
ETE L10 CHANGING ROOM 02	60	-
ETE L10 COMM ROOM 07	80	-
ETE L10 COMM ROOM 08	400	-
ETE L10 COMM ROOM 09	390	-
ETE L10 F&b 03	340	-
ETE L10 F&b 04	330	-
ETE L10 F&b 05	170	-
ETE L10 F&b 06	140	-
ETE L10 F&b 07	1710	-
ETE L10 FOH CICULATION 06	190	-
ETE L10 FOH CICULATION 07	140	-
ETE L10 FOH CICULATION 08	690	-
ETE L10 FOH CICULATION 09	100	-
ETE L10 FOH CICULATION 10	120	-

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
ETE L10 FOH CICULATION 11	30	-
ETE L10 FOH CICULATION 12	50	-
ETE L10 FOH CICULATION 13	60	-
ETE L10 FOH CICULATION 14	40	-
ETE L10 FOH CICULATION 15	60	-
ETE L10 FOH CICULATION 16	20	-
ETE L10 FOH CICULATION 18	460	-
ETE L10 FOH CICULATION 19	0	-
ETE L10 FOH CICULATION 20	20	-
ETE L10 FOH CICULATION 23	70	-
ETE L10 FOH CICULATION 26	50	-
ETE L10 FOH CICULATION 27	140	-
ETE L10 FOH CIRCULATION (COOL) 03	80	-
ETE L10 GATE 01	390	-
ETE L10 KITCHEN 01	310	-
ETE L10 LOUNGE 01	370	-
ETE L10 LOUNGE 02	20	-
ETE L10 LOUNGE 03	210	-
ETE L10 LOUNGE 04	470	-
ETE L10 LOUNGE 05	510	-
ETE L10 LOUNGE 06	840	-
ETE L10 LOUNGE 07	140	-
ETE L10 OFFICE 08	190	-
ETE L10 OFFICE 09	460	-
ETE L10 OFFICE 09	4230	-
ETE L10 RETAIL 04	760	-
ETE L10 RETAIL 05	980	-
ETE L10 RETAIL 06	180	-
ETE L10 RETAIL 07	100	-
ETE L10 RETAIL 08	60	-
ETE L10 STORAGE 04	40	-
ETE L10 STORAGE 05	20	-
ETE L10 STORAGE 06	20	-
ETE L10 STORAGE 07	30	-
ETE L10 STORAGE 08	80	-
ETE L10 STORAGE 09	80	-
ETE L10 STORAGE 10	90	-
ETE L10 STORAGE 11	180	-
ETE L10 WC (ELEC DHW) 03	40	-
ETE L10 WC 02	600	-
ETE L10 WC 03	570	-
ETE L10 WC 04	110	-
ETE L10 WC 05	110	-
ETE L20 BOH CIRCULATION 30	30	-
ETE L20 BOH CIRCULATION 31	20	-
ETE L20 BOH CIRCULATION 32	20	-
ETE L20 BOH CIRCULATION 33	240	-

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
ETE L20 BOH CIRCULATION 34	100	-
ETE L20 BOH CIRCULATION 35	90	-
ETE L20 BOH CIRCULATION 36	80	-
ETE L20 BOH CIRCULATION 37	1000	-
ETE L20 CHANGING ROOM 04	360	-
ETE L20 COMM ROOM 10	50	-
ETE L20 COMM ROOM 11	310	-
ETE L20 KITCHEN 02	190	-
ETE L20 OFFICE 14	240	-
ETE L20 OFFICE 15	240	-
ETE L20 OFFICE 16	260	-
ETE L20 OFFICE 17	310	-
ETE L20 OFFICE 18	30	-
ETE L20 OFFICE 19	170	-
ETE L20 OFFICE 22	7620	-
ETE L20 RETAIL 09	1180	-
ETE L20 STORAGE 13	20	-
ETE L20 STORAGE 14	20	-
ETE L20 STORAGE 15	50	-
ETE L20 STORAGE 16	20	-
ETE L20 STORAGE 17	10	-
ETE L20 WC 07	540	-
ETE L20 WC 08	410	-
NEP L00 FOH CIRCULATION 28	2490	-
NEP L00 FOH CIRCULATION 28	340	-
NEP L00 FOH CIRCULATION 28	340	-
NEP L00 FOH CIRCULATION 28	200	-
NEP L00 FOH CIRCULATION 28	110	-
NEP L10 FOH CIRCULATION 21	300	-
NEP L10 FOH CIRCULATION 21	1780	-
NEP L10 FOH CIRCULATION 21	280	-
NEP L10 FOH CIRCULATION 29	20	-
NEP L10 FOH CIRCULATION 30	20	-
NEP L10 FOH CIRCULATION 31	20	-
NEP L10 FOH CIRCULATION 32	70	-
NEP L10 FOH CIRCULATION 33	20	-
NEP L10 FOH CIRCULATION 34	70	-
NEP L10 FOH CIRCULATION 35	20	-
NEP L10 FOH CIRCULATION 36	70	-
NEP L10 FOH CIRCULATION 37	20	-
NEP L10 FOH CIRCULATION 45	70	-
NEP L10 FOH CIRCULATION 46	20	-
NEP L10 FOH CIRCULATION 47	70	-
NEP L10 FOH CIRCULATION 48	20	-
NEP L10 FOH CIRCULATION 49	70	-
NEP L10 FOH CIRCULATION 50	20	-
NEP L10 FOH CIRCULATION 54	180	-

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
NEP L10 FOH CICULATION 60	70	-
NEP L10 FOH CICULATION 61	70	-
NEP L10 FOH CICULATION 62	70	-
NEP L10 FOH CIRCULATION (COOL702		-
NEP L10 FOH CIRCULATION (COOL703		-
NEP L10 FOH CIRCULATION (COOL704		-
NEP L10 FOH CIRCULATION (COOL705		-
NEP L10 FOH CIRCULATION (COOL709		-
NEP L10 FOH CIRCULATION (COOL722		-
NEP L10 FOH CIRCULATION (COOL723		-
NEP L10 FOH CIRCULATION (COOL724		-
NEP L10 FOH CIRCULATION (COOL725		-
NEP L10 GATE 02	470	-
NEP L10 GATE 03	470	-
NEP L10 GATE 04	470	-
NEP L10 GATE 05	470	-
NEP L10 GATE 06	470	-
NEP L10 GATE 07	470	-
NEP L10 GATE 08	470	-
NEP L10 GATE 09	470	-
NEP L10 GATE 10	470	-
NEP L10 GATE 11	850	-
NEP L10 WC (ELEC DHW) 14	40	-
NEP L10 WC (ELEC DHW) 15	40	-
NEP L10 WC (ELEC DHW) 16	40	-
NEP L10 WC (ELEC DHW) 17	40	-
NEP L10 WC (ELEC DHW) 18	40	-
NEP L10 WC (ELEC DHW) 19	40	-
NEP L10 WC (ELEC DHW) 27	40	-
NEP L10 WC (ELEC DHW) 28	40	-
NEP L10 WC (ELEC DHW) 29	40	-
NEP L20 BOH CIRCULATION 38	50	-
NEP L20 BOH CIRCULATION 39	40	-
NEP L20 BOH CIRCULATION 40	60	-
NEP L20 BOH CIRCULATION 41	30	-
NEP L20 BOH CIRCULATION 42	30	-
NEP L20 BOH CIRCULATION 50	40	-
NEP L20 BOH CIRCULATION 51	30	-
NEP L20 BOH CIRCULATION 52	30	-
NEP L20 BOH CIRCULATION 53	40	-
NEP L20 BOH CIRCULATION 54	30	-
NEP L20 BOH CIRCULATION 55	30	-
NEP L20 BOH CIRCULATION 56	40	-
NEP L20 BOH CIRCULATION 57	30	-
NEP L20 BOH CIRCULATION 58	30	-
NEP L20 BOH CIRCULATION 59	40	-
NEP L20 BOH CIRCULATION 60	30	-

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
NEP L20 BOH CIRCULATION 61	30	-
NEP L20 BOH CIRCULATION 62	40	-
NEP L20 BOH CIRCULATION 63	30	-
NEP L20 BOH CIRCULATION 64	30	-
NEP L20 BOH CIRCULATION 65	40	-
NEP L20 BOH CIRCULATION 66	30	-
NEP L20 BOH CIRCULATION 67	30	-
NEP L20 BOH CIRCULATION 68	40	-
NEP L20 BOH CIRCULATION 69	30	-
NEP L20 BOH CIRCULATION 70	30	-
NEP L20 BOH CIRCULATION 71	40	-
NEP L20 BOH CIRCULATION 72	30	-
NEP L20 BOH CIRCULATION 73	30	-
NEP L20 BOH CIRCULATION 74	40	-
NEP L20 BOH CIRCULATION 75	30	-
NEP L20 BOH CIRCULATION 76	30	-
NEP L20 CHANGING ROOM 05	150	-
NEP L20 CHANGING ROOM 06	120	-
NEP L20 CHANGING ROOM 07	160	-
NEP L20 CHANGING ROOM 08	110	-
NEP L20 COMM ROOM 12	100	-
NEP L20 COMM ROOM 13	80	-
NEP L20 COMM ROOM 14	80	-
NEP L20 COMM ROOM 15	80	-
NEP L20 COMM ROOM 19	430	-
NEP L20 COMM ROOM 20	430	-
NEP L20 COMM ROOM 21	430	-
NEP L20 COMM ROOM 22	430	-
NEP L20 COMM ROOM 23	160	-
NEP L20 COMM ROOM 24	80	-
NEP L20 COMM ROOM 25	110	-
NEP L20 COMM ROOM 26	80	-
NEP L20 COMM ROOM 27	430	-
NEP L20 COMM ROOM 28	430	-
NEP L20 FOH CICULATION 05	360	-
NEP L20 FOH CICULATION 22	20	-
NEP L20 FOH CICULATION 38	20	-
NEP L20 FOH CICULATION 39	20	-
NEP L20 FOH CICULATION 40	20	-
NEP L20 FOH CICULATION 41	20	-
NEP L20 FOH CICULATION 42	20	-
NEP L20 FOH CICULATION 43	20	-
NEP L20 FOH CICULATION 44	20	-
NEP L20 FOH CICULATION 51	20	-
NEP L20 FOH CICULATION 52	20	-
NEP L20 FOH CICULATION 53	210	-
NEP L20 FOH CICULATION 55	180	-

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
NEP L20 FOH CICULATION 57	290	-
NEP L20 FOH CICULATION 58	570	-
NEP L20 FOH CICULATION 59	300	-
NEP L20 FOH CICULATION 59	2300	-
NEP L20 FOH CICULATION 59	300	-
NEP L20 FOH CIRCULATION (COOL	100	-
NEP L20 FOH CIRCULATION (COOL	102	-
NEP L20 FOH CIRCULATION (COOL	104	-
NEP L20 FOH CIRCULATION (COOL	106	-
NEP L20 FOH CIRCULATION (COOL	106	-
NEP L20 FOH CIRCULATION (COOL	100	-
NEP L20 FOH CIRCULATION (COOL	108	-
NEP L20 FOH CIRCULATION (COOL	109	-
NEP L20 FOH CIRCULATION (COOL	120	-
NEP L20 FOH CIRCULATION (COOL	121	-
NEP L20 FOH CIRCULATION (COOL	116	-
NEP L20 FOH CIRCULATION (COOL	110	-
NEP L20 FOH CIRCULATION (COOL	118	-
NEP L20 FOH CIRCULATION (COOL	120	-
NEP L20 FOH CIRCULATION (COOL	120	-
NEP L20 FOH CIRCULATION (COOL	126	-
NEP L20 FOH CIRCULATION (COOL	120	-
NEP L20 FOH CIRCULATION (COOL	128	-
NEP L20 FOH CIRCULATION (COOL	129	-
NEP L20 FOH CIRCULATION (COOL	130	-
NEP L20 OFFICE 20	280	-
NEP L20 STORAGE 18	10	-
NEP L20 STORAGE 19	10	-
NEP L20 STORAGE 20	10	-
NEP L20 STORAGE 21	30	-
NEP L20 STORAGE 25	10	-
NEP L20 STORAGE 26	10	-
NEP L20 STORAGE 27	30	-
NEP L20 STORAGE 28	10	-
NEP L20 STORAGE 29	10	-
NEP L20 STORAGE 30	30	-
NEP L20 STORAGE 31	10	-
NEP L20 STORAGE 32	10	-
NEP L20 STORAGE 33	30	-
NEP L20 STORAGE 34	10	-
NEP L20 STORAGE 35	10	-
NEP L20 STORAGE 36	30	-
NEP L20 STORAGE 37	10	-
NEP L20 STORAGE 38	10	-
NEP L20 STORAGE 39	30	-
NEP L20 STORAGE 40	10	-
NEP L20 STORAGE 41	10	-

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
NEP L20 STORAGE 42	30	-
NEP L20 STORAGE 43	10	-
NEP L20 STORAGE 44	10	-
NEP L20 STORAGE 45	30	-
NEP L20 STORAGE 46	10	-
NEP L20 STORAGE 47	10	-
NEP L20 STORAGE 48	30	-
NEP L20 STORAGE 49	10	-
NEP L20 STORAGE 50	10	-
NEP L20 STORAGE 51	30	-
NEP L20 WC (ELEC DHW) 01	40	-
NEP L20 WC (ELEC DHW) 02	40	-
NEP L20 WC (ELEC DHW) 04	40	-
NEP L20 WC (ELEC DHW) 05	40	-
NEP L20 WC (ELEC DHW) 06	40	-
NEP L20 WC (ELEC DHW) 07	40	-
NEP L20 WC (ELEC DHW) 08	40	-
NEP L20 WC (ELEC DHW) 09	40	-
NEP L20 WC (ELEC DHW) 10	40	-
NEP L20 WC (ELEC DHW) 11	40	-
NEP L20 WC (ELEC DHW) 12	40	-
NEP L20 WC (ELEC DHW) 13	40	-
NEP L20 WC (ELEC DHW) 20	40	-
NEP L20 WC (ELEC DHW) 21	40	-
NEP L20 WC (ELEC DHW) 22	40	-
NEP L20 WC (ELEC DHW) 23	40	-
NEP L20 WC (ELEC DHW) 24	40	-
NEP L20 WC (ELEC DHW) 25	40	-
NEP L20 WC (ELEC DHW) 26	40	-
NEP L20 WC (ELEC DHW) 30	40	-
NEP L20 WC (ELEC DHW) 31	40	-
WTE L00 BAGGAGE	1760	-
WTE L00 BOH CIRCULATION 01	70	-
WTE L00 BOH CIRCULATION 02	50	-
WTE L00 BOH CIRCULATION 03	40	-
WTE L00 BOH CIRCULATION 04	40	-
WTE L00 BOH CIRCULATION 44	90	-
WTE L00 CIRCULATION (FCU)	540	-
WTE L00 COMM ROOM 01	80	-
WTE L00 COMM ROOM 02	80	-
WTE L00 COMM ROOM 16	100	-
WTE L00 COMM ROOM 17	310	-
WTE L00 FOH CICULATION 01	250	-
WTE L00 FOH CICULATION 24	30	-
WTE L00 FOH CICULATION 25	120	-
WTE L00 IMMIGRATION	460	-
WTE L00 OFFICE 01	130	-

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
WTE L00 OFFICE 02	260	-
WTE L00 STORAGE 22	10	-
WTE L00 STORAGE 23	10	-
WTE L00 WC 09	140	-
WTE L00 WC 10	570	-
WTE L10 BOH CIRCULATION 08	0	-
WTE L10 BOH CIRCULATION 09	0	-
WTE L10 BOH CIRCULATION 10	40	-
WTE L10 BOH CIRCULATION 43	50	-
WTE L10 BOH CIRCULATION 45	60	-
WTE L10 BOH CIRCULATION 47	180	-
WTE L10 COMM ROOM 06	310	-
WTE L10 F&b 02	100	-
WTE L10 OFFICE 07	820	-
WTE L10 RETAIL 03	180	-
WTE L10 SECURITY HALL	1890	-
WTE L10 SECURITY PREP AREA	800	-
WTE L10 SECURITY QUEUE AREA	550	-
WTE L10 STORAGE 03	20	-
WTE L10 STORAGE 24	20	-
WTE L20 BOH CIRCULATION 26	110	-
WTE L20 BOH CIRCULATION 26	180	-
WTE L20 BOH CIRCULATION 26	30	-
WTE L20 BOH CIRCULATION 26	40	-
WTE L20 BOH CIRCULATION 26	50	-
WTE L20 BOH CIRCULATION 27	110	-
WTE L20 BOH CIRCULATION 28	70	-
WTE L20 BOH CIRCULATION 29	90	-
WTE L20 BOH CIRCULATION 46	170	-
WTE L20 CHANGING ROOM 03	80	-
WTE L20 CHANGING ROOM 09	440	-
WTE L20 CHILLED STORE	140	-
WTE L20 COMM ROOM 18	300	-
WTE L20 OFFICE 10	160	-
WTE L20 OFFICE 11	1000	-
WTE L20 OFFICE 12	870	-
WTE L20 OFFICE 13	160	-
WTE L20 OFFICE 21	1840	-
WTE L20 STORAGE 12	10	-
WTE L20 WC 06	140	-
WTE L20 WC 11	190	-

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
ETE L00 CHECK-IN	NO (-99.1%)	NO
ETE L00 COMM ROOM 03	N/A	N/A
ETE L00 COMM ROOM 04	N/A	N/A
ETE L00 COMM ROOM 05	N/A	N/A
ETE L00 COMM ROOM 29	N/A	N/A
ETE L00 COMM ROOM 30	N/A	N/A
ETE L00 F&b 01	NO (-94%)	NO
ETE L00 FOH CICULATION 02	NO (-3.6%)	NO
ETE L00 FOH CICULATION 03	NO (-86.9%)	NO
ETE L00 FOH CICULATION 03	NO (-42.4%)	NO
ETE L00 FOH CICULATION 04	NO (-1.7%)	NO
ETE L00 FOH CICULATION 17	N/A	N/A
ETE L00 FOH CICULATION 56	NO (-92.8%)	NO
ETE L00 FOH CICULATION 63	NO (-19%)	NO
ETE L00 FOH CIRCULATION (GLAS	(+194.1%)	NO
ETE L00 OFFICE 03	N/A	N/A
ETE L00 OFFICE 04	N/A	N/A
ETE L00 OFFICE 05	N/A	N/A
ETE L00 OFFICE 06	N/A	N/A
ETE L00 OFFICE 23	N/A	N/A
ETE L00 RETAIL 01	NO (-93.9%)	NO
ETE L00 RETAIL 02	NO (-94%)	NO
ETE L10 COMM ROOM 07	NO (-81.9%)	NO
ETE L10 COMM ROOM 08	N/A	N/A
ETE L10 COMM ROOM 09	N/A	N/A
ETE L10 F&b 03	NO (-98.5%)	NO
ETE L10 F&b 04	NO (-98.5%)	NO
ETE L10 F&b 05	NO (-88%)	NO
ETE L10 F&b 06	NO (-80.5%)	NO
ETE L10 F&b 07	NO (-9.6%)	NO
ETE L10 FOH CICULATION 06	NO (-99.5%)	NO
ETE L10 FOH CICULATION 07	NO (-99.3%)	NO
ETE L10 FOH CICULATION 08	NO (-95.5%)	NO
ETE L10 FOH CICULATION 09	NO (-85.1%)	NO
ETE L10 FOH CICULATION 10	NO (-87.3%)	NO
ETE L10 FOH CICULATION 11	NO (-81.1%)	NO
ETE L10 FOH CICULATION 12	NO (-93.9%)	NO
ETE L10 FOH CICULATION 13	NO (-91.2%)	NO
ETE L10 FOH CICULATION 14	NO (-93.5%)	NO
ETE L10 FOH CICULATION 15	NO (-88.2%)	NO
ETE L10 FOH CICULATION 16	NO (-81.9%)	NO
ETE L10 FOH CICULATION 18	NO (-6.3%)	NO
ETE L10 FOH CICULATION 19	NO (-65.4%)	NO
ETE L10 FOH CICULATION 20	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
ETE L10 FOH CICULATION 23	NO (-76.4%)	NO
ETE L10 FOH CICULATION 26	NO (-7.4%)	NO
ETE L10 FOH CICULATION 27	NO (-38.5%)	NO
ETE L10 FOH CIRCULATION (COOL)03	NO (-84.4%)	NO
ETE L10 GATE 01	NO (-7.9%)	NO
ETE L10 LOUNGE 01	NO (-94.4%)	NO
ETE L10 LOUNGE 02	NO (-91.4%)	NO
ETE L10 LOUNGE 03	NO (-90.2%)	NO
ETE L10 LOUNGE 04	NO (-92.8%)	NO
ETE L10 LOUNGE 05	NO (-89.7%)	NO
ETE L10 LOUNGE 06	NO (-90%)	NO
ETE L10 LOUNGE 07	NO (-81.3%)	NO
ETE L10 OFFICE 08	N/A	N/A
ETE L10 OFFICE 09	NO (-37.6%)	NO
ETE L10 OFFICE 09	YES (+91.9%)	NO
ETE L10 RETAIL 04	NO (-97.8%)	NO
ETE L10 RETAIL 05	NO (-97.8%)	NO
ETE L10 RETAIL 06	N/A	N/A
ETE L10 RETAIL 07	NO (-91.1%)	NO
ETE L10 RETAIL 08	NO (-93.8%)	NO
ETE L20 COMM ROOM 10	N/A	N/A
ETE L20 COMM ROOM 11	N/A	N/A
ETE L20 OFFICE 14	N/A	N/A
ETE L20 OFFICE 15	NO (-25.6%)	NO
ETE L20 OFFICE 16	N/A	N/A
ETE L20 OFFICE 17	N/A	N/A
ETE L20 OFFICE 19	N/A	N/A
ETE L20 OFFICE 22	NO (-47.7%)	NO
ETE L20 RETAIL 09	NO (-36.2%)	NO
NEP L00 FOH CICULATION 28	NO (-30.1%)	NO
NEP L00 FOH CICULATION 28	NO (-30.5%)	NO
NEP L00 FOH CICULATION 28	NO (-98.8%)	NO
NEP L00 FOH CICULATION 28	N/A	N/A
NEP L00 FOH CICULATION 28	N/A	N/A
NEP L10 FOH CICULATION 21	NO (-75.6%)	NO
NEP L10 FOH CICULATION 21	NO (-82.3%)	NO
NEP L10 FOH CICULATION 21	NO (-80%)	NO
NEP L10 FOH CICULATION 29	N/A	N/A
NEP L10 FOH CICULATION 30	N/A	N/A
NEP L10 FOH CICULATION 31	N/A	N/A
NEP L10 FOH CICULATION 32	NO (-76.2%)	NO
NEP L10 FOH CICULATION 33	N/A	N/A
NEP L10 FOH CICULATION 34	NO (-76.2%)	NO
NEP L10 FOH CICULATION 35	N/A	N/A
NEP L10 FOH CICULATION 36	NO (-76.2%)	NO
NEP L10 FOH CICULATION 37	N/A	N/A
NEP L10 FOH CICULATION 45	NO (-76.2%)	NO
NEP L10 FOH CICULATION 46	N/A	N/A
NEP L10 FOH CICULATION 47	NO (-76.2%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
NEP L10 FOH CICULATION 48	N/A	N/A
NEP L10 FOH CICULATION 49	NO (-76.2%)	NO
NEP L10 FOH CICULATION 50	N/A	N/A
NEP L10 FOH CICULATION 54	NO (-95.7%)	NO
NEP L10 FOH CICULATION 60	NO (-76.2%)	NO
NEP L10 FOH CICULATION 61	NO (-76.3%)	NO
NEP L10 FOH CICULATION 62	NO (-76.4%)	NO
NEP L10 FOH CIRCULATION (COOL_NE2	NO (-84.4%)	NO
NEP L10 FOH CIRCULATION (COOL_NE3	NO (-84.2%)	NO
NEP L10 FOH CIRCULATION (COOL_NE4	NO (-84.2%)	NO
NEP L10 FOH CIRCULATION (COOL_NE5	NO (-84.2%)	NO
NEP L10 FOH CIRCULATION (COOL_NE9	NO (-84.2%)	NO
NEP L10 FOH CIRCULATION (COOL_NE2	NO (-84.3%)	NO
NEP L10 FOH CIRCULATION (COOL_NE3	NO (-84.2%)	NO
NEP L10 FOH CIRCULATION (COOL_NE4	NO (-84.2%)	NO
NEP L10 FOH CIRCULATION (COOL_NE5	NO (-84.2%)	NO
NEP L10 GATE 02	NO (-7.1%)	NO
NEP L10 GATE 03	NO (-7.1%)	NO
NEP L10 GATE 04	NO (-5.4%)	NO
NEP L10 GATE 05	NO (-5.4%)	NO
NEP L10 GATE 06	NO (-5.4%)	NO
NEP L10 GATE 07	NO (-5.4%)	NO
NEP L10 GATE 08	NO (-5.4%)	NO
NEP L10 GATE 09	NO (-5.4%)	NO
NEP L10 GATE 10	NO (-7.5%)	NO
NEP L10 GATE 11	NO (-84.7%)	NO
NEP L20 COMM ROOM 12	NO (-100%)	NO
NEP L20 COMM ROOM 13	N/A	N/A
NEP L20 COMM ROOM 14	N/A	N/A
NEP L20 COMM ROOM 15	N/A	N/A
NEP L20 COMM ROOM 19	N/A	N/A
NEP L20 COMM ROOM 20	N/A	N/A
NEP L20 COMM ROOM 21	N/A	N/A
NEP L20 COMM ROOM 22	N/A	N/A
NEP L20 COMM ROOM 23	N/A	N/A
NEP L20 COMM ROOM 24	N/A	N/A
NEP L20 COMM ROOM 25	N/A	N/A
NEP L20 COMM ROOM 26	N/A	N/A
NEP L20 COMM ROOM 27	N/A	N/A
NEP L20 COMM ROOM 28	N/A	N/A
NEP L20 FOH CICULATION 05	NO (-74.4%)	NO
NEP L20 FOH CICULATION 22	N/A	N/A
NEP L20 FOH CICULATION 38	N/A	N/A
NEP L20 FOH CICULATION 39	N/A	N/A
NEP L20 FOH CICULATION 40	N/A	N/A
NEP L20 FOH CICULATION 41	N/A	N/A
NEP L20 FOH CICULATION 42	N/A	N/A
NEP L20 FOH CICULATION 43	N/A	N/A
NEP L20 FOH CICULATION 44	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
NEP L20 FOH CICULATION 51	N/A	N/A
NEP L20 FOH CICULATION 52	N/A	N/A
NEP L20 FOH CICULATION 53	NO (-98.9%)	NO
NEP L20 FOH CICULATION 55	NO (-99.6%)	NO
NEP L20 FOH CICULATION 57	NO (-80.1%)	NO
NEP L20 FOH CICULATION 58	NO (-96%)	NO
NEP L20 FOH CICULATION 59	NO (-94.3%)	NO
NEP L20 FOH CICULATION 59	NO (-41.4%)	NO
NEP L20 FOH CICULATION 59	NO (-49.2%)	NO
NEP L20 FOH CIRCULATION (COOL_NO1	NO (-68.9%)	NO
NEP L20 FOH CIRCULATION (COOL_NO2	NO (-89.7%)	NO
NEP L20 FOH CIRCULATION (COOL_NO4	NO (-68.7%)	NO
NEP L20 FOH CIRCULATION (COOL_NO5	NO (-68.7%)	NO
NEP L20 FOH CIRCULATION (COOL_NO6	NO (-68.7%)	NO
NEP L20 FOH CIRCULATION (COOL_NO7	NO (-68.7%)	NO
NEP L20 FOH CIRCULATION (COOL_NO8	NO (-68.7%)	NO
NEP L20 FOH CIRCULATION (COOL_NO9	NO (-68.7%)	NO
NEP L20 FOH CIRCULATION (COOL_NO9	NO (-68.7%)	NO
NEP L20 FOH CIRCULATION (COOL_NO1	NO (-68.7%)	NO
NEP L20 FOH CIRCULATION (COOL_NO6	NO (-88.2%)	NO
NEP L20 FOH CIRCULATION (COOL_NO7	NO (-88.2%)	NO
NEP L20 FOH CIRCULATION (COOL_NO8	NO (-88.2%)	NO
NEP L20 FOH CIRCULATION (COOL_NO9	NO (-88.2%)	NO
NEP L20 FOH CIRCULATION (COOL_NO1	NO (-68.8%)	NO
NEP L20 FOH CIRCULATION (COOL_NO6	NO (-88.2%)	NO
NEP L20 FOH CIRCULATION (COOL_NO7	NO (-86.8%)	NO
NEP L20 FOH CIRCULATION (COOL_NO8	NO (-88.2%)	NO
NEP L20 FOH CIRCULATION (COOL_NO9	NO (-88.7%)	NO
NEP L20 FOH CIRCULATION (COOL_NO9	NO (-89.7%)	NO
NEP L20 OFFICE 20	N/A	N/A
WTE L00 BAGGAGE	N/A	N/A
WTE L00 CIRCULATION (FCU)	NO (-91.3%)	NO
WTE L00 COMM ROOM 01	N/A	N/A
WTE L00 COMM ROOM 02	N/A	N/A
WTE L00 COMM ROOM 16	N/A	N/A
WTE L00 COMM ROOM 17	N/A	N/A
WTE L00 FOH CICULATION 01	N/A	N/A
WTE L00 FOH CICULATION 24	N/A	N/A
WTE L00 FOH CICULATION 25	N/A	N/A
WTE L00 IMMIGRATION	N/A	N/A
WTE L00 OFFICE 01	N/A	N/A
WTE L00 OFFICE 02	NO (-90.8%)	NO
WTE L10 BOH CIRCULATION 47	NO (-43%)	NO
WTE L10 COMM ROOM 06	N/A	N/A
WTE L10 F&b 02	N/A	N/A
WTE L10 OFFICE 07	N/A	N/A
WTE L10 RETAIL 03	N/A	N/A
WTE L10 SECURITY HALL	NO (-96.7%)	NO
WTE L10 SECURITY PREP AREA	NO (-98.6%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
WTE L10 SECURITY QUEUE AREA	NO (-93%)	NO
WTE L20 CHILLED STORE	N/A	N/A
WTE L20 COMM ROOM 18	N/A	N/A
WTE L20 OFFICE 10	NO (-86.9%)	NO
WTE L20 OFFICE 11	NO (-54%)	NO
WTE L20 OFFICE 12	N/A	N/A
WTE L20 OFFICE 13	N/A	N/A
WTE L20 OFFICE 21	N/A	N/A

Criterion 4: The performance of the building, as built, should be consistent with the BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	34380.4	34380.4
External area [m²]	51360.7	51360.7
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	5	5
Average conductance [W/K]	15801.3	0
Average U-value [W/m²K]	0.31	0
Alpha value* [%]	9.91	10

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Inst.: Hospitals and Care Homes
	C2 Residential Inst.: Residential schools
	C2 Residential Inst.: Universities and colleges
	C2A Secure Residential Inst.
	Residential spaces
	D1 Non-residential Inst.: Community/Day Centre
	D1 Non-residential Inst.: Libraries, Museums, and Galleries
	D1 Non-residential Inst.: Education
	D1 Non-residential Inst.: Primary Health Care Building
	D1 Non-residential Inst.: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs and Theatres
100	**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	13.08	15.28
Cooling	6.7	7.7
Auxiliary	41.14	36.51
Lighting	13.92	24.55
Hot water	45.86	27.49
Equipment*	78.05	78.05
TOTAL**	**103.43**	**111.54**

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	17.28	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Indicative Target
Heating + cooling demand [MJ/m²]	101.81	151.45
Primary energy* [kWh/m²]	193.96	244.68
Total emissions [kg/m²]	34.3	43.4

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	31.1	161.6	2.2	13.5	31	0.85	3.34	0.92	4.19
	Notional	55.8	152.4	18.6	11.2	38.9	0.83	3.79	---	---
[ST] Single-duct VAV, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	26.9	70.6	2	6.4	66.2	0.81	3.06	0.92	4.19
	Notional	46.6	132.1	15.5	9.7	52.7	0.83	3.79	---	---
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	12.8	1.2	0.8	0.1	0	4.45	4.9	4.54	6.56
	Notional	15.4	1.4	1.7	0.1	0	2.56	3.79	---	---
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	91.3	0	7	0	48.3	0.86	0	0.92	0
	Notional	108.9	0	36.3	0	43.2	0.83	0	---	---
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	36.4	0	3.1	0	2.5	0.86	0	0.92	0
	Notional	145.2	0	48.4	0	2.5	0.83	0	---	---
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	---	---

Key to terms

- Heat dem [MJ/m2] - Heating energy demand
- Cool dem [MJ/m2] - Cooling energy demand
- Heat con [kWh/m2] - Heating energy consumption
- Cool con [kWh/m2] - Cooling energy consumption
- Aux con [kWh/m2] - Auxiliary energy consumption
- Heat SSEFF - Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
- Cool SSEER - Cooling system seasonal energy efficiency ratio
- Heat gen SSEFF - Heating generator seasonal efficiency
- Cool gen SSEER - Cooling generator seasonal energy efficiency ratio
- ST - System type
- HS - Heat source
- HFT - Heating fuel type
- CFT - Cooling fuel type

Key Features

The BCO can give particular attention to items with specifications that are better than typically expected.

Building fabric

Element	U_{typ}	U_{min}	Surface where the minimum value occurs*
Wall	0.23	0.2	RM000055:Surf[1]
Floor	0.2	0.18	RM00004C:Surf[0]
Roof	0.15	0.15	TL000006:Surf[1]
Windows, roof windows, and rooflights	1.5	0.97	RM0000D4:Surf[0]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

U_{typ} = Typical individual element U-values [W/(m²K)] U_{min} = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5

A.4. BRUKL extract “Be Green” – Terminal buildings

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L 2010

Project name

LCA CADP CHP Green — As designed

Date: Mon Jan 15 18:19:23 2018

Administrative information

Building Details

Address: Hartman Road, London, E16 2PX

Certification tool

Calculation engine: Apache

Calculation engine version: 6.4.0.15

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 6.4.0.15

BRUKL compliance check version: v4.1.g.0

Owner Details

Name: London City Airport

Telephone number: Phone

Address: Hartman Road, London, E16 2PX

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

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

1.1	CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	43.4
1.2	Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	43.4
1.3	Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	32.1
1.4	Are emissions from the building less than or equal to the target?	BER =< TER
1.5	Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services should achieve reasonable overall standards of energy efficiency

2.a Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.2	0.2	RM000055:Surf[1]
Floor	0.25	0.18	0.18	RM00004C:Surf[0]
Roof	0.25	0.15	0.15	TL000006:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.27	1.7	L0000051:Surf[3]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	5

2.b Building services

The building services parameters listed below are expected to be checked by the BCO against guidance. No automatic checking is performed by the tool.

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- Heating and Mechanical Ventilation

Heating seasonal efficiency	Cooling nominal efficiency	SFP [W/(l/s)]	HR seasonal efficiency
0.92	-	0	0.7
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

2- VAV System

Heating seasonal efficiency	Cooling nominal efficiency	SFP [W/(l/s)]	HR seasonal efficiency
0.92	4.19	1.65	0.7
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

3- DX System

Heating seasonal efficiency	Cooling nominal efficiency	SFP [W/(l/s)]	HR seasonal efficiency
4.54	6.56	0	0.73
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

4- Fan Coil System

Heating seasonal efficiency	Cooling nominal efficiency	SFP [W/(l/s)]	HR seasonal efficiency
0.92	4.19	1.65	0.7
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

5- Heating and Mechanical Extract

Heating seasonal efficiency	Cooling nominal efficiency	SFP [W/(l/s)]	HR seasonal efficiency
0.92	-	0	0.7
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

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

Local mechanical ventilation and exhaust

Zone	Supply/extract SFP [W/(l/s)]	HR seasonal efficiency	Exhaust SFP [W/(l/s)]
ETE L10 WC (ELEC DHW) 03	-	-	0.45
NEP L10 WC (ELEC DHW) 14	-	-	0.45
NEP L10 WC (ELEC DHW) 15	-	-	0.45
NEP L10 WC (ELEC DHW) 16	-	-	0.45
NEP L10 WC (ELEC DHW) 17	-	-	0.45
NEP L10 WC (ELEC DHW) 18	-	-	0.45
NEP L10 WC (ELEC DHW) 19	-	-	0.45
NEP L10 WC (ELEC DHW) 27	-	-	0.45
NEP L10 WC (ELEC DHW) 28	-	-	0.45
NEP L10 WC (ELEC DHW) 29	-	-	0.45
NEP L20 STORAGE 19	-	-	0.25
NEP L20 STORAGE 25	-	-	0.25
NEP L20 STORAGE 28	-	-	0.25
NEP L20 STORAGE 31	-	-	0.25
NEP L20 STORAGE 34	-	-	0.25
NEP L20 STORAGE 37	-	-	0.25
NEP L20 STORAGE 40	-	-	0.25

Local mechanical ventilation and exhaust

Zone	Supply/extract SFP [W/(l/s)]	HR seasonal efficiency	Exhaust SFP [W/(l/s)]
NEP L20 STORAGE 43	-	-	0.25
NEP L20 STORAGE 46	-	-	0.25
NEP L20 STORAGE 49	-	-	0.25
NEP L20 WC (ELEC DHW) 01	-	-	0.45
NEP L20 WC (ELEC DHW) 02	-	-	0.45
NEP L20 WC (ELEC DHW) 04	-	-	0.45
NEP L20 WC (ELEC DHW) 05	-	-	0.45
NEP L20 WC (ELEC DHW) 06	-	-	0.45
NEP L20 WC (ELEC DHW) 07	-	-	0.45
NEP L20 WC (ELEC DHW) 08	-	-	0.45
NEP L20 WC (ELEC DHW) 09	-	-	0.45
NEP L20 WC (ELEC DHW) 10	-	-	0.45
NEP L20 WC (ELEC DHW) 11	-	-	0.45
NEP L20 WC (ELEC DHW) 12	-	-	0.45
NEP L20 WC (ELEC DHW) 13	-	-	0.45
NEP L20 WC (ELEC DHW) 20	-	-	0.45
NEP L20 WC (ELEC DHW) 21	-	-	0.45
NEP L20 WC (ELEC DHW) 22	-	-	0.45
NEP L20 WC (ELEC DHW) 23	-	-	0.45
NEP L20 WC (ELEC DHW) 24	-	-	0.45
NEP L20 WC (ELEC DHW) 25	-	-	0.45
NEP L20 WC (ELEC DHW) 26	-	-	0.45
NEP L20 WC (ELEC DHW) 30	-	-	0.45
NEP L20 WC (ELEC DHW) 31	-	-	0.45

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
ETE L00 BOH CIRCULATION 05	40	-
ETE L00 BOH CIRCULATION 06	460	-
ETE L00 BOH CIRCULATION 07	50	-
ETE L00 BOH CIRCULATION 49	10	-
ETE L00 BOH CIRCULATION 80	40	-
ETE L00 BOH CIRCULATION 81	50	-
ETE L00 BOH CIRCULATION 82	100	-
ETE L00 CHANGING ROOM 10	280	-
ETE L00 CHECK-IN	2660	-
ETE L00 COMM ROOM 03	80	-
ETE L00 COMM ROOM 04	70	-
ETE L00 COMM ROOM 05	170	-
ETE L00 COMM ROOM 29	220	-
ETE L00 COMM ROOM 30	130	-
ETE L00 F&b 01	160	-
ETE L00 FOH CICULATION 02	120	-
ETE L00 FOH CICULATION 03	270	-
ETE L00 FOH CICULATION 03	1070	-
ETE L00 FOH CICULATION 04	500	-
ETE L00 FOH CICULATION 17	40	-

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
ETE L00 FOH CICULATION 56	350	-
ETE L00 FOH CICULATION 63	360	-
ETE L00 FOH CIRCULATION (GLASS BOX)		-
ETE L00 OFFICE 03	150	-
ETE L00 OFFICE 04	400	-
ETE L00 OFFICE 05	190	-
ETE L00 OFFICE 06	860	-
ETE L00 OFFICE 23	410	-
ETE L00 PLANT ROOM	140	-
ETE L00 RETAIL 01	150	-
ETE L00 RETAIL 02	450	-
ETE L00 STORAGE 01	20	-
ETE L00 STORAGE 02	30	-
ETE L00 WC 01	280	-
ETE L10 BOH CIRCULATION 11	20	-
ETE L10 BOH CIRCULATION 12	20	-
ETE L10 BOH CIRCULATION 13	80	-
ETE L10 BOH CIRCULATION 14	0	-
ETE L10 BOH CIRCULATION 15	0	-
ETE L10 BOH CIRCULATION 16	30	-
ETE L10 BOH CIRCULATION 17	230	-
ETE L10 BOH CIRCULATION 18	370	-
ETE L10 BOH CIRCULATION 19	250	-
ETE L10 BOH CIRCULATION 20	130	-
ETE L10 BOH CIRCULATION 21	500	-
ETE L10 BOH CIRCULATION 22	40	-
ETE L10 BOH CIRCULATION 23	40	-
ETE L10 BOH CIRCULATION 24	40	-
ETE L10 BOH CIRCULATION 25	40	-
ETE L10 BOH CIRCULATION 48	20	-
ETE L10 BOH CIRCULATION 78	130	-
ETE L10 BOH CIRCULATION 79	40	-
ETE L10 CHANGING ROOM 01	140	-
ETE L10 CHANGING ROOM 02	60	-
ETE L10 COMM ROOM 07	80	-
ETE L10 COMM ROOM 08	400	-
ETE L10 COMM ROOM 09	390	-
ETE L10 F&b 03	340	-
ETE L10 F&b 04	330	-
ETE L10 F&b 05	170	-
ETE L10 F&b 06	140	-
ETE L10 F&b 07	1710	-
ETE L10 FOH CICULATION 06	190	-
ETE L10 FOH CICULATION 07	140	-
ETE L10 FOH CICULATION 08	690	-
ETE L10 FOH CICULATION 09	100	-
ETE L10 FOH CICULATION 10	120	-