HOLBORN LINKS ESTATE, 18-19 SOUTHAMPTON PLACE
LONDON BOROUGH OF CAMDEN, LONDON

ENERGY STATEMENT

FOR

HOGARTH PROPERTIES S.A.R.L

Architect: Spratley & Partners

Rev: **1.0 – Issued for Planning**

Date: April 2022

Report Status , Revision and Date:	Issued for Planning – rev 1.0 – April 2022	
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EXECUTIVE SUMMARY

The Energy Statement has been developed for the proposed development 18-19 Southampton Place, London; this establishes how the site will achieve compliance with London Borough of Camden (LBC) requirements. This has been achieved by following best practice procedures of the London Plan's Energy Hierarchy: be lean (improved building performance); be clean (centralised heating and cooling systems); and be green (use of low or zero carbon technologies). Moreover, along with the relevant LBC policies, the Greater London Authority (GLA) Guidance on preparing energy assessments issued in April 2020 was considered when carrying out the energy and carbon emissions calculations. The tables and graphs below illustrate the carbon emissions and relative savings achieved for the development. In addition to this, the carbon emission factors on which the carbon emissions savings have been calculated are those adopted in the updated SAP 10 methodology. Furthermore, both regulated and unregulated energy use and associated carbon emissions are reported: regulated emissions alone are covered by Part L and include emissions associated with fixed components of the building (i.e. fixed lighting, ventilation, space heating and water heating); unregulated emissions are not covered by Part L and include emissions associated with plug-in appliances (i.e. cooking and appliances, catering and computing).

The development is located in the London Borough of Camden and has a total gross floor area estimated to be circa 770 m² and comprises the refurbishment and reconfiguration of the existing buildings plus minor internal works aimed at improving the existing areas. It is understood that the buildings 18-19 Southampton Place are grade II* Listed buildings hence the best possible carbon savings have been targeted considering the listed nature of the buildings and the constrains particularly on the internal and external fabric that such feature creates. Please refer to the "Heritage Statement 9802 - Holborn Link: Project 4 Nos. 18 & 19 Southampton Place" by Giles Quarme Architects for more details about the evidential, historical, aesthetical and communal value of the buildings.

The following tables and graphs illustrate the results obtained in terms of carbon reduction calculations for the development as requested by the Energy Statement Guidance and in line with an Energy Hierarchy – Be Lean, Be Clean and Be Green. The GLA Carbon Emission Reporting Spreadsheet has been used to convert the carbon saving calculations from SAP 2012 to SAP 10.

18-19 Southampton Place are grade II* Listed buildings therefore a careful assessment was carried out to evaluate the best options to improve their energy and carbon footprint while being sympathetic to the nature and original features of the buildings. The following figures have been calculated to show how the various interventions will reduce the carbon emissions following the three steps approach which the LBC requires. The Baseline has been calculated based on the requirements of the Energy Statement Guidance April 2020 for refurbished buildings. In particular, guidance was sought from the Energy Efficiency and Adaptation document which lists the possible interventions for this type refurbishment. Specifically, energy efficient lighting will be provided along with draught-sealing of doors and windows and pipework insulation.

In addition to this, better space conditioning controls along with improved heating and cooling systems efficiencies will be deployed.

Carbon Dioxide Emissions [Tonnes CO_2 per annum]		
	Regulated	**Unregulated**
Baseline: Building regulations 2013 Part L Compliant Development	19.3	28.10
After energy demand reduction	46.5	28.10
After Heat Network / CHP	46.5	28.10
After Renewable energy	19.0	28.10

Table 1 Non-Domestic Carbon Emissions

Regulated Carbon Dioxide savings		
	[Tonnes CO_2 per annum]	**[%]**
Savings from energy demand reduction	-27.23	-141.46%
Savings from CHP	0.00	0.00%
Savings from renewable energy	27.44	142.52%
Total cumulative savings	**0.20**	1.06%

Table 2 Non-Domestic Carbon Savings

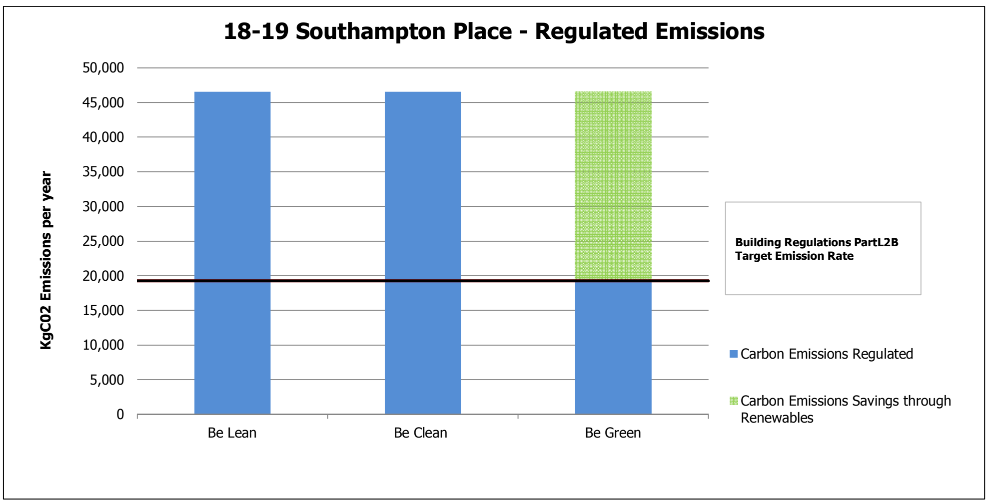

Figure 1 Non-Domestic Energy Hierarchy Graph

Based on the standard Energy Hierarchy steps the development will achieve a 1.06% carbon savings over a Part L2B compliant baseline; however, it has to be considered that the baseline as such calculated creates unfairly onerous target for a grade II* Listed building whose opaque and transparent façade elements cannot be upgraded because of their historical and aesthetical value as illustrated and examined in the Heritage Statement 9802 - Holborn Link: Project 5 Nos. 18 - 19 Southampton Place by Giles Quarme Architects.

1 INTRODUCTION

Thornton Reynolds was commissioned by Hogarth Properties S.A.R.L to undertake an Energy Statement and produce a statement for a proposed development 18-19 Southampton Place, London. This report will form part of a planning submission to the LBC and relates to full planning application. This report outlines the scheme and current planning context and assesses likely energy demands of the development prior to consideration of low and zero carbon technology options. The report concludes with the proposed Energy Statement. The Energy Report comprised:

a) a scheme overview;

b) a review of the planning context;

c) a review of applicable legislation or sustainability targets;

d) energy assessment of the project, following the Energy and Cooling Hierarchy;

e) presentation of results and recommendations

1.1 Scheme Overview

The development is located in the London Borough of Camden and has a total gross floor area estimated to be circa 770 m² and comprises refurbishment and reconfiguration of two existing buildings; plus minor works associated with internal alterations to provide better office accommodation. A more detailed description of the development can be found on the Heritage Statement 9802 - Holborn Link: Project 4 Nos. 18 & 19 Southampton Place by Giles Quarme Architects

Figure 2 3D renderings of the development (image courtesy of Google maps)

1.2 Report Structure & Methodology

The report has been written in accordance to meet the planning requirements of an Energy Statement. A summary of the planning requirements relevant to energy consumption within the development are provided in Section 2 of the report.

The method preferred by LBC towards the site wide Energy Statement is the adoption of a hierarchical approach which ensures that the energy requirements and associated emissions are reduced to the maximum before applying renewable energy options. Sections 3, 4, and 5 of this report detail the steps taken to follow the energy hierarchy (be lean, be clean, be green) and the cooling hierarchy. Section 6 summarizes the results and draws the conclusions.

2 PLANNING CONTEXT

The relevant authority for this site is the London Borough of Camden: its requirements have been considered within this feasibility study. The key planning framework applicable to the energy aspects of the development are outlined below:

2.1 National level policies

There are a number of national policies and regulations related to energy; those most relevant to the energy assessment of new developments are detailed below.

National Planning Policy Framework – NPPF (2021)

The National Planning Policy Framework (NPPF) was first published in March 2012 and the updated 2021 version has been consulted for this application. The NPPF is designed to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth. It provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

At the heart of the National Planning Policy Framework is a presumption in favour of sustainable development. The three dimensions of sustainable development can be defined as the economic, social and environmental. There are twelve core planning principles in the NPPF. Within these principals there is a strong support for the transition to a low carbon future in a climate change context, taking full account of a number of different factors. There is also an aim to contribute to conserving and enhancing the natural environment and reducing pollution.

The NPPF aims to strengthen local decision making, with decision-taking in a positive way to foster the delivery of sustainable development.

Climate Change Act 2008

The Government has introduced legislation and a number of policies during recent years focusing on the reduction of CO_2 emissions. The Climate Change Act (2008) sets a legally binding target for the reduction in UK carbon dioxide emissions. Upon ratification of the Kyoto Protocol the UK committed to a reduction in its CO_2 emissions by 80% compared to 1990 levels (by 2050). In addition, under the Climate Change Act an interim target of a 34% reduction by 2020 was set.

In order to enforce these targets, the Government is using the Building Regulations: Part L 2013 – (Conservation of fuel and power) which set the standards with which all new and existing buildings must comply.

Building Regulations 2013 Part L

Building Regulations are statutory instruments that seek to ensure that the policies set out within relevant UK legislation are carried out. Building regulations approval is required for most of building works carried out in the United Kingdom. Part L of these regulations covers the requirements with respect to conservation of fuel and power in all building types. It controls the insulation values of building fabric elements and openings, the air permeability of the structure, the heating efficiency of heating, ventilation and air conditioning systems together with hot water storage and lighting efficiency. It also sets out the requirements for calculating the carbon dioxide emissions and the Carbon Emission Targets for each building type.

Part L is split into four sections:

- L1A New dwellings
- L1B Existing Dwellings
- L2A New Buildings other than Dwellings
- L2B Existing Buildings other than dwellings

Part L2B is the one adopted for the calculations and considerations set in this report as a basis for a Listed Building carbon savings calculation.

Regional level policies - The Greater London Authority

Planning policy for London is set out in the Mayor's London Plan version 2021; this sets out an integrated social, economic and environmental framework for future development of Greater London. The London Plan contains a number of policies related to energy; those most relevant to the energy assessment of new developments are detailed below. Furthermore, the Energy Assessment Guidance issued in April 2020 was taken into account; in particular, this latest version states which fuel carbon factors must be used in carrying out the carbon savings calculations on which this Energy Statement is based. A carbon emissions reporting spreadsheet is provided by the GLA and this has been used to generate the new carbon emissions figures.

Policy SI2 Minimising Greenhouse Gas Emissions

Development proposals should make the fullest contribution to minimising carbon dioxide emissions. Major development should be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy:

- Be lean: use less energy;
- Be clean: supply energy efficiently;

- Be green: use renewable energy;
- Be seen: monitor, verify and report on energy performance.

Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy. A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:

1) through a cash in lieu contribution to the borough's carbon offset fund, or

2) off-site provided that an alternative proposal is identified, and delivery is certain.

Major development proposals should calculate and minimise carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations, i.e. unregulated emissions.

Policy SI3 Energy infrastructure

Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system:

1) The heat source for the communal heating system should be selected in accordance with the following heating hierarchy:

a) connect to local existing or planned heat networks

b) use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)

c) use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network)

d) use ultra-low NOx gas boilers

2) CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that they meet the requirements in Part B of Policy SI 1 Improving air quality.

Moreover, increasing the amount of renewable and secondary energy is supported and development proposals should identify opportunities to maximise both secondary heat sources and renewable energy production on-site. This includes the use of solar photovoltaics, heat pumps and solar thermal, both on buildings and at a larger scale on appropriate sites. There is also potential for wind and hydropower-based renewable energy in some locations within London. Innovative low- and zero-carbon technologies will also be supported.

Policy SI4 Managing Heat Risk

Major development proposals should reduce potential overheating and reliance on air conditioning systems and demonstrate this in accordance with the following cooling hierarchy:

- Minimise internal heat generation through energy efficient design;
- Reduce the amount of heat entering a building during summer months through orientation, shading, albedo, fenestration, insulation and green roofs and walls;
- Manage the heat within the building through exposed internal thermal mass and high ceilings;
- Passive ventilation;
- Mechanical ventilation;
- Active cooling systems (ensuring they are the lowest carbon options).

Major development proposals should demonstrate how the design, materials, construction and operation of the development would minimise overheating and meet its cooling needs. New development in London should also be designed to avoid the need for energy intensive air conditioning systems as much as possible.

Local level policies – London Borough of Camden

The Planning and Energy Act 2008 enables a local planning authority in England, through their development plan documents, to include policies imposing reasonable requirements for:

- a proportion of energy used in development in their area to be energy from renewable sources in the locality of the development;
- a proportion of energy used in development in their area to be low carbon energy from sources in the locality of the development;
- development in their area to comply with energy efficiency standards that exceed the energy requirements of building regulations

Two main documents were taken into account when carrying out this Energy Statement:

- Camden's Local Plan adopted in July 2017;
- Energy efficiency and adaptation adopted in January 2021.

Camden's Local Plan:

Chapter 8 deals with matters of sustainability and climate change:

- Policy CC1 Climate change mitigation

The Council will require all development to minimise the effects of climate change and encourage all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation.

- Policy CC2 Adapting to climate change

All development should adopt appropriate climate change adaptation measures such as: a. the protection of existing green spaces and promoting new appropriate green infrastructure; b. not increasing, and wherever possible reducing, surface water runoff through increasing permeable surfaces and use of Sustainable Drainage Systems; c. incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate; and d. measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy.

Energy Efficiency and Adaptation

In January 2021 the council adopted a revised version of the "Energy efficiency and adaptation" planning guidance which is the document where the LBC climate change and carbon reduction policies are illustrated. Moreover, the LBC follows the London Plan framework in terms of carbon reduction and renewable energy targets which has also been taken into account when carrying out this energy assessment. It is recognised that the whole document is fundamental in the LBC carbon emissions reduction and energy efficiency strategy so this energy statement has incorporated the guidelines contained in this document. In particular, table 2.b "Energy reduction targets, non-domestic" has been taken into account to identify the carbon targets.

However, considering the listed nature of the buildings, there are some constrains in what can be achieved in terms of carbon emissions savings and energy efficiency with some caveats which are illustrated in the following paragraphs.

Camden Planning Guidance I **Energy efficiency and adaptation**

Table 2b Energy reduction targets, non-domestic

Development should comply with these standards/provide this information	**Non-domestic New Build (assessed under L2A)**			**Non-domestic Refurbishment (assessed under L2B)**		
	Major (>1,000 sqm)	**Medium (500sq.m and <1,000 sqm)**	**Minor (<500sq.m)**	**Major (>1,000 sqm)**	**Medium (500sq.m and <1,000 sqm)**	**Minor (<500sq.m)**
Energy and carbon reduction targets						
Overall carbon reduction targets	*Zero carbon, minimum 35% reduction below Part L Building Regulations on-site, with 15% reduction through on-site energy efficiency measures) (London Plan Local Plan CC1)*	*Greatest possible reduction below Part L of 2013 Building Regulations (Local Plan CC1)*	*Greatest possible reduction below Part L of 2013 Building Regulations (Local Plan CC1)*	*Greatest possible reduction, meeting Part L2B for retained thermal elements. (London Plan 5.4, Local Plan CC1)*	*Greatest possible reduction below Part L of 2013 Building Regulations (Local Plan CC1)*	*Greatest possible reduction below Part L of 2013 Building Regulations (Local Plan CC1)*
Reduction in CO_2 from onsite renewables (after all other energy efficiency measures have been incorporated)	*20% (London Plan, Local Plan CC1)*	*20% (London Plan, Local Plan CC1)*	*Incorporate renewables where feasible*	*20% (London Plan, Local Plan CC1*	*20% (London Plan, Local Plan CC1*	*Incorporate renewables where feasible*

Figure 3 Camden Planning Guidance - Energy reduction targets for Non-Domestic Developments

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3 ENERGY MODELLING

The energy modelling for the development is based on the National Calculation Method (NCM). The National Calculation Method (NCM) for the Energy Performance of Buildings Directive (EPBD) is defined by the Department for Communities and Local Government (DCLG) and it is the procedure for demonstrating compliance with the Building Regulations for buildings other than dwellings. Depending on the complexity of the assessment, either of the Simplified Building Energy Model (SBEM) or Dynamic Simulation Methodology (DSM) can be used. Both of these tools are Government approved. In order to identify the carbon dioxide emissions DSM assessment was carried out. The energy demand calculated using the NCM methodology is relative to the Regulated Emissions which include the energy consumed by power space heating, domestic hot water, cooling, ventilation and internal lighting systems. The unregulated emissions (i.e. catering and computing) are calculated using benchmark figures detailed in technical publications such as CIBSE guide A and through the use of approved thermal simulation software.

A 3D thermal model for the development was built in the government approved software IESve 2021 based on the Architects drawings issued in March 2022. This model shows how the development will achieve compliance with the LBC requirements in terms of carbon emission reduction. The figure below illustrates the 3D thermal model built in the software (IESve). This has been used also for addressing the request of the Cooling Hierarchy.

The carbon emissions calculated were then inputted in the GLA Carbon Emission Reporting Spreadsheet to obtain new figures based on the latest carbon emissions factors (SAP10).

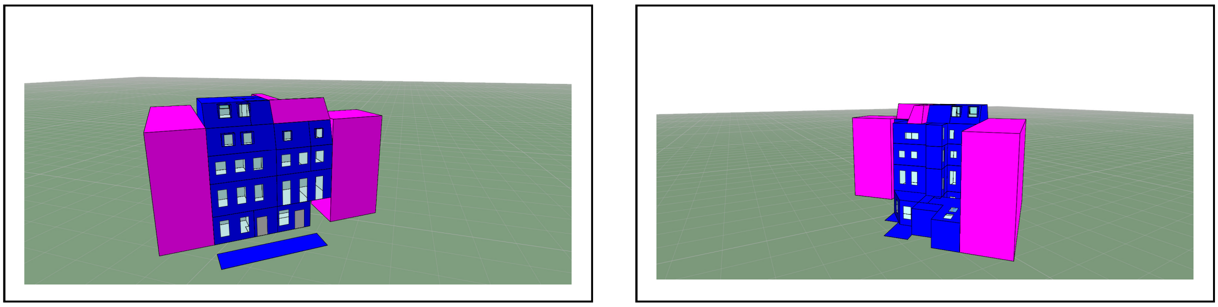


Figure 4 3D thermal models of the development and surrounding areas

The results of the indicative calculations should not be used for any other purpose other than those which they are intended (namely as a basis for this energy statement). Formal assessments will be required at a later stage of the development process to satisfy Building Control requirements.

The proposed Energy Statement approach is based on the recognised structure of reduction in carbon dioxide emissions through:

- Reducing the building energy consumption (Be Lean) by optimising the design and construction of the building to ensure less energy is required.
- Supply the energy required in an efficient manner (Be Clean).
- Supplying the energy from Low Zero Carbon and Renewable Energy Sources (Be Green).
- Monitor, verify and report on energy performance through the Mayor's post construction monitoring platform (Be Seen).

It is understood that the Be Seen part of the Hierarchy is requested only for referable applications and 18-19 Southampton does not fall into this category. However, in line with the LBC requirements, each renewable energy system will be provided with individual monitoring.

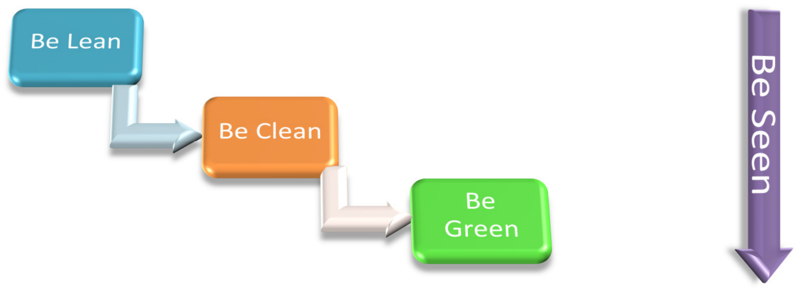


Figure 5 The four stages of the energy hierarchy

3.1. Baseline scenario

For 18-19 Southampton Place this scenario includes all insulation levels, ventilation and building services which are set at the minimum to comply with Approved Document Part L2B and the Non-Domestic/Domestic Building Services Compliance Guide 2013 and as illustrated in Appendix 4 of the Energy Assessment Guidance April 2020. The modelling undertaken identified the CO_2 emissions across the site as following:

- Baseline: 19,300 $KgCO_2$/year

3.2. Energy Saving Measures (Lean)

Energy demand reduction within the building can be utilised to improve its energy efficiency. However, it is understood that given the listed nature of the development and its small offices and services areas it would be technically and economically unfeasible to upgrade the fabric thermal transmittance values. Hence, the simulation for the Be Lean part of the Energy hierarchy was carried out considering the existing U values as obtained from the NCM construction database file based on the buildings age along with the upgrade in terms of lighting, ventilation, and auxiliary systems.

The details of these measures are summarised in the table below.

Element	Technical values
Roof	2.00 W/m^{2}K
External wall	2.10 /m^{2}K
Ground and upper floors	0.58 W/m^{2}K
Windows	5.6 W/m^{2}K (G $_{value}$ = 0.8)
Air permeability	25 m^3/hm^2 @50Pa
Lighting efficiency	120 lm/W
Auxiliary energy	Variable speed pumps
Extract SFP	0.5 W/l/s

Table 3 Passive design energy saving measures

As mentioned above, it is estimated that 18-19 Southampton Place at present has worse performing U values (based on CIBSE Guide A estimate and the Notional Calculation Methodology database) than those adopted in the Baseline specification. From an engineering point of view it is advisable to try to improve them to minimise the energy needed to condition the building. It is acknowledged that technically and economically the improvement of fabrics U values will not always be feasible given the listed nature of the building as also stated in the Energy Efficiency and Adaptation Guidance which includes it under the major intervention measures. Retrofitting external and/or internal insulation would have a negative effect in terms of retaining the historical and aesthetic features which characterised grade II* Listed buildings. These recommendations are in line with the findings listed in the Heritage Statement 9802 - Holborn Link: Project 5 Nos. 18 -19 Southampton Place by Giles Quarme Architects.

It is important that the energy used within the building is efficient. To achieve this, energy efficient heating services have been specified with a very efficient heating control system (time and temperature zone control). Electrical lighting also represents a significant energy use within a building so to maximise energy savings the installation of low energy lighting across the development has been specified coupled with controlled sensors.

The modelling undertaken after the inclusion of the "Be Lean" measures identified the site wide CO_2 emissions as following:

BE LEAN	Regulated Carbon Dioxide savings [Tonnes CO_2 per annum]	[%]
18-19 Southampton Place emissions and savings	46.5	-141.46

Table 4 Carbon emissions and savings for Be Lean Stage

The negative savings achieved compared to the Baseline are due to the fact that the U values used for the baseline calculations are those required by PartL2B for upgraded thermal elements whilst those used in the Be Lean step are those tracked down based on historical values. The use of part L2B values is required by the Energy Statement Guidance April 2020 however in case of listed buildings where these fabric improvements cannot be targeted it might create an unfairly onerous Baseline hence making difficult to show any improvement over the existing situation.

3.3. Decentralised Energy – CHP (Clean)

Thornton Reynolds undertook an extensive assessment on whether a connection to an existing district heating network (DHN) was feasible within the redevelopment of 18-19 Southampton Place. This was based both on the information contained in the London Heat Map and the Borough Wide Heat Demand and Heat Source Mapping. The London Heat Map was consulted, and it was found out that no district heat network exists and none is envisaged for the area (see picture below). Moreover, the development is outside any of the energy clusters identified in the Borough Wide Heat Demand and Heat Source Mapping.

18-19 Southampton Place are both small terraces which have conservation and listed requirements which suggests they are near impossible to connect to a District Energy Network (DEN). They are part of an ownership 'estate', but consideration of linking the buildings together needs to be part of future consideration of larger buildings with more resources for linking together. Further, there are existing light wells that run along the front of the properties and incoming DEN connections could be accommodated into the buildings, but would be at odds with the conservation/'listed' appearance.

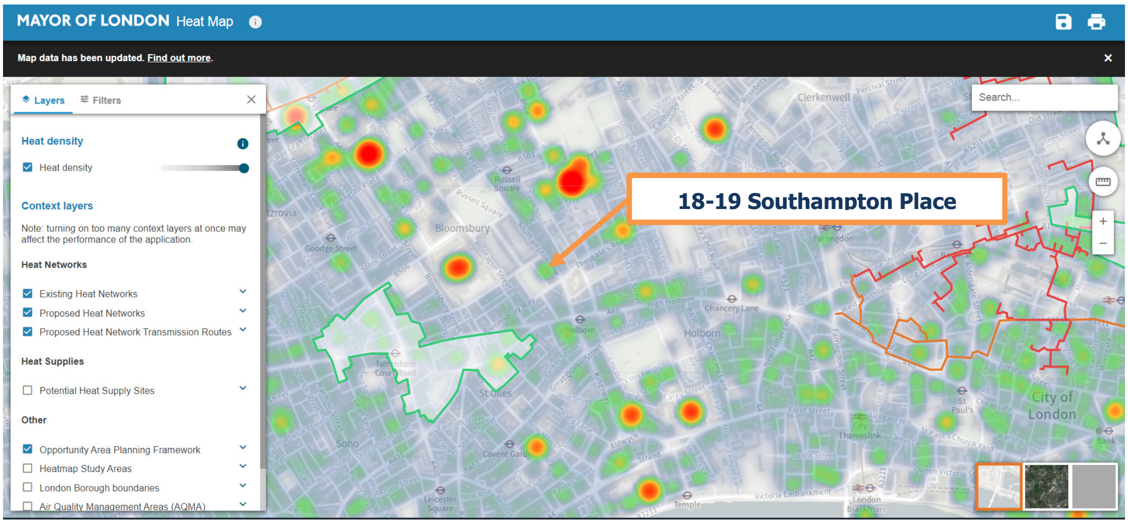


Figure 6 London Heat Map - Development area

BE CLEAN	Regulated Carbon Dioxide savings	
	[Tonnes CO_2 per annum]	[%]
18-19 Southampton Place emissions and savings	0	0

Table 5 Carbon emissions and savings for Be Clean Stage

3.4. Low and Zero Carbon Technologies (Green)

This section discusses the feasibility of using low and zero carbon (LZC) technologies for the proposed scheme. The London Plan, which the LBC comes under, aspires that all major developments reduce their carbon dioxide emissions as much as technically and economically feasible using on-site renewable energy generation, where feasible.

In order to address the planning requirement for the integration of LZC technologies on site, the installation of solar panels, photovoltaics, wind turbines, biomass and heat pumps was investigated.

These technologies meet all requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. Full details for these technologies can be found in Appendix A.

After taking into consideration a number of different factors, including local authority requirements, potential noise impacts, available space within the development and technology risk implementation it was concluded that the best strategy for the development is the installation of an Air Source Heat Pump (ASHP) to meet the whole space heating and cooling demand. Moreover, as requested by the GLA the developer confirms that it is obligated to maintaining the heat pump in accordance with manufacturer's recommendations and the warranty. This will likely entail regular annual servicing and intervening periodic inspection to ensure performance is optimised. Please refer to Paragraph 5 for more details about the ASHP specifications.

The modelling undertaken after the inclusion of the "Be Green" measures identified the site wide CO_2 emissions as following:

BE CLEAN	Regulated Carbon Dioxide savings	
	[Tonnes CO_2 per annum]	[%]
18-19 Southampton Place emissions and savings	19.0	142.52

Table 6 Carbon emissions and savings for Be Green Stage

The high percentage of renewable contribution is again due to the way the Baseline was assessed and the use of PartL2B upgraded thermal elements values.

4 COOLING HIERARCHY

Policy SI 4 Managing Heat Risk contained in the London Plan 2021 and to which the LBC refers to states that "*major development proposals should reduce potential overheating and reliance on air conditioning systems and demonstrate this in accordance with the following cooling hierarchy:*

1. Minimise internal heat generation through energy efficient design;
2. Reduce the amount of heat entering a building during summer months through orientation, shading, albedo, fenestration, insulation and green roofs and walls;
3. Manage the heat within the building through exposed internal thermal mass and high ceilings;
4. Passive ventilation;
5. Mechanical ventilation;
6. Active cooling systems (ensuring they are the lowest carbon options).

Major development proposals should demonstrate how the design, materials, construction and operation of the development would minimise overheating and also meet its cooling needs. New development in London should also be designed to avoid the need for energy intensive air conditioning systems as much as possible".

CIBSE has released further guidance specifically aimed at the assessment of the overheating risk within non-residential buildings (CIBSE TM52). The framework illustrated in this publication should be used for any future assessments in relation to the development. This report aims to take into account both the requirements set out in the London Cooling Hierarchy and the TM52 guidance to design a robust thermal comfort strategy for the development.

4.1 CIBSE TM52 – The limits of thermal comfort: avoiding overheating in European buildings (For Free-Running Buildings)

This is a standardised approach to predict overheating risk for free running and mechanically cooled buildings design using dynamic thermal analysis. The document provides some guidelines to standardise these types of studies and create a consistent approach which can be used across the industry. The bases of CIBSE TM52 are rooted in the adaptive thermal comfort framework and in CIBSE Guide A which includes Key Performances Indicators (KPIs) and targets to be achieved if thermal comfort and overheating risk are to be minimised. CIBSE TM52 (applicable only to free-running buildings) is based on the following three criteria:

Criterion 1: Hours of exceedance (He)

"The number of hours (He) during which ΔT (Temperature Difference between the operative temperature and the maximum acceptable temperature; please refer to CIBSE TM 52 paragraph 6.1.2 for a more detailed explanation) is greater than or equal to one degree Kelvin (K) during the period May to September inclusive shall not be more than 3 per cent of occupied hours".

The first criterion sets a limit for the number of hours that the operative temperature can exceed the threshold comfort temperature (upper limit of the range of comfort temperature) by 1 K or more during the occupied hours of a typical non-heating, summer season (1 May to 30 September), when the risk of overheating is most likely to occur.

Criterion 2: Daily weighted exceedance (We)

"To allow for the severity of overheating the weighted exceedance (We) shall be less than or equal to 6 in any one day where:

$We = (\sum he) \times wf = (he0 \times 0) + (he1 \times 1) + (he2 \times 2) + (he3 \times 3)$

Where the weighting factor wf = 0 if ΔT <= 0, otherwise wf =ΔT, and hey is the time (h) when wf = y".

The second criterion deals with the severity of overheating within any one day, which can be as important as its frequency, the level of which is a function of both temperature rise and its duration. This criterion sets a daily limit for acceptability.

Criterion 3: Upper limit temperature

"To set an absolute maximum value for the indoor operative temperature; the value of ΔT shall not exceed 4 K".

The third criterion sets an absolute maximum daily temperature for a room, beyond which the level of overheating is unacceptable.

In order to comply with CIBSE TM52 requirements, a room has to meet at least two of the three criteria.

4.1.1 Predicted Mean Vote and Percentage People Dissatisfied (PMV &PPD) (For mechanically cooled buildings)

BS EN ISO 7730 defines thermal comfort as "that condition of mind which expresses satisfaction with the thermal environment", i.e. the condition when someone is not feeling either too hot or too cold. The human thermal environment is not straight forward and cannot be expressed in degrees. Nor can it be satisfactorily defined by acceptable temperature ranges. It is a personal experience dependent on a great number of criteria and can be different from one person to another within the same space.

There are six factors to take into consideration when designing for thermal comfort. Its determining factors include the following:

- Metabolic rate (met): The energy generated from the human body
- Clothing insulation (clo): The amount of thermal insulation the person is wearing
- Air temperature: Temperature of the air surrounding the occupant
- Radiant temperature: The weighted average of all the temperatures from surfaces surrounding an occupant
- Air velocity: Rate of air movement given distance over time
- Relative humidity: Percentage of water vapour in the air

There are a great number of techniques for estimating likely thermal comfort, including; effective temperature, equivalent temperature, Wet Bulb Globe Temperature (WBGT), resultant temperature and so on; however, BS EN ISO 7730 and BS EN ISO 10551 suggest thermal comfort can be expressed in terms of Predicted Mean Vote (PMV) and Percentage People Dissatisfied (PPD). This approach is also validated in the CIBSE TM52 and CIBSE Guide A.

The Predicted Mean Vote (PMV) refers to a thermal scale that runs from Cold (-3) to Hot (+3). The following table illustrates this concept:

Index Value	Thermal Sensation
-3	Cold
-2	Cool
-1	Slightly cool
0	Neutral
1	Slightly warm
2	Warm
3	Hot

Table 7 Thermal sensation scale

Predicted Percentage of Dissatisfied (PPD) predicts the percentage of occupants that will be dissatisfied with the thermal conditions. It is a function of PMV, given that as PMV moves further from 0, or neutral, PPD increases.

As stated in CIBSE Guide A: "People are thermally dissimilar. Where a group of people is subject to the same environment, it will normally not be possible to satisfy everyone at the same time. The aim, therefore, is to create optimum thermal comfort for the whole group, i.e. a condition in which the highest possible percentage of the group is thermally comfortable".

As the individual thermal sensation votes will be scattered around the mean predicted value (i.e. PMV), it is useful also to predict the percentage of people who would be dissatisfied, taken as those who would vote

>+1 or <–1 on the sensation scale. The predicted percentage dissatisfied (PPD) attempts to do this and is obtained from the PMV using the following equation:

PPD = 100 – 95 exp [–(0.03353 PMV4 + 0.2179 PMV2)]

The following picture shows the predicted percentage dissatisfied (PPD) as a function of predicted mean vote (PMV).

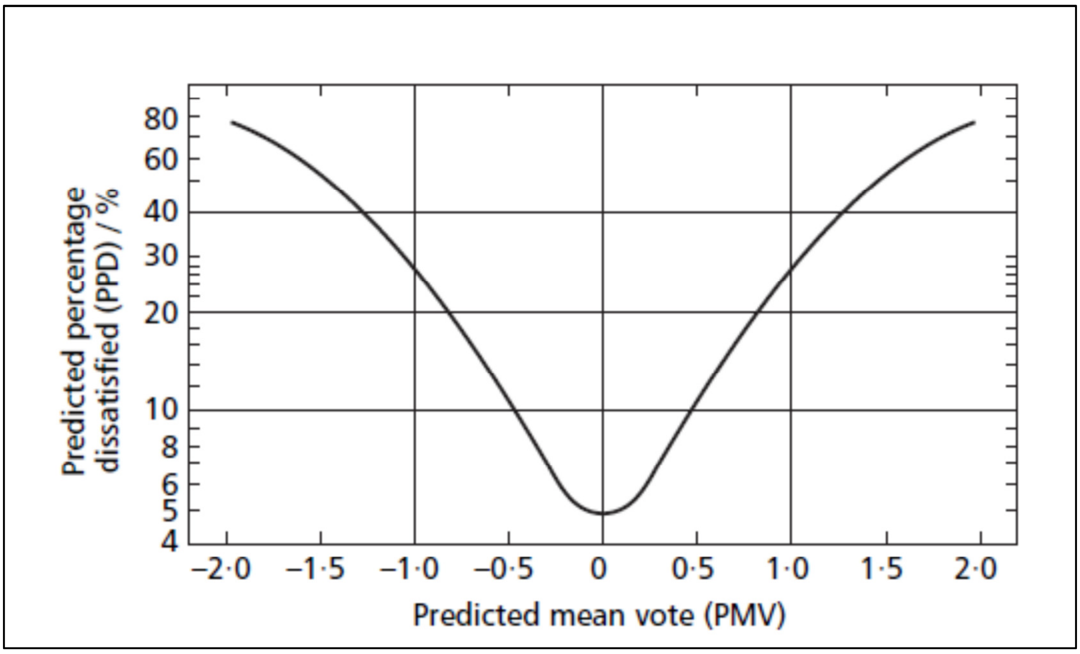


Figure 7PMV and PDD function

PPD reflects that people have different tolerances/preferences to their thermal environment and it will not normally be possible to satisfy everyone at the same time. Results will be scattered around the predicted mean value (i.e. PMV) and PPD looks at the probability that a person selected at random (from a hypothetical large group) is likely to be dissatisfied.

For summer comfort, CIBSE Guide A Table 1.8 suggests that the acceptable upper limit operative temperature for office areas should be 26°C. This is based on a PMV of 0 (neutral), whereas for mechanically cooled spaces CIBSE Guide A and ISO 7730 recommends that 10% PPD is acceptable which corresponds to a PMV of ±0.5. The predicted indoor temperature or values of PMV should not exceed the recommended values (-0.5<=PMV<=0.5; $T_{operative}$<=26°C) for more than 3% of occupied hours.

Overheating assessment

The London Cooling hierarchy asks, as first step in reducing the cooling needs of a development, to "*minimise internal heat generation through energy efficient design*". This has been achieved specifying LED lighting fittings and insulated HWS/refrigerant pipework.

Secondly, the London Cooling Hierarchy asks to "reduce the amount of heat entering a building during summer months through orientation, shading, albedo, fenestration, insulation and green roofs and walls". In this case, being the buildings existing, it is not possible to influence the design to take advantage of these features.

Finally, the weather file selected is the London DSY1 2020 high emissions 50% percentile scenario. This file data supports the use of night cooling ventilation and use of thermal mass as ten months have a diurnal swing between 5 to 10 °C of which six are in the warmest six months as illustrated in the figures below:

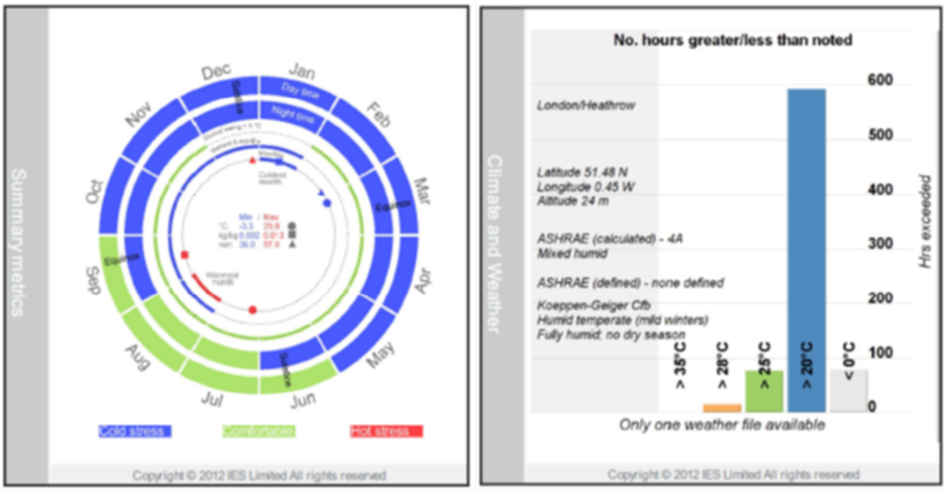


Figure 8 Natural ventilation potential assessment and temperature distribution

The overheating period has been considered between May and September and occupied hours for offices between 08:00 and 18:00 Monday to Friday. The internal heat gains have been considered as following: lighting 10 W/m², equipment 25 W/m²; 10 m²/people. Opening windows for natural ventilation were set to be open when the internal air temperature was higher than 22˚C and the external air temperature lower or equal to this value (50% openable area). Under these assumptions, the office areas were tested against the criteria previously illustrated (CIBSE TM52) and the results are illustrated in the table below. These are relative to a cooling hierarchy where all the design features listed above (points 1 to 5 of section 4) have been implemented so to lower the cooling load and peak. Moreover, the thermal comfort of the occupants has been assessed.

Room Name	Criteria 1 (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg.Hrs)	Criteria 3 (Max.DeltaT)	Criteria failing	Status
LL_office R0B.17	1.6	14	3	2	Pass
L00_office R00.02	3.3	22	5	1 & 2 & 3	Fail
L00_office R00.03	1.3	12	3	2	Pass
L00_office R00.08	1	11	3	2	Pass
L00_office R00.09	8.4	37	6	1 & 2 & 3	Fail
L00_office R00.10	12.2	45	6	1 & 2 & 3	Fail
L01_office R01.02	3.7	21	5	1 & 2 & 3	Fail
L01_office R01.03	8.4	42	6	1 & 2 & 3	Fail
L01_office R01.07	9.6	39	7	1 & 2 & 3	Fail
L01_office R01.08	11.2	45	6	1 & 2 & 3	Fail
L02_office R02.02	4.6	25	5	1 & 2 & 3	Fail
L02_office R02.03	14.9	51	7	1 & 2 & 3	Fail
L02_office R02.04	7.7	37	5	1 & 2 & 3	Fail
L02_office R02.07	14.8	48	7	1 & 2 & 3	Fail
L02_office R02.08	17.3	55	7	1 & 2 & 3	Fail
L03_office R03.02	4.2	23	5	1 & 2 & 3	Fail
L03_office R03.03	15	45	7	1 & 2 & 3	Fail
L03_office R03.04	7.5	35	5	1 & 2 & 3	Fail
L03_office R03.07	17.1	57	8	1 & 2 & 3	Fail
L03_office R03.08	17.8	54	7	1 & 2 & 3	Fail
L04_office R04.04	8.8	48	9	1 & 2 & 3	Fail

Table 8 CIBSE TM52 results - Free running scenario under weather file London 2020s 50th percentile high emissions

As illustrated in the table above, the vast majority of the office spaces would fail to comply with the CIBSE TM52 criteria hence exposing their occupants to the risk of overheating. These results lead to the deployment of comfort cooling to enhance occupants' comfort. However, the passive measures listed above will reduce the cooling loads and peak and minimise carbon emissions and plant equipment.

Comfort cooling was then introduced in the calculations and its impact of the energy consumption, carbon emissions and occupants comfort assessed.

Location	Operative temperature (TM 52/CIBSE) (°C) - % hours in range $T_{operative}$>26˚C
LL_office R0B.17	0
L00_office R00.02	0
L00_office R00.03	0
L00_office R00.08	0
L00_office R00.09	0
L00_office R00.10	0
L01_office R01.02	0
L01_office R01.03	0
L01_office R01.07	0
L01_office R01.08	0
L02_office R02.02	0
L02_office R02.03	0
L02_office R02.04	0
L02_office R02.07	0

L02_office R02.08	0
L03_office R03.02	0
L03_office R03.03	0
L03_office R03.04	0
L03_office R03.07	0
L03_office R03.08	0
L04_office R04.04	0

Table 9 Overheating results DSY1 file (2020)

Moreover, as requested by the GLA Guidance on preparing energy assessments (April 2020), two further scenarios were assessed in terms of overheating risk. This additional testing was undertaken using the "London Weather Centre" (as illustrated in CIBSE TM 49) data weather files DSY2 (2003) and DSY3 (1976). As illustrated in the tables below, a number of rooms failed to meet the CIBSE TM52 requirements. However, the GLA Guidance acknowledges that meeting the CIBSE compliance criteria is challenging for the DSY2 and DSY3 weather files.

Location	Operative temperature (TM 52/CIBSE) (°C) - % hours in range $T_{operative}$>26˚C
LL_office R0B.17	0.2
L00_office R00.09	0
L00_office R00.02	0.4
L00_office R00.03	0.3
L00_office R00.08	0
L00_office R00.10	0.9
L01_office R01.07	0
L01_office R01.02	0
L01_office R01.03	2
L01_office R01.08	0.9
L02_office R02.07	0
L02_office R02.02	0
L02_office R02.08	0.9
L02_office R02.04	0.5
L02_office R02.03	0.9
L03_office R03.07	0
L03_office R03.02	0
L03_office R03.03	0.2
L03_office R03.08	0.4
L03_office R03.04	0.2
L04_office R04.04	3.5

Table 10 Overheating results DSY2 (1976)

Location	Operative temperature (TM 52/CIBSE) (°C) - % hours in range $T_{operative}$>26˚C
LL_office R0B.17	0.1
L00_office R00.02	0.3
L00_office R00.03	0.1
L00_office R00.08	0
L00_office R00.09	0
L00_office R00.10	1
L01_office R01.02	0.2
L01_office R01.03	2.7
L01_office R01.07	0
L01_office R01.08	1
L02_office R02.02	0
L02_office R02.03	1
L02_office R02.04	0.5
L02_office R02.07	0
L02_office R02.08	1.1
L03_office R03.02	0.1
L03_office R03.03	0.1
L03_office R03.04	0.1
L03_office R03.07	0.1
L03_office R03.08	0.3
L04_office R04.04	4.8

Table 11 Overheating results DSY3 file (2003)

As expected, for the DSY2 and DSY3 files, some of the areas are more likely to overheat. In addition to this, the cooling energy demand for the development is reported in the table below for both the Notional and Actual buildings; this shows an overall improvement of more than 85%.

	Area weighted average non-domestic cooling demand [MJ/m^2]	Total area weighted non-domestic cooling demand [MJ/year]
Actual	0.50	544.8
Notional (from Baseline)	3.63	3,931

Table 12 Cooling Demand

5 ENERGY REDUCTION ANALYSIS

The LBC follows the principles of the London Plan for the sustainable design and construction of all major developments within its boundary.

Policy SI2 and SI3 of the London Plan require new developments to achieve an on-site 35% improvement on Building Regulations 2013 for new non-residential developments following the energy hierarchy (be lean, be clean, be green) and there is a presumption that all major development proposals will seek to maximise carbon dioxide emissions reductions through on-site renewable energy generation wherever feasible. 18-19 Southampton represents a particular case as the buildings are grade II* Listed hence a right balance between upgrading and retaining their valuable architectural features must be struck.

This Energy Statement has been produced in line with the energy hierarchy. Carbon dioxide emission savings have been achieved through the following step process. The 'Be lean' measures specified include high specification HVAC and Lighting systems. The remaining carbon dioxide savings have been achieved through the inclusion of renewable technologies 'Be green'. The following table summarises the main features of the HVAC system and of the LZC technologies.

FEATURE	Proposed Values Non-Domestic
Ventilation	Mechanical ventilation with zonal SFP=0.5 W/l/s
Heating/ Cooling systems and DHW	SCOP=4.1 (heating); SEER=6.2 (cooling); SCOP=1 (direct electric hot water)
Controls	Central time control; Optimum start/stop; Local time control; Local temperature control; Weather compensator
Lighting	120lm/W efficiency
LZC technologies	ASHP please refer to Heating

Table 13 HVAC and lighting fittings specification

Carbon dioxide emissions provided in following tables.

Carbon Dioxide Emissions [Tonnes CO_2 per annum]		
	Regulated	**Unregulated**
Baseline: Building regulations 2013 Part L Compliant Development	19.3	28.10
After energy demand reduction	46.5	28.10
After Heat Network / CHP	46.5	28.10
After Renewable energy	19.0	28.10

Table 14 Non-Domestic Carbon emissions

Regulated Carbon Dioxide savings		
	[Tonnes CO_2 annum]	[%]
Savings from energy demand reduction	-27.23	-141.46%
Savings from CHP	0.00	0.00%
Savings from renewable energy	27.44	142.52%
Total cumulative savings	**0.20**	1.06%

Table 15 Non-Domestic Carbon Savings

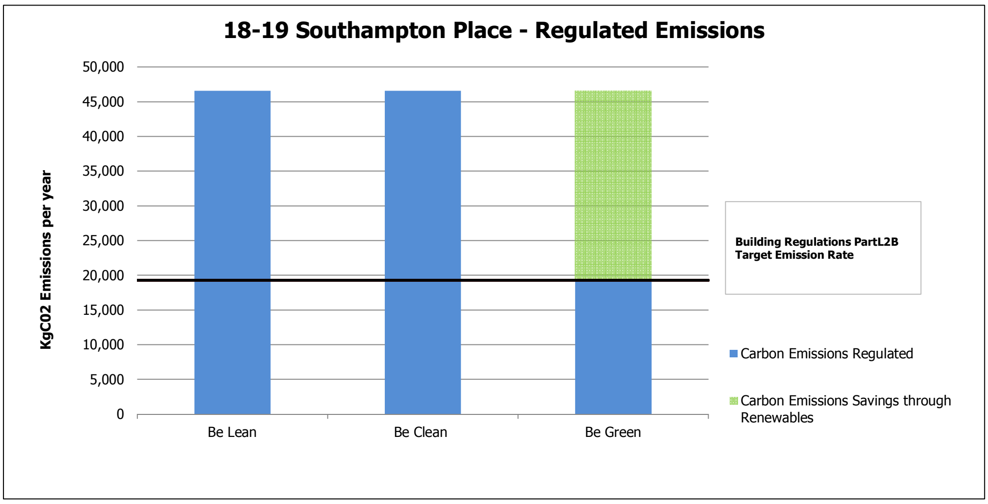


Figure 9 Non-Domestic Energy Hierarchy

6 CONCLUSIONS

In conclusion, based on the standard Energy Hierarchy steps the development will achieve 1.06% carbon savings over a Part L2B complaint baseline; however, it has to be considered that the baseline as such calculated creates unfairly onerous target for a grade II* Listed building whose opaque and transparent façade elements cannot be upgraded because of their historical and aesthetical value as illustrated and examined in the "Heritage Statement 9802 - Holborn Link: Project 4 Nos. 18 & 19 Southampton Place" by Giles Quarme Architects.

APPENDICES

APPENDIX A: LZC TECHNOLOGIES

Solar Thermal

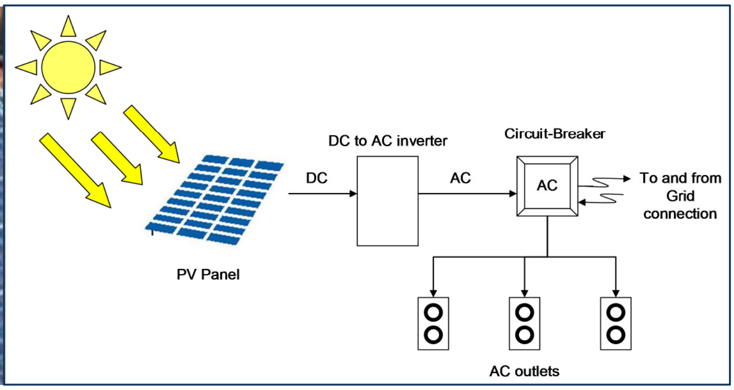
Solar thermal generates energy for the provision of domestic hot water; this system typically works in tandem with a conventional boiler in the event that the hot water demand cannot be solely met by the renewable technology. The two types of solar thermal technology suitable for inclusion are flat plate collectors and evacuated tubes, with the latter typically being more efficient. The panels are most efficient when they face south at 30°.

Picture 1: Flat plate and Evacuated tubes Solar Panels

Solar thermal is most suited to houses. Providing solar panels and associated pipework to each flat within the main block would not be a practical approach. For non-residential buildings they should only be considered for buildings with high hot water demand, like hotels and gyms and when a CHP system has not been implemented.

Photovoltaic panels

The word photovoltaic is a marriage of the words 'photo', which cleans light in Greek, and 'voltaic', which refers to the production of electricity. Photovoltaic technology is similar to SWH but it generates electricity and not heat from light.



Picture 2: Photovoltaic panels

The photovoltaic panel converts free solar energy directly into electricity. The electricity produced is on direct current (DC). Therefore inverters are used to convert the output into AC for connection to the building's supply board. The electricity generated can either be used to supply communal (landlord) areas or for individual dwellings, the latter configuration tending to be more complex and costly owing to the need for multiple meters. The panels are most efficient when they face south at 30^o. Photovoltaic panels should not be considered in cases with significant overshadow (i.e. next to taller buildings). In this case, the use of PV was discouraged by the limited available roof space.

Biomass

Biomass is a term used to describe all plant and animal material. A range of biomass material can be burnt to generate energy including wood, straw, poultry litter and energy crops such as willow or poplar. Biomass material is considered carbon neutral if the fuel comes from a sustainably managed source.

Picture 3: Biomass boiler

The primary disadvantage for any biomass installation is that it requires large amounts of fuel storage (which will need to be fed by deliveries of biomass fuel). Developments that use biomass need to secure constant delivery of wood chips or wood pellets, from a local supplier. Finally biomass requires a suitable flue design to address air quality issues.

Wind Turbines

Wind technology is now a well-established technology for the generation of electricity in large scale projects. Small scale wind projects within built up areas however is less common.

Picture 4: Wind turbine

The lower uptake of wind turbines in urban settings is due to the reduced efficiency of smaller scale turbines as a result of the high surface roughness reducing wind speeds. According to the Department of Energy and Climate Change Windspeed Database, the average wind speed at 10m agl (above ground level) is 5.1m/s in the vicinity of the site. At 25m agl the average speed is 5.8m/s. These speeds are towards the lower end of what would be considered economical for a turbine. Furthermore, it is likely that the surrounding buildings will create turbulence and locally reduce near surface wind speeds thus further reducing the potential of good wind speeds. In addition wind turbines integrated on buildings might cause other problems, like vibrations. Wind turbines are therefore not considered a viable renewable technology for the development given the setting within a built up area and lack of consistent adequate winds.

APPENDIX B: BRUKL REPORTS

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

18-19 Southampton Place BASELINE

As designed

Date: Mon Mar 28 10:54:48 2022

Administrative information

Building Details

Address: 18-19 Southampton Place, London, WC1A 2AJ

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

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

Certifier details

Name: Thornton Reynolds

Telephone number: Phone

Address: 10 A Lant street, London, SE1 1QR

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

The building does not comply with England Building Regulations Part L 2013

CO_2 emission rate from the notional building, $kgCO_2/m^2$.annum	16.2
Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	16.2
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	26.4
Are emissions from the building less than or equal to the target?	BER > TER
Are as built details the same as used in the BER calculations?	Separate submission

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

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.55	0.55	LL000001:Surf[1]
Floor	0.25	0.25	0.25	LL000001:Surf[0]
Roof	0.25	0.18	0.18	LL000000:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.81	2	L0000003:Surf[7]
Personnel doors	2.2	2.2	2.2	LL000006:Surf[1]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

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

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

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	25

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Circulation and toilets

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.84	-	0.2	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system	NO				
* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

2- Office spaces

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.84	2.6	0	0	0.7
Standard value	0.91*	2.6	N/A	N/A	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system	NO				
* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

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

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	**Zone**	**Standard**
LL_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
LL_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
LL_office	-	-	-	2.2	-	-	-	-	-	-	N/A
L00_office R00.09	-	-	-	2.2	-	-	-	-	-	-	N/A
L00_office R00.02	-	-	-	2.2	-	-	-	-	-	-	N/A
L00_office R00.03	-	-	-	2.2	-	-	-	-	-	-	N/A
L00_office R00.08	-	-	-	2.2	-	-	-	-	-	-	N/A
L00_shower WC R00.06	-	-	0.5	-	-	-	-	-	-	-	N/A
L00_office R00.10	-	-	-	2.2	-	-	-	-	-	-	N/A
L01_office R01.07	-	-	-	2.2	-	-	-	-	-	-	N/A
L01_office R01.02	-	-	-	2.2	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L01_shower WC R01.06	-	-	0.5	-	-	-	-	-	-	-	N/A
L01_office R01.03	-	-	-	2.2	-	-	-	-	-	-	N/A
L01_office R01.08	-	-	-	2.2	-	-	-	-	-	-	N/A
L02_office R02.07	-	-	-	2.2	-	-	-	-	-	-	N/A
L02_office R02.02	-	-	-	2.2	-	-	-	-	-	-	N/A
L02_shower WC R02.06	-	-	0.5	-	-	-	-	-	-	-	N/A
L02_office R02.08	-	-	-	2.2	-	-	-	-	-	-	N/A
L02_office R02.04	-	-	-	2.2	-	-	-	-	-	-	N/A
L02_office R02.03	-	-	-	2.2	-	-	-	-	-	-	N/A
L03_office R03.07	-	-	-	2.2	-	-	-	-	-	-	N/A
L03_office R03.02	-	-	-	2.2	-	-	-	-	-	-	N/A
L03_office R03.03	-	-	-	2.2	-	-	-	-	-	-	N/A
L03_office R03.08	-	-	-	2.2	-	-	-	-	-	-	N/A
L03_office R03.04	-	-	-	2.2	-	-	-	-	-	-	N/A
L04_office R04.04	-	-	-	2.2	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
LL_WC	-	51	-	177
LL_circulation corridor	-	51	-	48
LL_circulation landing	-	51	-	55
LL_lobby	-	51	15	64
LL_WC	-	51	-	183
LL_plantroom	51	-	-	258
LL_storage	51	-	-	33
LL_hall	-	51	15	108
LL_office	51	-	-	345
LL_kitchnette	-	51	-	141
LL_plantroom	51	-	-	290
L00_circulation stairs R00.01	-	51	-	63
L00_office R00.09	51	-	-	402
L00_store R00.07	51	-	-	25
L00_office R00.02	51	-	-	656
L00_office R00.03	51	-	-	396
L00_office R00.08	51	-	-	577
L00_shower WC R00.06	-	51	-	41
L00_circulation corridor R00.05	-	51	-	46
L00_office R00.10	51	-	-	384
LL_lobby	-	51	15	155
L00_circulation lobby R00.04	-	51	-	130
L01_circulation stairs R01.01	-	51	-	71
L01_office R01.07	51	-	-	426

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
L01_office R01.02	51	-	-	465
L01_shower WC R01.06	-	51	-	50
L01_office R01.03	51	-	-	613
L01_circulation stairs R01.04/05	-	51	-	99
L01_office R01.08	51	-	-	564
L02_circulation stairs R02.01	-	51	-	59
L02_office R02.07	51	-	-	389
L02_office R02.02	51	-	-	427
L02_shower WC R02.06	-	51	-	50
L02_circulation stairs R02.05	-	51	-	83
L02_office R02.08	51	-	-	520
L02_office R02.04	51	-	-	264
L02_office R02.03	51	-	-	380
L03_circulation stairs R03.01	-	51	-	55
L03_office R03.07	51	-	-	376
L03_office R03.02	51	-	-	415
L03_office R03.03	51	-	-	363
L03_plantroom R03.09	51	-	-	87
L03_circulation stairs R03.05/06	-	51	-	55
L03_office R03.08	51	-	-	520
L03_office R03.04	51	-	-	247
L04_plantroom R04.02	51	-	-	105
L04_office R04.04	51	-	-	580
L04_store R04.03	51	-	-	10
L04_circulation stairs R04.01	-	51	-	35

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?
LL_lobby	N/A	N/A
LL_hall	N/A	N/A
LL_office	NO (-68.2%)	NO
LL_kitchnette	NO (-93.6%)	NO
L00_office R00.09	NO (-83.7%)	NO
L00_office R00.02	NO (-70.5%)	NO
L00_office R00.03	NO (-85.7%)	NO
L00_office R00.08	NO (-76.1%)	NO
L00_office R00.10	NO (-56.2%)	NO
LL_lobby	N/A	N/A
L01_office R01.07	NO (-71.9%)	NO
L01_office R01.02	NO (-79%)	NO
L01_office R01.03	NO (-53.4%)	NO
L01_office R01.08	NO (-59.1%)	NO
L02_office R02.07	NO (-84.6%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L02_office R02.02	NO (-89.3%)	NO
L02_office R02.08	NO (-68.1%)	NO
L02_office R02.04	NO (-86%)	NO
L02_office R02.03	NO (-62.8%)	NO
L03_office R03.07	NO (-78.6%)	NO
L03_office R03.02	NO (-89.2%)	NO
L03_office R03.03	NO (-90.9%)	NO
L03_office R03.08	NO (-86.7%)	NO
L03_office R03.04	NO (-93%)	NO
L04_office R04.04	NO (-80.2%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	1081.2	1081.2
External area [m^2]	1691.5	1691.5
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	25	3
Average conductance [W/K]	906.77	771.46
Average U-value [W/m^2K]	0.54	0.46
Alpha value* [%]	10	10

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
100	**B1 Offices and Workshop businesses**
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	48.68	17.73
Cooling	1.01	3.39
Auxiliary	6.77	2.25
Lighting	21.08	17.27
Hot water	4.1	3.6
Equipment*	50.1	50.1
TOTAL**	**81.63**	**44.22**

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

Energy Production by Technology [kWh/m^2]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	141.79	89.66
Primary energy* [kWh/m^2]	152.97	94.56
Total emissions [kg/m^2]	26.4	16.2

* 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] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	128.3	0	47.5	0	1.7	0.75	0	0.84	0
	Notional	54.5	0	17.5	0	0.9	0.86	0	----	----
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	139	10.6	49.3	1.6	9.7	0.78	1.85	0.84	2.6
	Notional	55.4	54.6	17.8	5.3	3	0.86	2.84	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.55	LL000001:Surf[1]
Floor	0.2	0.25	LL000001:Surf[0]
Roof	0.15	0.18	LL000000:Surf[1]
Windows, roof windows, and rooflights	1.5	1.8	LL000001:Surf[3]
Personnel doors	1.5	2.2	LL000006:Surf[1]
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

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

$U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

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

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	25

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

18-19 Southampton Place BE LEAN

As designed

Date: Wed Mar 30 17:05:03 2022

Administrative information

Building Details

Address: 18-19 Southampton Place, London, WC1A 2AJ

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

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

Certifier details

Name: Thornton Reynolds

Telephone number: Phone

Address: 10 A Lant street, London, SE1 1QR

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

The building does not comply with England Building Regulations Part L 2013

CO_2 emission rate from the notional building, $kgCO_2/m^2$.annum	17.3
Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	17.3
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	45.8
Are emissions from the building less than or equal to the target?	BER > TER
Are as built details the same as used in the BER calculations?	Separate submission

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

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	2.1	2.1	LL000001:Surf[1]
Floor	0.25	0.58	0.58	LL000001:Surf[0]
Roof	0.25	2	2	LL000000:Surf[1]
Windows***, roof windows, and rooflights	2.2	5.5	5.6	LL000001:Surf[3]
Personnel doors	2.2	2.2	2.2	LL000006:Surf[1]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

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

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

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	25

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

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

1- Circulation and toilets

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.84	-	0.2	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

2- Office spaces

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.84	2.6	0	0	-
Standard value	0.91*	2.6	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

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

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
LL_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
LL_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L00_shower WC R00.06	-	-	0.5	-	-	-	-	-	-	-	N/A
L01_shower WC R01.06	-	-	0.5	-	-	-	-	-	-	-	N/A
L02_shower WC R02.06	-	-	0.5	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
LL_WC	-	120	-	75

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
LL_circulation corridor	-	120	-	20
LL_circulation landing	-	120	-	24
LL_lobby	-	120	120	27
LL_WC	-	120	-	78
LL_plantroom	120	-	-	110
LL_storage	51	-	-	33
LL_hall	-	120	120	46
LL_office	120	-	-	147
LL_kitchnette	-	120	-	60
LL_plantroom	120	-	-	123
L00_circulation stairs R00.01	-	120	-	27
L00_office R00.09	120	-	-	171
L00_store R00.07	120	-	-	11
L00_office R00.02	120	-	-	279
L00_office R00.03	120	-	-	168
L00_office R00.08	120	-	-	245
L00_shower WC R00.06	-	120	-	17
L00_circulation corridor R00.05	-	120	-	20
L00_office R00.10	120	-	-	163
LL_lobby	-	120	120	66
L00_circulation lobby R00.04	-	120	-	55
L01_circulation stairs R01.01	-	120	-	30
L01_office R01.07	120	-	-	181
L01_office R01.02	120	-	-	198
L01_shower WC R01.06	-	120	-	21
L01_office R01.03	120	-	-	261
L01_circulation stairs R01.04/05	-	120	-	42
L01_office R01.08	120	-	-	240
L02_circulation stairs R02.01	-	120	-	25
L02_office R02.07	120	-	-	165
L02_office R02.02	120	-	-	182
L02_shower WC R02.06	-	120	-	21
L02_circulation stairs R02.05	-	120	-	35
L02_office R02.08	120	-	-	221
L02_office R02.04	120	-	-	112
L02_office R02.03	120	-	-	162
L03_circulation stairs R03.01	-	120	-	24
L03_office R03.07	120	-	-	160
L03_office R03.02	120	-	-	176
L03_office R03.03	120	-	-	154
L03_plantroom R03.09	120	-	-	37
L03_circulation stairs R03.05/06	-	120	-	23
L03_office R03.08	120	-	-	221

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
L03_office R03.04	120	-	-	105
L04_plantroom R04.02	120	-	-	45
L04_office R04.04	120	-	-	246
L04_store R04.03	120	-	-	4
L04_circulation stairs R04.01	-	120	-	15

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?
LL_lobby	N/A	N/A
LL_hall	N/A	N/A
LL_office	NO (-29.3%)	NO
LL_kitchnette	NO (-85.8%)	NO
L00_office R00.09	NO (-64.3%)	NO
L00_office R00.02	NO (-35.2%)	NO
L00_office R00.03	NO (-68.4%)	NO
L00_office R00.08	NO (-67.5%)	NO
L00_office R00.10	NO (-3.6%)	NO
LL_lobby	N/A	N/A
L01_office R01.07	NO (-38.2%)	NO
L01_office R01.02	NO (-53.4%)	NO
L01_office R01.03	YES (+2.1%)	NO
L01_office R01.08	NO (-10.1%)	NO
L02_office R02.07	NO (-65.9%)	NO
L02_office R02.02	NO (-76.2%)	NO
L02_office R02.08	NO (-29.9%)	NO
L02_office R02.04	NO (-69.2%)	NO
L02_office R02.03	NO (-18%)	NO
L03_office R03.07	NO (-52.3%)	NO
L03_office R03.02	NO (-75.9%)	NO
L03_office R03.03	NO (-79.9%)	NO
L03_office R03.08	NO (-70.6%)	NO
L03_office R03.04	NO (-84.5%)	NO
L04_office R04.04	NO (-56.5%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	1081.2	1081.2
External area [m^2]	1691.5	1691.5
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	25	3
Average conductance [W/K]	3454.52	771.46
Average U-value [W/m^2K]	2.04	0.46
Alpha value* [%]	10	10

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
100	**B1 Offices and Workshop businesses**
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	194.1	29.06
Cooling	0.36	2.61
Auxiliary	0.89	0.32
Lighting	4.66	17.3
Hot water	4.1	3.6
Equipment*	50.1	50.1
TOTAL**	**204.1**	**52.89**

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

Energy Production by Technology [kWh/m^2]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	543.06	116.92
Primary energy* [kWh/m^2]	259.46	100.41
Total emissions [kg/m^2]	45.8	17.3

* 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] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	385.1	0	142.7	0	2.4	0.75	0	0.84	0
	Notional	55.8	0	18	0	0.9	0.86	0	----	----
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	630.2	3.7	223.6	0.6	0	0.78	1.85	0.84	2.6
	Notional	110	42.1	35.4	4.1	0	0.86	2.84	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U_{i-Typ}	U_{i-Min}	Surface where the minimum value occurs*
Wall	0.23	2.1	LL000001:Surf[1]
Floor	0.2	0.58	LL000001:Surf[0]
Roof	0.15	2	LL000000:Surf[1]
Windows, roof windows, and rooflights	1.5	2	L0000003:Surf[7]
Personnel doors	1.5	2.2	LL000006:Surf[1]
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

U_{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
$m^3/(h.m^2)$ at 50 Pa	5	25

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

18-19 Southampton Place BE GREEN

As designed

Date: Wed Mar 30 16:59:09 2022

Administrative information

Building Details

Address: 18-19 Southampton Place, London, WC1A 2AJ

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

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

Certifier details

Name: Thornton Reynolds

Telephone number: Phone

Address: 10 A Lant street, London, SE1 1QR

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

The building does not comply with England Building Regulations Part L 2013

CO_2 emission rate from the notional building, $kgCO_2/m^2$.annum	17.3
Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	17.3
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	38.3
Are emissions from the building less than or equal to the target?	BER > TER
Are as built details the same as used in the BER calculations?	Separate submission

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

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a-Limit}$	U_{a-Calc}	U_{i-Calc}	Surface where the maximum value occurs*
Wall**	0.35	2.1	2.1	LL000001:Surf[1]
Floor	0.25	0.58	0.58	LL000001:Surf[0]
Roof	0.25	2	2	LL000000:Surf[1]
Windows***, roof windows, and rooflights	2.2	5.5	5.6	LL000001:Surf[3]
Personnel doors	2.2	2.2	2.2	LL000006:Surf[1]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

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

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

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	25

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

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

1- Circulation and toilets - Be Green

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	0.2	0	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

2- Office spaces - Be Green

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.1	3.3	0	0	-
Standard value	2.5*	2.6	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

1- HWS - Be Green

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

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
LL_WC R0B.15	-	-	0.5	-	-	-	-	-	-	-	N/A
LL_WC R0B.02	-	-	0.5	-	-	-	-	-	-	-	N/A
L00_shower WC R00.06	-	-	0.5	-	-	-	-	-	-	-	N/A
L01_shower WC R01.06	-	-	0.5	-	-	-	-	-	-	-	N/A
L02_shower WC R02.06	-	-	0.5	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
LL_WC R0B.15	-	120	-	75

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
LL_circulation corridor R0B.04	-	120	-	20
LL_circulation landing R0B.01	-	120	-	24
LL_lobby	-	120	120	27
LL_WC R0B.02	-	120	-	78
LL_plantroom R0B.03/13/14	120	-	-	110
LL_storage R0B.05	120	-	-	14
LL_hall R0B.16	-	120	120	46
LL_office R0B.17	120	-	-	147
LL_kitchnette R0B.21	-	120	-	60
LL_plantroom/vaults	120	-	-	123
L00_circulation stairs R00.01	-	120	-	27
L00_office R00.09	120	-	-	171
L00_store R00.07	120	-	-	11
L00_office R00.02	120	-	-	279
L00_office R00.03	120	-	-	168
L00_office R00.08	120	-	-	245
L00_shower WC R00.06	-	120	-	17
L00_circulation corridor R00.05	-	120	-	20
L00_office R00.10	120	-	-	163
LL_lobby R0B.10/11	-	120	120	66
L00_circulation lobby R00.04	-	120	-	55
L01_circulation stairs R01.01	-	120	-	30
L01_office R01.07	120	-	-	181
L01_office R01.02	120	-	-	198
L01_shower WC R01.06	-	120	-	21
L01_office R01.03	120	-	-	261
L01_circulation stairs R01.04/05	-	120	-	42
L01_office R01.08	120	-	-	240
L02_circulation stairs R02.01	-	120	-	25
L02_office R02.07	120	-	-	165
L02_office R02.02	120	-	-	182
L02_shower WC R02.06	-	120	-	21
L02_circulation stairs R02.05	-	120	-	35
L02_office R02.08	120	-	-	221
L02_office R02.04	120	-	-	112
L02_office R02.03	120	-	-	162
L03_circulation stairs R03.01	-	120	-	24
L03_office R03.07	120	-	-	160
L03_office R03.02	120	-	-	176
L03_office R03.03	120	-	-	154
L03_plantroom R03.09	120	-	-	37
L03_circulation stairs R03.05/06	-	120	-	23
L03_office R03.08	120	-	-	221

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L03_office R03.04	120	-	-	105
L04_plantroom R04.02	120	-	-	45
L04_office R04.04	120	-	-	246
L04_store R04.03	120	-	-	4
L04_circulation stairs R04.01	-	120	-	15

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?
LL_lobby	N/A	N/A
LL_hall R0B.16	N/A	N/A
LL_office R0B.17	NO (-29.3%)	NO
LL_kitchnette R0B.21	NO (-85.8%)	NO
L00_office R00.09	NO (-64.3%)	NO
L00_office R00.02	NO (-35.2%)	NO
L00_office R00.03	NO (-68.4%)	NO
L00_office R00.08	NO (-67.5%)	NO
L00_office R00.10	NO (-3.6%)	NO
LL_lobby R0B.10/11	N/A	N/A
L01_office R01.07	NO (-38.2%)	NO
L01_office R01.02	NO (-53.4%)	NO
L01_office R01.03	YES (+2.1%)	NO
L01_office R01.08	NO (-10.1%)	NO
L02_office R02.07	NO (-65.9%)	NO
L02_office R02.02	NO (-76.2%)	NO
L02_office R02.08	NO (-29.9%)	NO
L02_office R02.04	NO (-69.2%)	NO
L02_office R02.03	NO (-18%)	NO
L03_office R03.07	NO (-52.3%)	NO
L03_office R03.02	NO (-75.9%)	NO
L03_office R03.03	NO (-79.9%)	NO
L03_office R03.08	NO (-70.6%)	NO
L03_office R03.04	NO (-84.5%)	NO
L04_office R04.04	NO (-56.5%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	1081.2	1081.2
External area [m^2]	1691.5	1691.5
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	25	3
Average conductance [W/K]	3454.52	771.46
Average U-value [W/m^2K]	2.04	0.46
Alpha value* [%]	10	10

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
100	**B1 Offices and Workshop businesses**
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	66.7	14.14
Cooling	0.14	2.61
Auxiliary	0.84	0.32
Lighting	4.66	17.3
Hot water	3.27	3.6
Equipment*	50.1	50.1
TOTAL**	**75.61**	**37.97**

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

Energy Production by Technology [kWh/m^2]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	543.08	116.92
Primary energy* [kWh/m^2]	226.31	94.44
Total emissions [kg/m^2]	38.3	17.3

* 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] Central heating using water: radiators, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	385.1	0	107	0	2.3	1	0	1	0
	Notional	55.8	0	18	0	0.9	0.86	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	630.2	3.7	43.5	0.2	0	4.02	4.63	4.1	6.2
	Notional	110	42.1	11.9	4.1	0	2.56	2.84	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	2.1	LL000001:Surf[1]
Floor	0.2	0.58	LL000001:Surf[0]
Roof	0.15	2	LL000000:Surf[1]
Windows, roof windows, and rooflights	1.5	2	L0000003:Surf[7]
Personnel doors	1.5	2.2	LL000006:Surf[1]
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

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

$U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

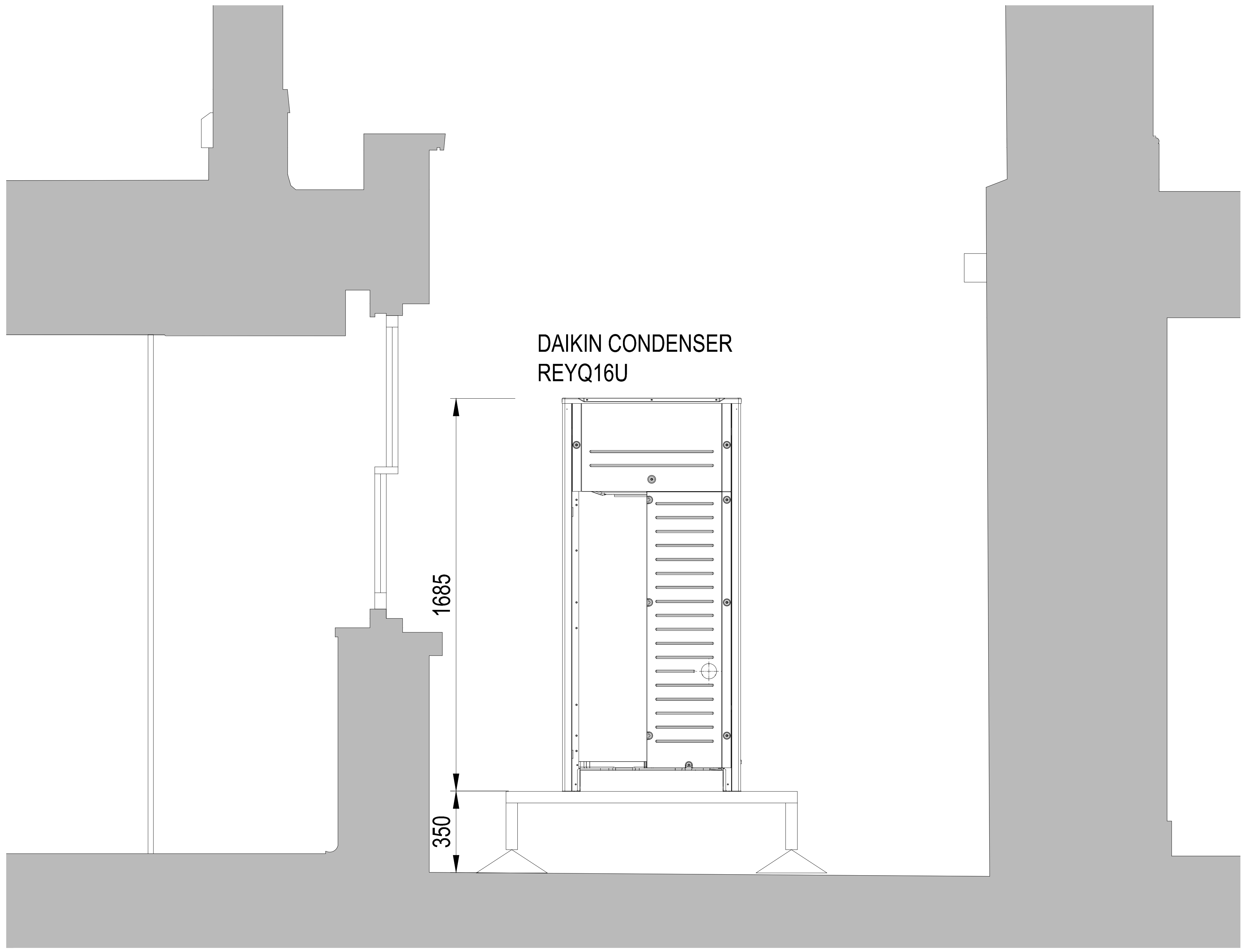
* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
$m^3/(h.m^2)$ at 50 Pa	5	25

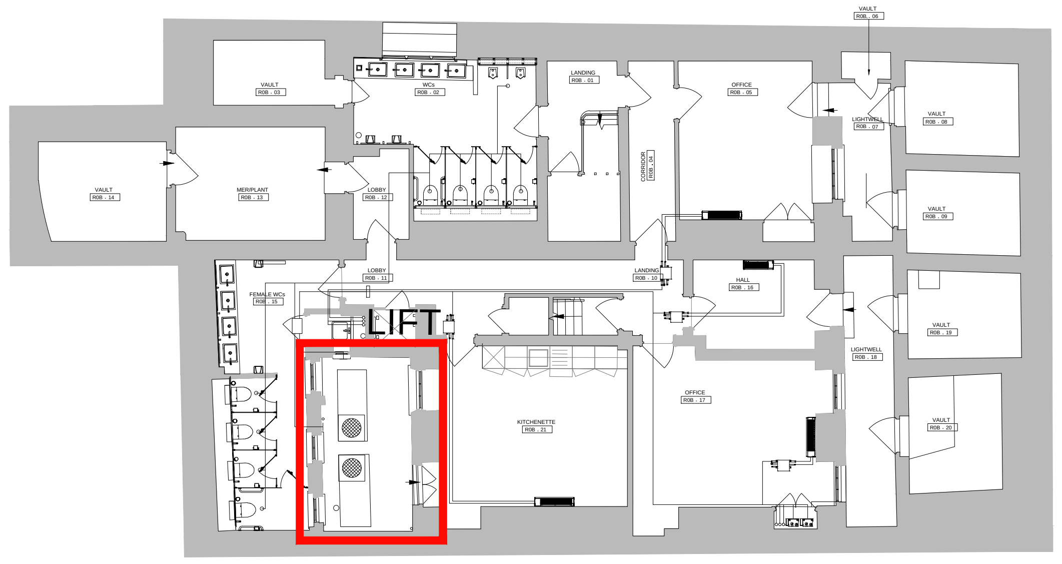
APPENDIX C: SAP10 CARBON EMISSIONS REPORTING SPREADSHEET

Please refer to the Excel spreadsheets submitted along with this Energy Statement.

APPENDIX D: PLANTROOM DETAILS AND SYSTEM SCHEMATICS



02 ELEVATION A - SIDE VIEW
1:20 @ A1

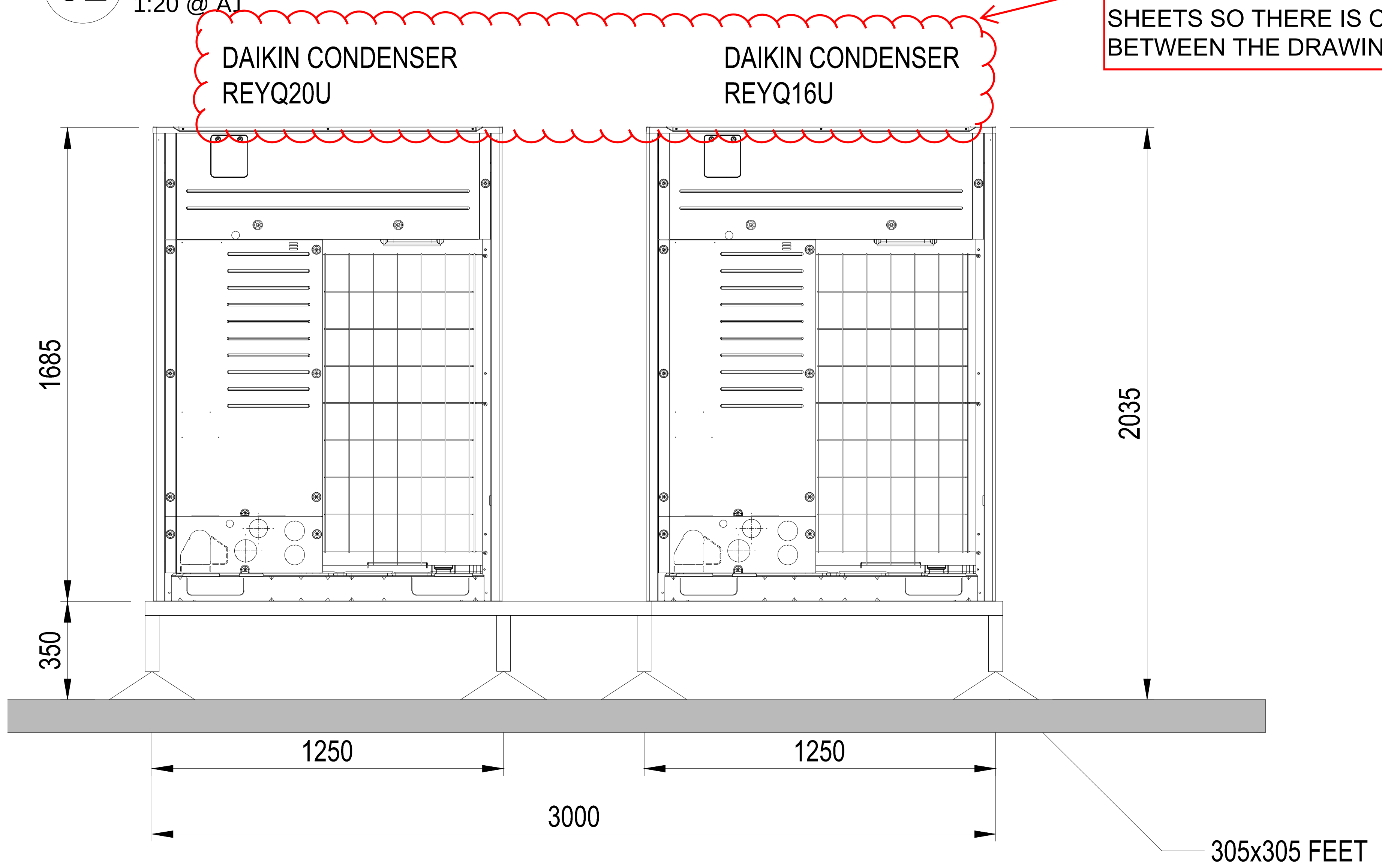


01 KEY PLAN
NTS @ A1

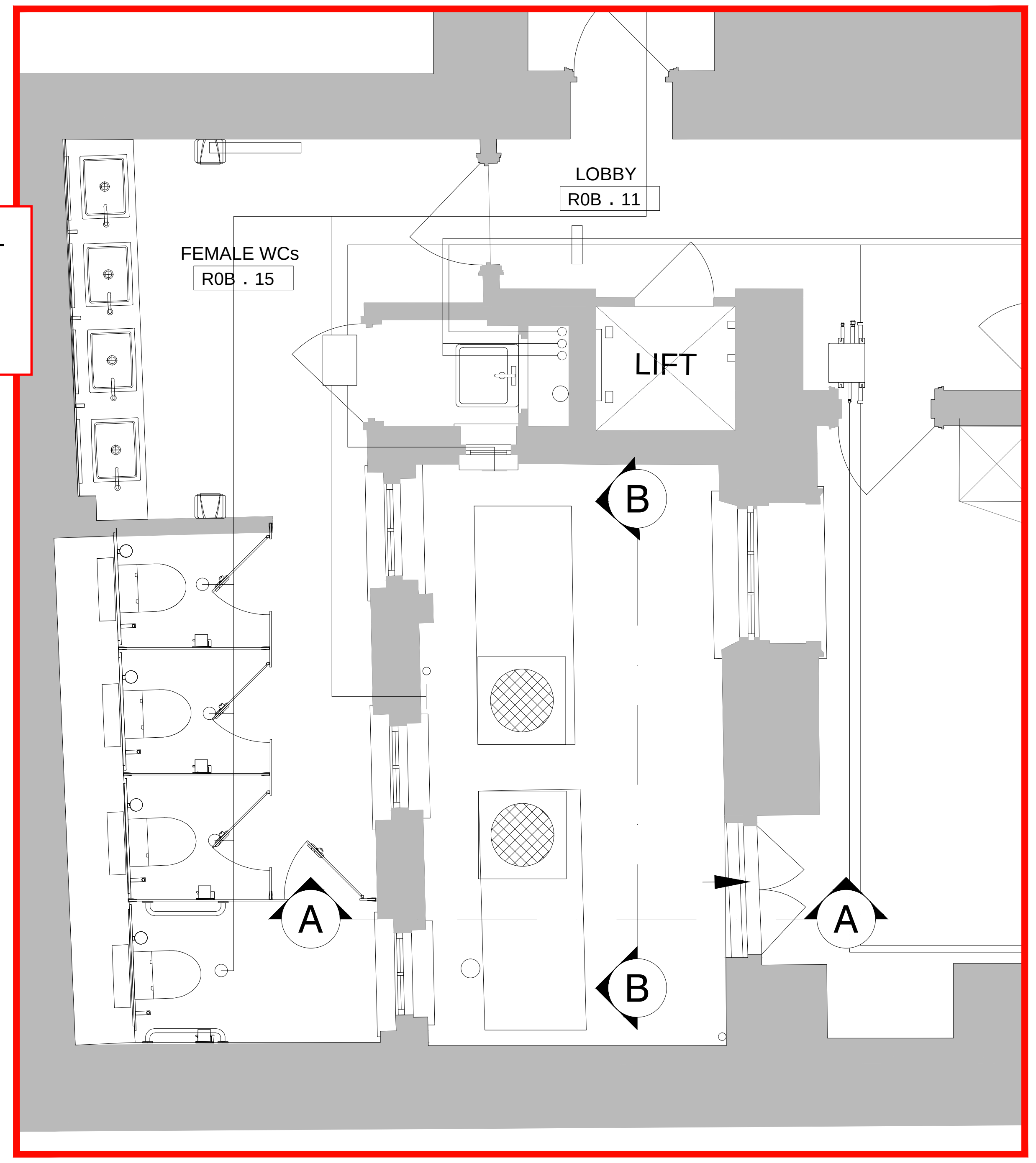
STATUS B

ADD REVISION, DESCRIPTION AND DATE TO TITLE BLOCK

SCHEMATICS SHOW 1no. REYQ16U UNIT AND 1no. REYQ18U UNIT. PLEASE ADJUST CONDENSER ELEVATION/SCHEMATIC SHEETS SO THERE IS CONSISTENCY BETWEEN THE DRAWINGS



03 ELEVATION B - FRONT VIEW
1:20 @ A1



04 EXTRACT PLAN - CONDENSER LOCATION
1:50 @ A1

D1 APPROVED INSTALLER

- DO NOT SCALE FROM THIS DRAWING -

LEGEND

EXISTING	CROSS TALK ATTENUATOR
SUPPLY	VCD VOLUME CONTROL DAMPER
RETURN / EXTRACT	FD FIRE DAMPER
RECTANGULAR DUCT	AD ACCESS DOOR
SPIRAL DUCT	SUPPLY GRILLE
REFRIGERANT PIPE WORK	EXTRACT GRILLE
CONDENSATE PIPE WORK	

Rev.	Detail.	By	Date
X	XXXXXX	XX	XX.XX.XX

Advent
Ductwork Systems Limited.
7 Westfield Road
Slyfield Industrial Estate
Guildford
Surrey
GU1 1RR
Telephone: 01932 856249

Drawing Status.
PROVISIONAL ONLY
FOR DISCUSSION & APPROVAL PURPOSES ONLY
SUBJECT TO SITE SURVEY

Client.
Morgan Lovell
Inspiring office transformation
16 Noel Street London W1F 8DA
T: 0207 734 4466 F: 0207 734 2968 E: contact@morganlovell.com
W: http://www.morganlovell.com

Job Title.
18 - 19 SOUTHAMPTON PLACE
HOLBORN
LONDON
WC1A 2AJ

Drawing Title.
CONDENSER ELEVATION

Drawn. R. HALL		Checked. A. WARD	
Scale. AS SHOWN	Sheet Size. A2	Date. 17.12.21	
Project No. Q21197	Floor No. G	Drawing No. 11	Rev. 0