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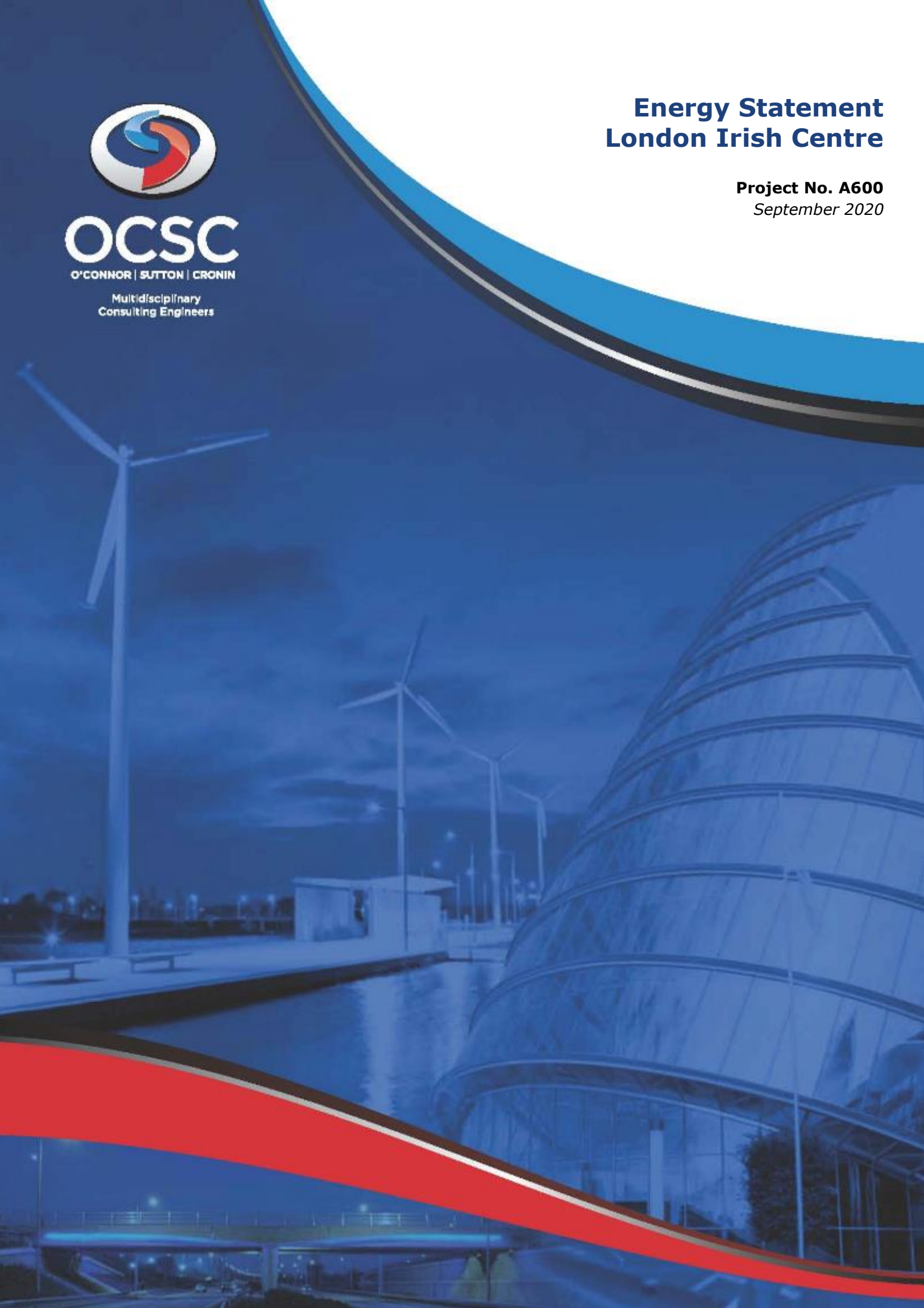
Energy Statement
London Irish Centre

Project No. A600
September 2020



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NOTICE

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EXECUTIVE SUMMARY

O'Connor Sutton Cronin & Associates Ltd have been appointed by Coffey Architects to prepare an Energy Statement to support a planning application for the development of London Irish Centre ("the proposed development") located in the London Borough of Camden.

This Energy Statement presents the energy strategy for the proposed development in relation to building energy and carbon performance, and planning policy targets as laid out within the following documents:

- National Planning Policy Framework (2012)
- The Draft London Plan (2018)
- Camden Local Plan (2017)

Specifically, Draft London Plan (2018) *Policy 5.2 'Minimising Carbon Dioxide Emissions'* requires the proposed development to achieve a minimum of 35% reduction in carbon emissions compared to the Building Regulations Part L 2013 baseline and encourages the maximisation or on-site renewable energy generation.

The energy strategy has been developed in line with the London Plan 'Energy Hierarchy', which encourages a tiered approach to low carbon design, comprising; adoption of measures for energy demand reduction (Be Lean) in the first instance, integration of energy efficient supply (Be Clean) secondly, and use of renewable energy (Be Green) as the final consideration. Following this approach, it is demonstrated that the proposed development energy strategy can meet and exceed energy and carbon policy targets through the application of enhanced energy efficient building fabric and servicing design measures, sufficient to provide 15% betterment over Building Regulations.

Based on energy assessment of the strategy, it is demonstrated that the proposed development (existing and new) can achieve a reduction in annual carbon dioxide (CO_2) emissions of up to 54% compared to the Building Regulations Part L 2013 baseline (Carbon emissions calculated against the latest SAP 10 emission factors). The carbon dioxide emissions and savings achieved for each tier of the energy hierarchy are illustrated in Figure 1 and Table 1, Table 2 and Table 3.

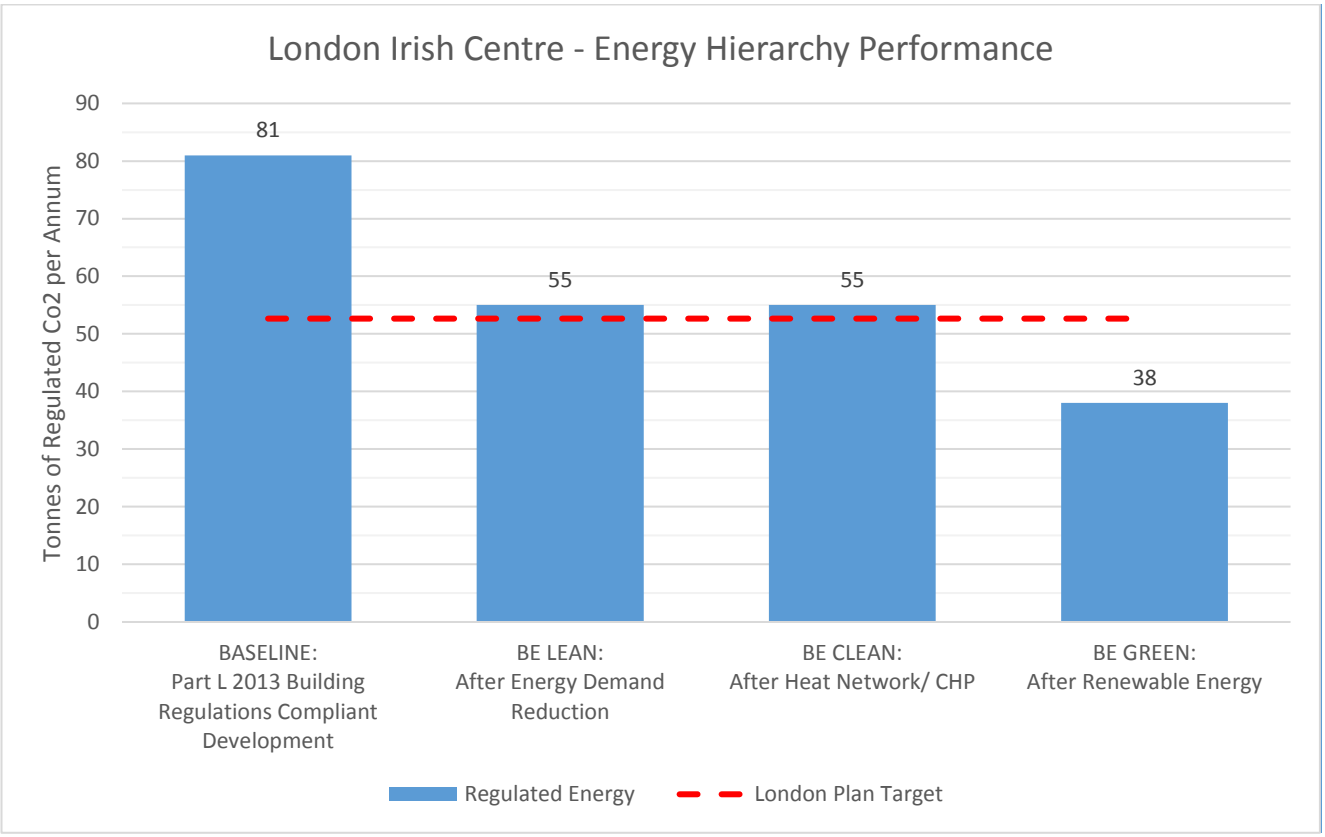


Figure 1 – Energy Hierarchy Performance (Existing and New)

	Carbon Dioxide Emissions (Tonnes CO_2 per Annum) – with SAP 10 Carbon Emission Factors			
	Regulated			Unregulated
	Existing Bldg	New Bldg	Combined Bldg	Combined Bldg
BASELINE: Part L 2013 Building Regulations Compliant Development	38	43	81	91
BE LEAN: After Energy Demand Reduction	22	33	55	91
BE CLEAN: After Heat Network/ CHP	22	33	55	91
BE GREEN: After Renewable Energy	14	24	38	91

Table 1 – CO_2 Emissions by Energy Hierarchy Stage

	Regulated CO_2 Emissions Savings – with SAP 10 Carbon Emission Factors					
	Existing Bldg		New Bldg		Combined Bldg	
	Tonnes CO_2/year	%	Tonnes CO_2/year	%	Tonnes CO_2/year	%
London Irish Centre	24	63	20	45	43	54

Table 2 – Regulated CO_2 Emissions Saving

	Regulated CO_2 Emissions Savings – with SAP 10 Carbon Emission Factors					
	Existing Bldg		New Bldg		Combined Bldg	
	Tonnes CO_2/year	%	Tonnes CO_2/year	%	Tonnes CO_2/year	%
Savings from Energy Demand Reduction	16	42	11	25	27	33
Savings from Heat Network/ CHP	0	0	0	0	0	0
Savings from Renewable Energy	8	22	9	21	17	21
Total Cumulative On Site Savings	**24**	**63**	**20**	**45**	**43**	**54**

Table 3 – Overall Regulated CO_2 Emissions Saving by Energy Hierarchy Stage

Based on the design measures implemented by the design team, the cooling demand of the proposed building is less than the notional building where an active cooling load exists at all stages of the energy hierarchy, i.e. Be Lean, Be Clean and Be Green. Table 4 summarises the cooling demand at the "Be Green" stage with a 33.4% reduction in cooling demand and 54.2% reduction in cooling consumption evident for the combined building when compared to the notional building.

A natural ventilation overheating analysis was carried out for a select number of spaces within the London Irish Centre. The purpose of the analysis is to assess whether these spaces will comply with the overheating criteria as outlined within CIBSE TM52:2013 (The limits of thermal comfort: avoiding overheating in European buildings). It is evident that all rooms fail the overheating criteria for each of the weather files. This is primarily due to the fact they are densely occupied spaces, with the window openings being restricted in the existing building. Therefore, active cooling will be required to maintain thermal comfort within these densely occupied spaces. However, the proposed cooling demand has been shown to be significantly lower than the notional building due to cooling hierarchy approach that has been adopted by the design team. Furthermore, natural ventilation will be introduced as much as possible to reduce the active cooling demand.

Building	Cooling Demand (MJ/m^2)	Cooling Consumption (kWh/m^2)
Existing Building (Split System)		
Actual	131	7.1
Notional	187.8	14.5
% Reduction	30.2%	51.0%
New Building (Split System + VAV)		
Actual	229.4	12.1
Notional	332.7	25.7
% Reduction	31.0%	52.9%
Combined Building (Split System + VAV)		
Actual	224.6	11.9
Notional	337.3	26
% Reduction	33.4%	54.2%

Table 4 – Actual and Notional Building Cooling Demand Summary

Overall, it can be concluded that the appropriate and available measures will be taken to ensure the London Irish Centre will have the lowest associated carbon emissions possible.

1. INTRODUCTION

O'Connor Sutton Cronin & Associates Ltd have been appointed by Coffey Architects to prepare an Energy Statement to support a planning application for the development of London Irish Centre (the proposed development) located in the London Borough of Camden (LB Camden).

This statement presents the outcome of the energy appraisal of the proposed development and details the approach that the applicant and the design team have collectively taken towards achieving a high standard of operational energy performance. The measures suggested with the design proposals to reduce the energy demand, energy use, resultant carbon dioxide emissions and environmental impact of the scheme are outlined. In addition to the consideration of demand reduction and energy efficient design, the statement assesses the suitability of low and zero carbon technologies (LZCs) for application to the proposed development.

The Energy Statement includes:

- Description of the proposed development;
- Summary of the relevant national, regional and local energy planning policy drivers;
- Definition of the energy hierarchy applied to the development;
- Examination of the performance of the scheme in accordance with key energy policies at all levels, including the London Plan and Camden Local Plan; and
- A review of the proposed development's performance against set planning objectives and good practice identifying the opportunities and constraints of both the application site and the proposals.

2. THE PROPOSED DEVELOPMENT

The application site is located at 50-52 Camden Square in the London Borough of Camden.
The proposed development consists of the retention and elevational alterations of existing buildings at No.50, 51 and 52 Camden Square and the McNamara Hall. Demolition in part and redevelopment to provide new and reconfigured community floor space; associated landscaping and cycle parking.

Figure 2 illustrates the proposed massing of the site.

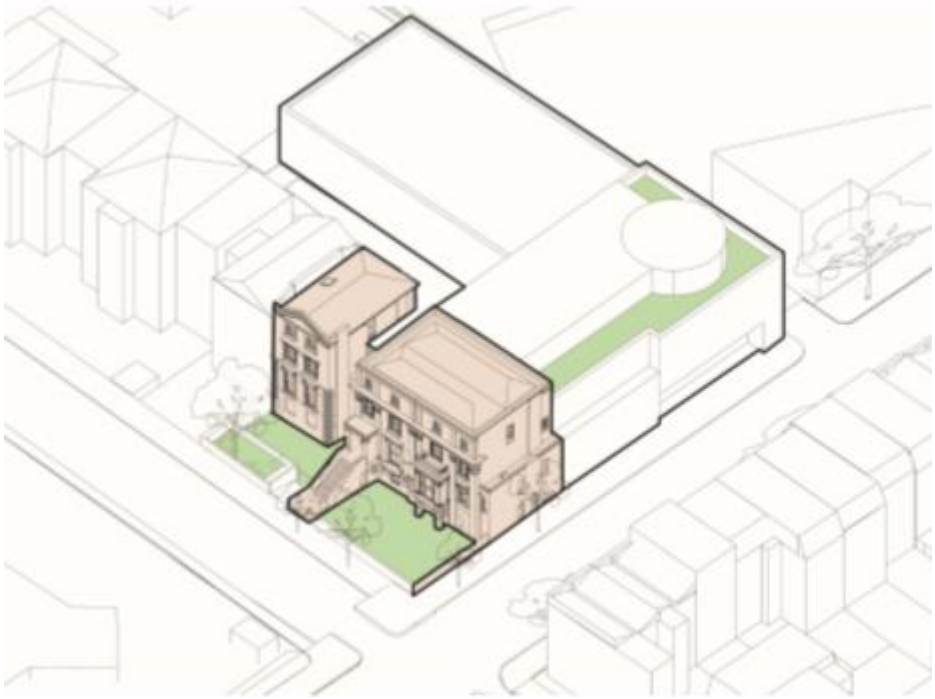


Figure 2 – Proposed Massing

The proposed development is classified as a D1 (non-residential institution) and D2 (Assembly and Leisure)

3. PLANNING POLICY

The planning policy context for London Irish Centre comprises the national, regional and local planning policy as detailed below:

NATIONAL PLANNING POLICY FRAMEWORK (2019)

The revised National Planning Policy Framework (NPPF) was published in February 2019 and sets out the Government's planning policies for England and how these are expected to be applied. It provides a framework within which locally prepared plans for housing and other developments can be produced. This revised Framework replaces the previous National Planning Policy Framework published in March 2012, which was adopted as a key part of the Government's reforms to make the planning system less complex and more accessible, whilst protecting the environment and promoting sustainable growth.

At the heart of the NPPF is a 'presumption in favour of sustainable development', which requires Local Authorities as part of any plan-making and decision-making to provide clear guidance on how the presumption should be applied locally. The NPPF additionally sets out thirteen core land-use planning principles that the Government has identified to underpin both plan-making and decision-making. Of these, the following has been identified as being relevant to energy:

'The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including conversion of existing buildings, and support the renewable and low carbon energy and associated infrastructure.'

THE DRAFT LONDON PLAN (2018)

The new Draft London Plan (2018) has been introduced and its new energy assessment guidance came into force in January of 2019. The London Plan is the overall strategic plan for London, setting out an integrated economic, environmental, transport and social framework for the development of London over the next 20-25 years. In terms of energy and carbon, Chapter 9 *'Sustainable Infrastructure'* outlines a number of the policies that set the overarching principles for reducing carbon emissions in the built environment. The relevant policies of Chapter 5 include:

Policy SI2: Minimising Greenhouse Gas Emissions

A. Major developments proposals 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 and manage demand during operation
- Be Clean - exploit local energy resources and supply energy efficiently and cleanly
- Be Green - maximise opportunities for renewable energy by producing, storing and using renewable energy on-site.

B. 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.

C. A minimum on-site reduction of at least 35% beyond Building Regulations is required for major development. Residential development should achieve a 10%, and non-residential development should achieve 15% through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:

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

9.2.4

A zero-carbon target for major residential developments has been in place for London since October 2016 and will apply to major non-residential developments from 2019 (when draft London Plan 2018 comes into effect later on this year).

9.2.10

The highest standards of sustainable design should be achieved to improve the environmental performance of a new development. The main information that should be contained in energy strategies:

- Calculation of the energy demand and carbon emissions covered by Building Regulations and, separately, the energy demand and carbon emissions from any part of the development, that are not covered by the Building Regulations (i.e. the unregulated emissions), at each stage of the energy hierarchy.
- Proposals to reduce carbon emissions beyond Building Regulations through the energy efficient design of the site, building and services.

- Proposals to further reduce carbon emissions through the use of zero or low emissions decentralised energy where feasible, prioritising connection to district heating and cooling networks.
- Avoiding internal overheating; and
- Avoiding pollution.

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 of CHP to enable the delivery of an area-wide heat 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 of policy SI1 for improving air quality
3) Where a heat network is planned but not yet in existence, the development should be designed for connection at a later date.

9.3.7:

Increasing the amount of renewable energy is supported and development proposals should identify opportunities to maximize renewable energy production on-site

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 cooling hierarchy.

CAMDEN LOCAL PLAN

The relevant planning authority is Camden Council and planning policy for the area is detailed in Camden Local Plan (2017). The Relevant policy CC1 for climate change mitigation indicates:

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.

We will:

a. promote zero carbon development and require all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy;
b. require all major development to demonstrate how London Plan targets for carbon dioxide emissions have been met;
c. ensure that the location of development and mix of land uses minimise the need to travel by car and help to support decentralised energy networks;
d. support and encourage sensitive energy efficiency improvements to existing buildings;
e. require all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building; and
f. expect all developments to optimise resource efficiency.

For decentralised energy networks, we will promote decentralised energy by:

g. working with local organisations and developers to implement decentralised energy networks in the parts of Camden most likely to support them;
h. protecting existing decentralised energy networks (e.g. at Gower Street, Bloomsbury, King's Cross, Gospel Oak and Somers Town) and safeguarding potential network routes; and
i. requiring all major developments to assess the feasibility of connecting to an existing decentralised energy network, or where this is not possible establishing a new network.

To ensure that the Council can monitor the effectiveness of renewable and low carbon technologies, major developments will be required to install appropriate monitoring equipment.

4. BUILDING REGULATIONS

The Building Regulations 2013 (England & Wales) set out standards and requirements that individual aspects of building design and construction must achieve. Approved Document Part L *'Conservation of fuel and power'* 2013 edition of the Building Regulations (BR Part L 2013) deals with energy efficiency requirements for buildings. The Approved Document relevant to the proposed development, and the basis against which compliance of the development energy strategy is measured against is:

- Non-residential: Building Regulations Part L2a 2013 *'Conservation of fuel and power in new buildings other than dwellings'*.

For new build non-residential buildings, the respective Government approved methodology for calculating energy efficiency and carbon emissions in accordance with Building Regulations Part L is the National Calculation Methodology (NCM). The current IESVE 2019 software (NCM) calculates the energy requirements for space and water heating, ventilation and internal lighting of buildings. The outputs produced from the software include a dwelling/ building carbon emission rate (BER) in terms of $kgCO_2/m^2/year$ for the modelled building.

To comply with Building Regulation Part L2a in terms of the carbon emissions rate, the BER must be equal to or better than the Target Emission Rate (TER), which is the Building Regulations baseline. The proposed development energy strategy performance has therefore been assessed in accordance with this carbon emission rate criterion to determine compliance of the proposals.

5. ENERGY ASSESSMENT

A Building Regulation Part L 2013 compliant energy assessment has been undertaken in order to assess the likely energy demands and carbon dioxide emission of the proposed development. The energy calculations have been produced based on information provided, which includes accommodation schedules, and layout plans for the proposed development, along with information regarding acceptable constructions and energy efficiency improvements.

The methodology used to estimate the energy demand from buildings on the proposed development site has been informed by the guidance in the following publications:

- National Calculation Methodology (NCM) 2013 guidance;
- The Draft London Plan (2018);
- The GLA Energy Assessments Guidance (October 2018)
- The London Renewables Toolkit for Planners, Developers and Consultants.

An energy modelling exercise has been undertaken to establish the anticipated regulated carbon dioxide emissions in accordance with Building Regulations Part L 2013. SBEM compliant software have been utilised to energy model the proposed development.

Grid electricity has significantly decarbonised since the last update of Part L in April 2014 and in July 2018 the Government published updated carbon emission factors (SAP 10) demonstrating this. These new emission factors will however not be incorporated into Part L of the Building Regulations until the Government has consulted on new Building Regulations. The impact of these new emission factors is significant in that technologies generating on-site electricity (such as gas-engine CHP and solar PV) would not achieve the carbon savings they have to date therefore it is anticipated that developments would need to utilise alternative or additional technologies to meet the 35 per cent on-site carbon reduction target, including using zero emission or local secondary heat sources. The update on the carbon emissions is outlined in Table 5.

Fuel Type	Fuel Carbon Factor ($kgCo_2/kWh$)	
	SAP 2012	SAP 10
Natural Gas	0.216	0.210
Grid Electricity	0.519	0.233

Table 5 – SAP 2012 and SAP 10 Carbon Emission Factors

The GLA is encouraging applicants to use the SAP 10 emissions factors for referable applications when estimating CO_2 emission performance against London Plan policies. As such, these figures have been used for the assessment of this building.

5.1 Regulated Emissions Baseline

The regulated emissions baseline is taken as the Target Emission Rate (TER) against Part L 2013 and are presented for the non-domestic building. This is calculated by modelling the actual geometry and type of use of the proposed building/ units and applying notional (Building Regulations minimum) building fabric and building services performance values to the models. Table 6 outlines the calculated average TER and overall carbon dioxide emissions with SAP 10 emissions factors, as per GLA guidance, for the regulated baseline.

	Existing Bldg		New Bldg		Combined Bldg	
Use	**TER with SAP 2012 figures ($KgCO_2/m^2$ /yr)**	**Annual CO_2 Emissions (tonnes CO_2) with SAP 10 emissions factors**	**TER with SAP 2012 figures ($KgCO_2/m^2$ /yr)**	**Annual CO_2 Emissions (tonnes CO_2) with SAP 10 emissions factors**	**TER with SAP 2012 figures ($KgCO_2/m^2$ /yr)**	**Annual CO_2 Emissions (tonnes CO_2) with SAP 10 emissions factors**
London Irish Centre	35.9	38	24.1	43	27.2	81

Table 6 – Target Emission Ratings for London Irish Centre

5.2 Regulated and Unregulated Emissions

For new developments, energy use within buildings is regulated to conserve heat and power as described in Chapter 5. In addition to the resultant carbon dioxide emissions from the regulated emissions, there are additional uses of energy which are unregulated, examples of which include energy for small power appliances, IT equipment and white goods. Such energy use in buildings is described as unregulated energy use (emissions) as it is not covered by the NCM calculation methodology for Building Regulations Part L.

For non-residential buildings, assessment of unregulated energy is best considered by using benchmarks generated by datasets of typical buildings. Benchmarks published by the CIBSE (Guide F) indicate the estimated overall emissions by building use type.

Table 7 outlines the estimated performance of the proposed development which includes regulated and unregulated emissions.

Building Regulations 2013 Part L Compliant Development with SAP 10 Emission Factors	Overall Baseline Emissions (tonnes CO_2)			
	Regulated			Unregulated
	Existing Bldg	New Bldg	Combined Bldg	Combined Bldg
London Irish Centre	38	43	81	91

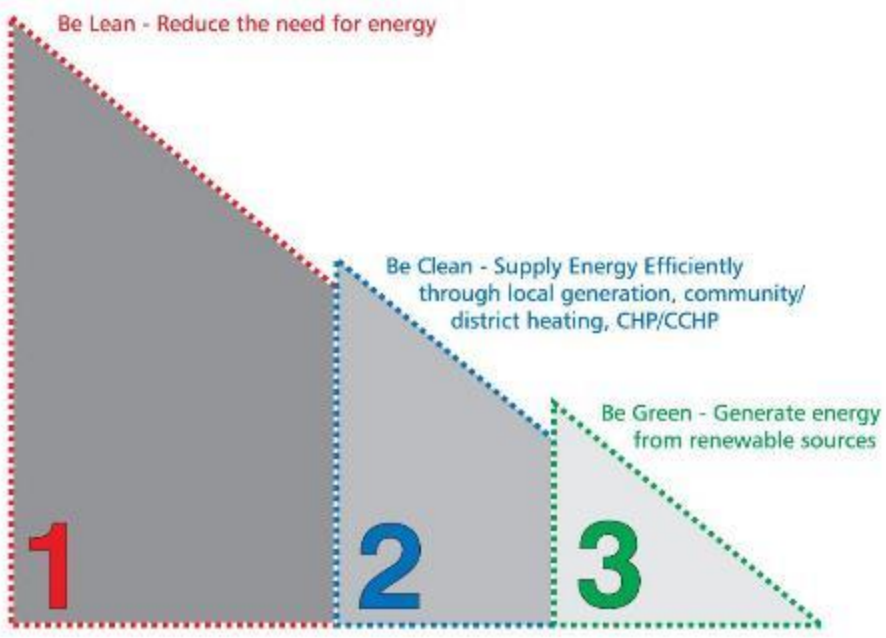
Table 7 – Carbon Dioxide Emissions Baseline for London Irish Centre

Note: Unregulated carbon dioxide emissions are to be included for information only as stated in the GLA Guidance on Preparing Energy Assessments (October 2018).

6. ENERGY EFFICIENCY MEASURE – BE LEAN

The London Plan and *GLA Guidance on Preparing Energy Assessments* describes a set of principles to guide design development and decisions regarding energy, balanced with the need to optimise environmental and economic benefits. These guiding principles are referenced in the London Plan, which states that *'The following hierarchy should be used to assess applications'*:

- Using less energy, in particular by adopting sustainable design and construction measures;
- Supplying energy efficiently, in particular by prioritising decentralised energy generation; and
- Use renewable energy.



In addition to the London Plan guidance, the Camden borough supports and reinforces this approach, making it a priority to install energy efficiency measures and to use low carbon generating technologies to reduce CO_2 emissions from new development.

6.1 Be Lean Measures

The first tier of the energy hierarchy requires energy strategies to consider energy demand reduction measures specific to the development, and seek to not only comply with the Buildings Regulation Part L baseline, but improve over Building Regulations Part L by at least 15% with these measures alone. Such measures typically include both architectural and building fabric measures (passive design) and energy efficient services (active design) in order to achieve a building that meets and exceeds Building Regulations energy performance. BRUKL reports indicating the BER and TER of the modelled building at each stage of the energy hierarchy is including in Appendix C. The proposed development energy strategy incorporates the following energy efficiency design measures to maximise the benefit of energy demand reduction in the energy strategy:

Passive Design

- Enhanced building envelope performance over and above Building Regulations Part L2a minimum U-Values, as outlined in Table 8.
- Enhanced air infiltration target.

Element	Current 2013 Part L2A & L2B U-values (W/m².K)	Energy Strategy U-values (W/m².K)
New External Walls	0.35	0.13
Upgraded Existing Walls	0.30	0.15
New Floors	0.25	0.13
Upgraded Existing Floor	0.25	0.25
New Roof	0.25	0.13
Upgraded Existing Roof	0.16	0.16
New Windows	2.20	1.00
Upgraded Existing Windows	2.20	1.40
Air Permeability	10 m³/(h.m²)@50pa	3.5 m³/(h.m²)@50pa

Table 8 – Proposed Non-Residential Envelope Performance

Active Design Measures

- 100% low energy light fittings provision.
- Occupant and daylighting control of lighting, with occupancy sensors and dimming throughout.
- High efficiency Heat Pumps and Mechanical Ventilation with Heat Recovery
- Effective monitoring and management of heating, cooling, ventilation and air conditioning systems.

6.2 Emissions Performance Following Demand Reduction Measures

The energy modelling of the proposed development indicates that by incorporating demand reduction 'Be Lean' measures, the following performance can be achieved:

	Existing Bldg		New Bldg		Combined Bldg	
Use	**BER with SAP 2012 figures ($KgCO_2/m^2$ /yr)**	**Annual CO_2 Emissions (tonnes CO_2) with SAP 10 emissions factors**	**BER with SAP 2012 figures ($KgCO_2/m^2$ /yr)**	**Annual CO_2 Emissions (tonnes CO_2) with SAP 10 emissions factors**	**BER with SAP 2012 figures ($KgCO_2/m^2$ /yr)**	**Annual CO_2 Emissions (tonnes CO_2) with SAP 10 emissions factors**
London Irish Centre	28.2	22	17.7	33	20.3	55

Table 9 – Be Lean: Building Emissions Rating for London Irish Centre

BE LEAN	Carbon Dioxide Emissions (tonnes CO_2 per annum) – with SAP 10 Carbon Emission Factors			
	Regulated			Unregulated
	Existing Bldg	New Bldg	Combined Bldg	Combined Bldg
Building Regulations 2013 Part L Compliant Development	38	43	81	91
After Energy Demand Reduction	22	33	55	91

Table 10 – Be Lean: Annual Emissions for London Irish Centre

BE LEAN	Regulated Carbon Dioxide Savings – with SAP 10 Carbon Emission Factors					
	Tonnes CO_2/year	%	Tonnes CO_2/year	%	Tonnes CO_2/year	%
Savings from Energy Demand Reduction	16	42	11	25	27	33

Table 11 – Be Lean: Emissions Savings for London Irish Centre

7. SUPPLYING ENERGY EFFICIENTLY – BE CLEAN

7.1 Existing and Planned Heat Networks

In response to the second tier of the energy hierarchy and LB Camden planning policy requirement that developments seek to connect to decentralised energy networks, an assessment of adjacent existing and future heat loads and infrastructure has been undertaken. Using the London Heat Map (https://maps.london.gov.uk/heatmap/) the potential for connection to an existing or proposed scheme in the locality of the proposed development has been examined.

An extract from the London Heat Map at the proposed development and surrounding area is illustrated in Figure 3 with the existing heat networks layer activated. The heat map extract illustrates there are currently no existing heat networks within the vicinity of the proposed development.

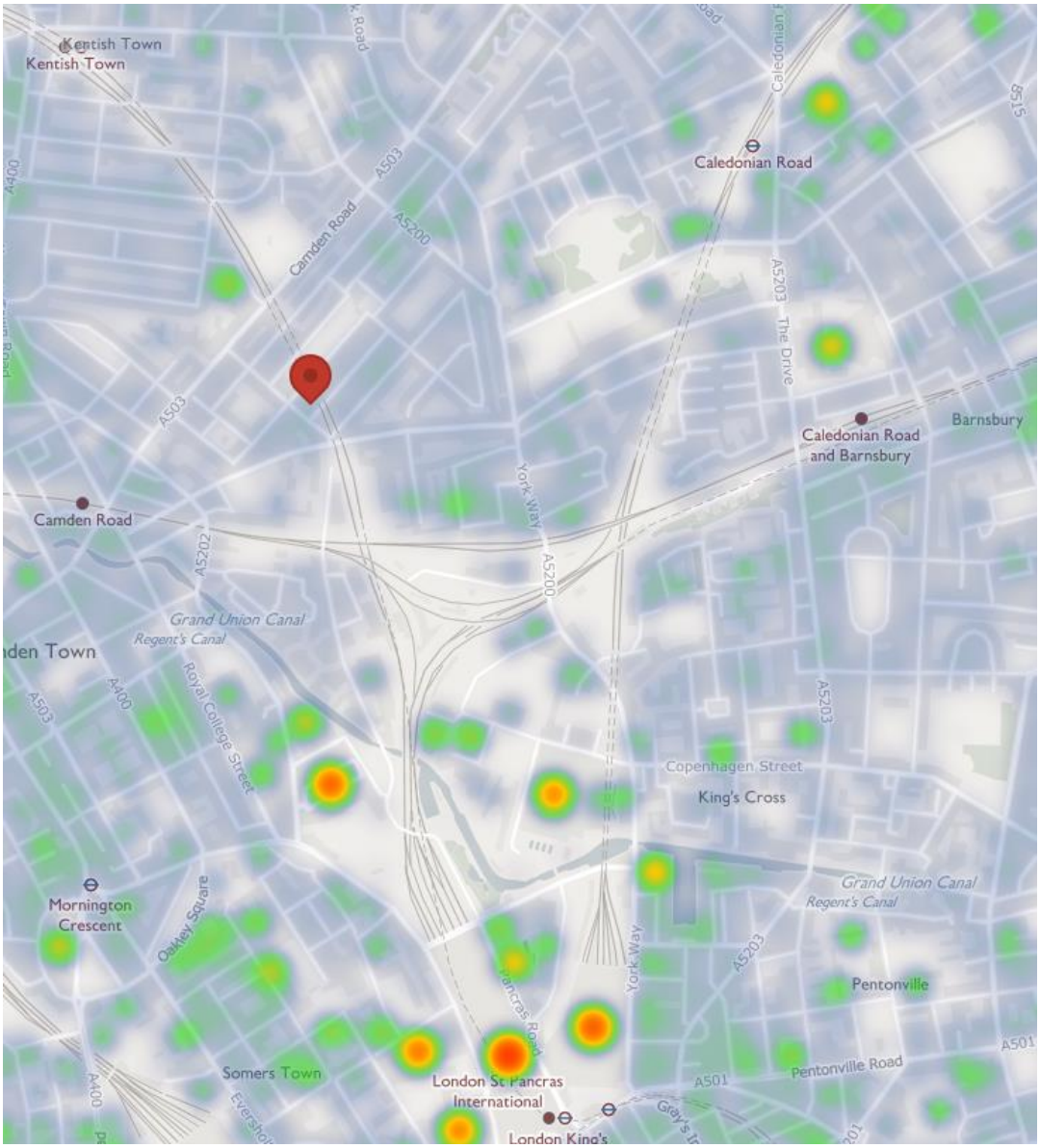


Figure 3 – London Heat Map for Application Site and Surrounding Areas
(Source: London Heat Map)

The heat map extract in Figure 4 illustrates the proposed development is outside an opportunity area planning framework and hasn't been considered in previous heatmap study areas. There is potentially a proposed heat network more than 1km away which, considering the distance, would be cost prohibitive. The proposed air-source heat pump strategy is deemed the most appropriate solution for the proposed development as associated carbon emissions will continue to reduce as the electricity grid becomes less carbon intensive.

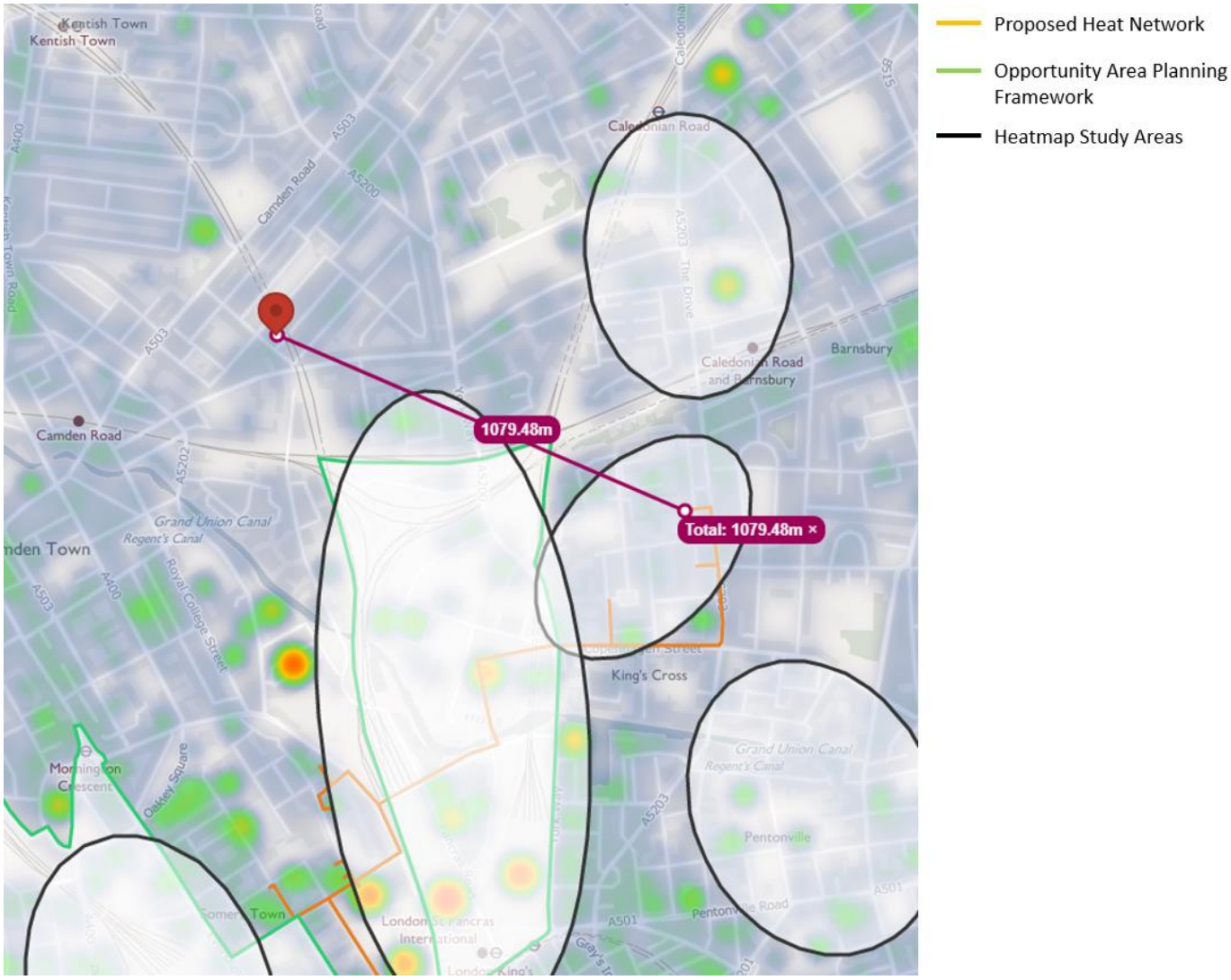


Figure 4 – London Heat Map for Application Site and Surrounding Areas
(Source: London Heat Map)

7.2 Site-Wide Heat Networks

Local heat and power sources minimise distribution losses and achieve greater efficiencies when compared to separate energy systems, thus reducing CO_2 emissions. In accordance with policy, the energy systems for the site have been determined in accordance with the following hierarchy:

1. Connection to existing heating and cooling networks
2. Site wide CHP network
3. Communal heating and cooling

In a communal energy system, energy in the form of heat, cooling, and/or electricity is generated from a central source and distributed via a network of insulated pipes to surrounding residencies and commercial units.

Site Wide Heating Network and CHP Combined heat and power engines are not viable for this development due to its small size.

Technical Assessment for future connection to DH network

Based on the proposed servicing strategy, a highly efficient refrigerant based VRF system is to be installed to provide simultaneous heating and cooling to the spaces at the London Irish Centre.
It would therefore not be feasible to connect any future DH network to the development should one become available in the future.

Heat Pumps

Heat pumps draw thermal energy from the air, water or ground ("source") and upgrade it to be used as useful heat at another location ("sink"). Heat pumps require electricity to operate (or gas in the case of Gas Absorption Heat Pumps) as mechanical input is required to convert harvested energy to useful heat and complete its transport to the "sink". Heat pumps are generally considered as renewable (despite an electrical or gas requirement) because the source of the heat is the ambient temperature in the exterior environment, which is ultimately heated via the sun.

7.3 Emissions Performance Following Low Carbon Energy Supply

The energy modelling of the proposed development indicates that by incorporating the 'Be Clean' features described in the chapter, the following performance can be achieved:

	Existing Bldg		New Bldg		Combined Bldg	
Use	**BER with SAP 2012 figures ($KgCO_2/m^2$ /yr)**	**Annual CO_2 Emissions (tonnes CO_2) with SAP 10 emissions factors**	**BER with SAP 2012 figures ($KgCO_2/m^2$ /yr)**	**Annual CO_2 Emissions (tonnes CO_2) with SAP 10 emissions factors**	**BER with SAP 2012 figures ($KgCO_2/m^2$ /yr)**	**Annual CO_2 Emissions (tonnes CO_2) with SAP 10 emissions factors**
London Irish Centre	28.2	22	17.7	33	20.3	55

Table 12 – Be Clean: Building Emissions Rating for London Irish Centre

BE CLEAN	Carbon Dioxide Emissions (tonnes CO_2 per annum) – with SAP 10 Carbon Emission Factors			
	Regulated			Unregulated
	Existing Bldg	New Bldg	Combined Bldg	Combined Bldg
Building Regulations 2013 Part L Compliant Development	38	43	81	91
After Energy Demand Reduction	22	33	55	91
After Energy Supply	22	33	55	91

Table 13 – Be Clean: Annual Emissions for London Irish Centre

BE LEAN	Regulated Carbon Dioxide Savings – with SAP 10 Carbon Emission Factors					
	Tonnes CO_2/year	**%**	**Tonnes CO_2/year**	**%**	**Tonnes CO_2/year**	**%**
Savings from Energy Demand Reduction	16	42	11	25	27	33
Savings from Energy Supply	0	0	0	0	0	0

Table 14 – Be Clean: Emissions Saving for London Irish Centre

8. USE LOW AND ZERO CARBON TECHNOLOGIES – BE GREEN

This section describes the low and zero carbon (LZC) technologies which have been considered for the proposed development.

When addressing the third tier of the energy hierarchy, the aim is to identify the feasibility of LZC technologies at the application site and recommendations based on cost/ effectiveness. As planning policy targets now focus on overall emissions reductions, rather than simply requiring a percentage of renewable energy generation, the assessment provides an indication of feasibility for the application site, but does recommend by default that any technologies are incorporated.

8.1 Technologies Excluded From Analysis

The renewable energy feasibility study has excluded the analysis of fuel cells, hydroelectricity and piezoelectric technologies for incorporation at the proposed development.

8.2 Technologies Included in Analysis

The LZC feasibility study for the proposed development has assessed the use of solar thermal collectors, photovoltaic modules, biomass heating, heat pumps and wind turbines.

8.2.1 Solar Thermal Collectors

Solar thermal panels convert energy from the sun to produce hot water for heating application within buildings. To maximise the irradiance level exposure, solar panels should ideally be installed on a flat or sloping roof orientated south and at an angle of 30°.

Recommendation

The installation of solar thermal collectors is technically feasible, however is not recommended given the proposed installation of heat pumps to provide heat energy.

8.2.2 Photovoltaic Modules

Solar Photovoltaics (PVs) are solar panels which generate electricity through photon-to-electron energy transfer, which takes place in the dielectric materials that make up the cells. The cells are made up from layers of semi-conducting silicon material which, when illuminated by the sun, produces an electrical field which generates an electrical current. PVs can generate electricity even on overcast days, requiring daylight, rather than direct sunlight. This makes them viable even in the UK, although peak output is obtained at midday on a sunny summer's day. PVs can therefore offer a simple and proven solution to generating renewable electricity.

Recommendation

The integration of PV arrays on roof space is technically feasible for the proposed development. They are considered suitable for the contribution towards reducing the carbon emissions on site and to align with planning policy which encourages the incorporation on-site renewable generation, where feasible.

For the London Irish Centre, a PV array of 79 modules of high efficiency (0.37kWp per panel of 1.558m x 1.046m), totalling 19.23 kWp total is proposed to be installed with 30° tilt and Southeast orientation, with 1.5m spacing. More details on the proposed photovoltaic module are included in Appendix B. An indicative roof allocation for PV array is illustrated in Figure 8 below. The allocation illustrated in Figure 5 is indicative and is subject to adjustment.

Figure 5 – Proposed PV Array Allocation

8.2.3 Biomass Heating

Biomass boilers replace conventionally powered boilers with an almost carbon neutral fuel such as wood pellets or wood chips. The fuel is classed as almost carbon neutral because the CO_2 released during the burning of biomass is balanced by that absorbed by the plants during their growth. Although biomass is considered a cleaner fuel than gas or heating oil, it should be noted that fossil fuels are utilised in the production, processing and transportation of the fuels. A key issue when choosing the biomass fuel supply is therefore distance between producer and processor, and from supplier and site, as well as the method of transportation.

Recommendation

Biomass heating for the proposed development is technically feasible, however is not recommended as an option for a range of considerations, including; significant site spatial requirements for storage, delivery and access, on-going management burden of regular fuel deliveries and maintenance requirements (removal of ash), and potential visual and air quality impact associated with the technology.

8.2.4 Wind Turbines

Wind turbines are an established means of capturing wind energy and converting it into usable electricity. A wind turbine usually consists of a nacelle containing a generator connected, sometimes via a gearbox, to a rotor consisting of three blades.

The two main types of commercially available wind turbines on offer in the UK are described below:

- Horizontal axis wind turbines (HAWT) are traditionally the most common form of wind turbines installed in the UK. They are usually formed of three blades and work best when provided with a constant laminar air flow; and
- Vertical axis wind turbines (VAWT) are less efficient compared to HAWTs, but have the advantage that they can cope with variable wind flows as they do not have to 'face' the wind.

Referring to the Numerical Objective Analysis Boundary Layer (NOABL) wind speed database as adopted by the DECC, the application site experiences fairly low wind speeds in this area, averaging 4.8 m/s assuming a rotor height at around 10m above ground level. Taking a roof mounted turbine with a rotor at 45m above ground level may increase wind speeds to 6.0 m/s, but given the urban environment, it is unlikely that average speeds will meet this estimate given the experience of urban installations.

Recommendation

The installation of wind turbines though technically feasible at the application site, are not considered appropriate. This recommendation is based on consideration of the low wind speed availability in the area, and nature of the proposed development and surrounding areas, which is likely to give rise to amenity issues, including shadow-flicker and noise associated with operation of wind turbines.

8.3 Emissions Performance Following Assessment of LZC Technology

The carbon emissions following the 'Be Green' step are shown below, after the application of the LZC technologies.

	Existing Bldg		New Bldg		Combined Bldg	
Use	**BER with SAP 2012 figures ($KgCO_2/m^2$ /yr)**	**Annual CO_2 Emissions (tonnes CO_2) with SAP 10 emissions factors**	**BER with SAP 2012 figures ($KgCO_2/m^2$ /yr)**	**Annual CO_2 Emissions (tonnes CO_2) with SAP 10 emissions factors**	**BER with SAP 2012 figures ($KgCO_2/m^2$ /yr)**	**Annual CO_2 Emissions (tonnes CO_2) with SAP 10 emissions factors**
London Irish Centre	30.3	14	17.7	24	20.8	38

Table 15 – Be Green: Building Emissions Rating for London Irish Centre

BE CLEAN	Carbon Dioxide Emissions (tonnes CO_2 per annum) – with SAP 10 Carbon Emission Factors			
	Regulated			Unregulated
	Existing Bldg	New Bldg	Combined Bldg	Combined Bldg
Building Regulations 2013 Part L Compliant Development	38	43	81	91
After Energy Demand Reduction	22	33	55	91
After Energy Supply	22	33	55	91
After LZC	14	24	38	91

Table 16 – Be Green: Annual Emissions for London Irish Centre

BE LEAN	Regulated Carbon Dioxide Savings – with SAP 10 Carbon Emission Factors					
	Tonnes CO_2/year	%	Tonnes CO_2/year	%	Tonnes CO_2/year	%
Savings from Energy Demand Reduction	16	42	11	25	27	33
Savings from Energy Supply	0	0	0	0	0	0
Savings from LZC	8	22	9	21	17	21

Table 17 – Be Green: Emissions Saving for London Irish Centre

9. COOLING AND OVERHEATING

9.1 Active Cooling

The energy strategy approach for non-residential developments is to avoid to the need for active cooling. At the detailed design stage, the strategy for minimising cooling demand will be fully developed in accordance with Policy SI4 of the London Plan. To reduce the potential of internal overheating and reliance on air conditioning systems, the following principles of cooling hierarchy are recommended:

1. Reduce the amount of heat entering a building in summer through orientation, shading, high albedo materials, fenestration, insulation and green infrastructure.
    a. The proposed development's glazing to wall ratio has been carefully considered with a ratio of approx. 15% for the new build elements. This minimises excessive solar gains during peak summer months. Furthermore, the glazing G-value will be optimised to reduce unnecessary solar gains even further.
2. Minimise internal heat generation through energy efficient design.
    a. The proposed development will utilise high efficiency LED lighting throughout which reduces heat gain to the space and subsequently reduces internal cooling loads.
3. Manage the heat within the building through exposed internal thermal mass and high ceilings.
    a. The proposed development will utilise high ceilings within the densely occupied areas which will help create stratification within these spaces, thus contributing to reduced internal cooling loads within the occupied zones.
4. Passive ventilation.
    a. The upgraded windows within the existing elements of the proposed development will be openable, thus enabling passive ventilation.
5. Mechanical ventilation.
    a. All densely occupied areas will have mechanical ventilation as natural ventilation alone will not be sufficient to satisfy the ventilation loads. The mechanical ventilation systems will be high efficiency and incorporate heat recovery. Furthermore, CO_2 sensors will be incorporated which will vary the ventilation rate supplied to the spaces depending on the occupancy load, thus further improving energy efficiency and thermal comfort.
6. Active cooling systems.
    a. Due to the nature of the proposed development, i.e. densely occupied areas over short periods of time, active cooling is a requirement for this development. However, the cooling hierarchy, as outlined above, has been followed by the design team to minimise the active cooling loads as much as possible. The active cooling system will be a high efficiency air-source heat pump system, thus reducing associated carbon emissions as much as possible.

Based on the proposed design measures outlined above, the cooling demand of the proposed building is less than the notional building where an active cooling load exists at all stages of the energy hierarchy, i.e. Be Lean, Be Clean and Be Green. Table 18 summarises the cooling demand at the "Be Green" stage with a 33.4% reduction in cooling demand and 54.2% reduction in cooling consumption evident for the combined building when compared to the notional building. The output results from the BRUKL output reports can be viewed in their entirety in Appendix C.

Building	Cooling Demand (MJ/m^2)	Cooling Consumption (kWh/m^2)
Existing Building (Split System)		
Actual	131	7.1
Notional	187.8	14.5
% Reduction	30.2%	51.0%
New Building (Split System + VAV)		
Actual	229.4	12.1
Notional	332.7	25.7
% Reduction	31.0%	52.9%
Combined Building (Split System + VAV)		
Actual	224.6	11.9
Notional	337.3	26
% Reduction	33.4%	54.2%

Table 18 – Actual and Notional Building Cooling Demand Summary

9.2 Natural Ventilation and Overheating Analysis

A natural ventilation overheating analysis was carried out for a select number of spaces within the London Irish Centre. The purpose of the analysis is to assess whether these spaces will comply with the overheating criteria as outlined within CIBSE TM52:2013 (The limits of thermal comfort: avoiding overheating in European buildings).

The following three criteria, taken together, provide a robust yet balanced assessment of the risk of overheating of buildings in the UK and Europe:

***CIBSE TM52* 'Criteria for defining overheating in free-running buildings'**

A room or building that fails any two of the three criteria is classed as overheating:

(1) *Criterion 1: Hours of exceedance (H^e)*: The number of hours (He) during which ΔT is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3 per cent of occupied hours. If data are not available for the whole period (or if occupancy is only for a part of the period) then 3 per cent of available hours should be used.

(2) *Criterion 2: Daily weighted exceedance (W_e)*: To allow for the severity of overheating the weighted exceedance (W_e) shall be less than or equal to 6 in any one day.

(3) *Criterion 3: Upper limit temperature (T_{upp})*: To set an absolute maximum value for the indoor operative temperature the value of ΔT shall not exceed 4 K.

A room or building that fails any two of the three criteria is classed as overheating.

9.2.1 Energy Model Inputs

To assess the overheating risk, a dynamic energy modelling simulation was carried out in IES VE 2019 over an annual period. The simulation takes into account the following factors:

- Orientation of the building;
- The local weather conditions outlined in TM49 (Design Summer Years for London 2014) were analysed;
- The thermal properties of the proposed envelope;
- The proposed thermal properties of the glazing including the G-value and the daylight transmittance;
- Opening profile for the proposed glazing units;
- Expected internal gains from occupants, lighting, and equipment once occupied.

The calculations for the overheating assessment are based on the inputs in the following sections.

Architectural Drawings

The analysis is based on the latest architectural floor plans, elevations and sections received from Coffey Architects.

Location

Site Name/Location: Camden, London

Orientation: According to site plan

Weather Data

Based on Figure 6 and 7, due to the location of Camden within the London area, the weather file for London Weather Centre has been used for the assessment.

These weather files aim to better represent urban (LWC), semi-urban (Heathrow) and rural or peri-urban (Gatwick) locations. The report recommends that

- London Weather Centre data be used for development in the central zone,
- Heathrow data be used for development in urban and suburban areas, and
- Gatwick data be used for more rural areas around the edge of Greater London.

Figure 6 – Description of CIBSE TM49 Weather Files

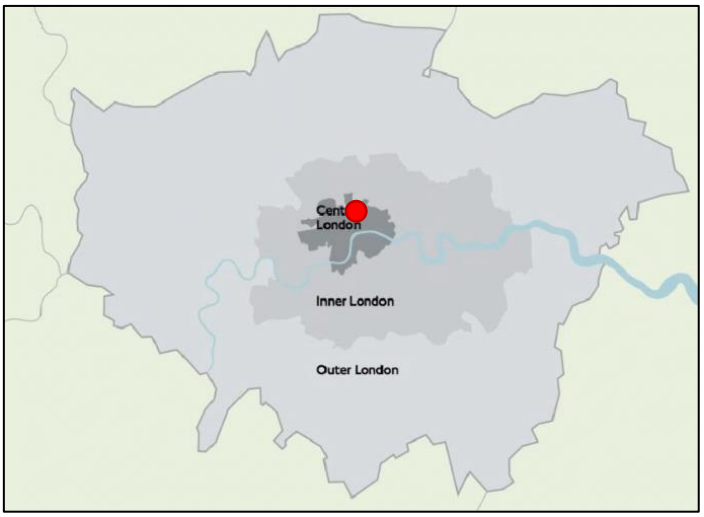


Figure 7 – Location of Proposed Development

The following weather files were used for the London Weather Centre location.

DSY1: probabilistic weather scenario based on 1989, a year with moderately warm summer
DSY2: probabilistic weather scenario based on 2003, a year with an intense single warm spell
DSY3: probabilistic weather scenario based on 1976, a year with a long period of persistent warmth

Building Envelope Specifications

The thermal performance of the proposed building elements are outlined in Table 8.

Analysed Rooms

A natural ventilation overheating analysis has been completed for a select number of spaces for the London Irish Centre which are illustrated in Figure 8 to 11.

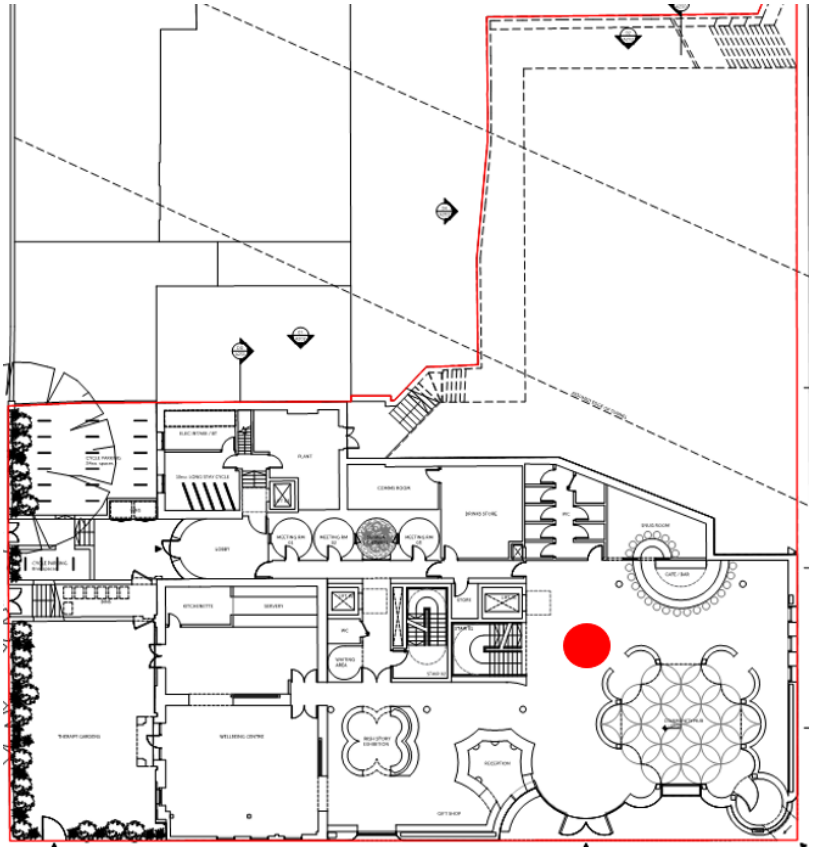


Figure 8 – Ground Floor Analysed Rooms (Highlighted with Red Circle)

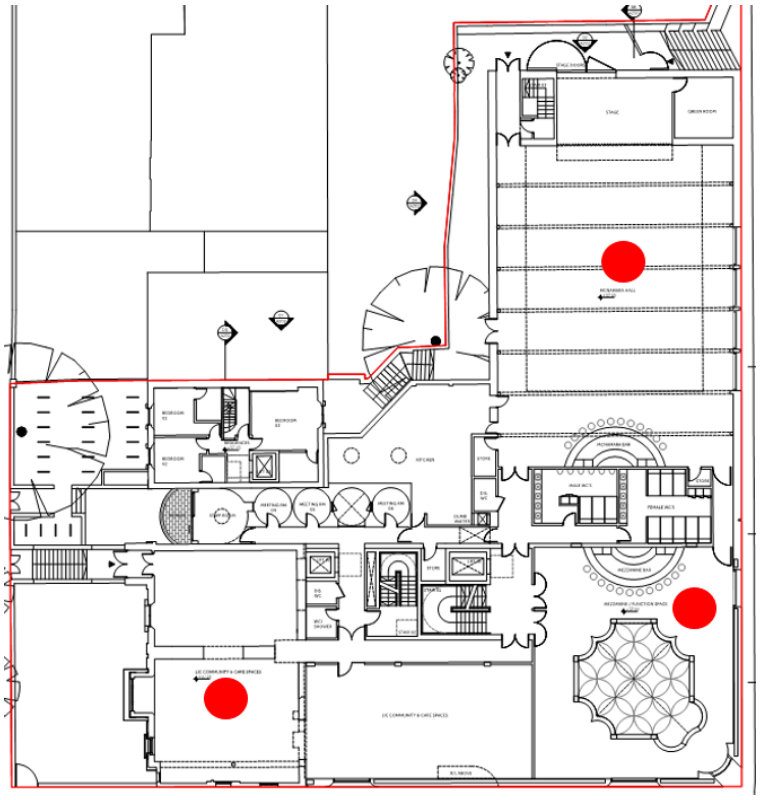


Figure 9 – 1st Floor Analysed Rooms (Highlighted with Red Circle)

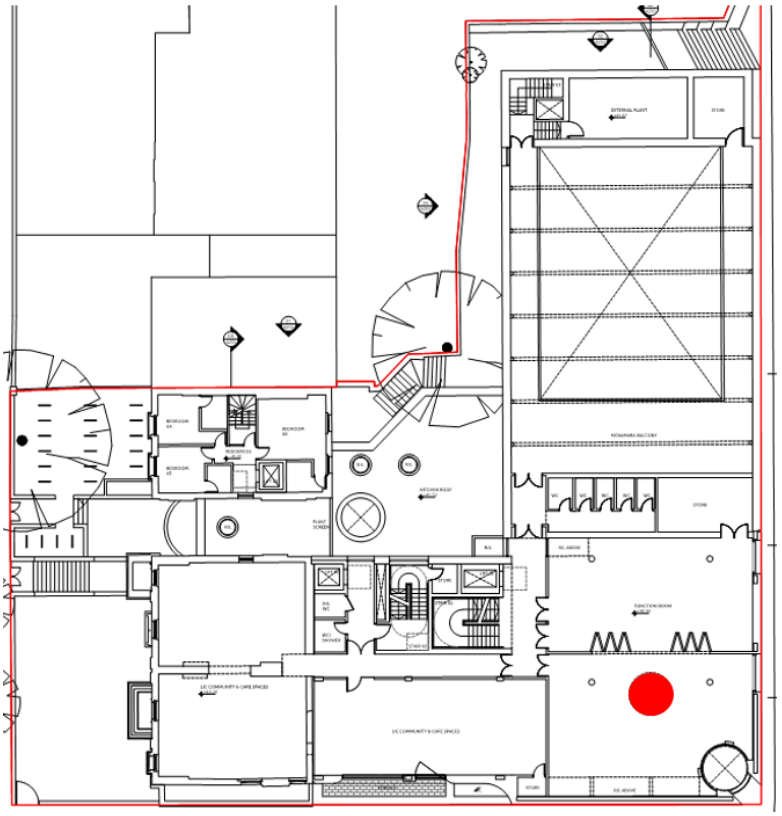


Figure 10 – 2nd Floor Analysed Rooms (Highlighted with Red Circle)

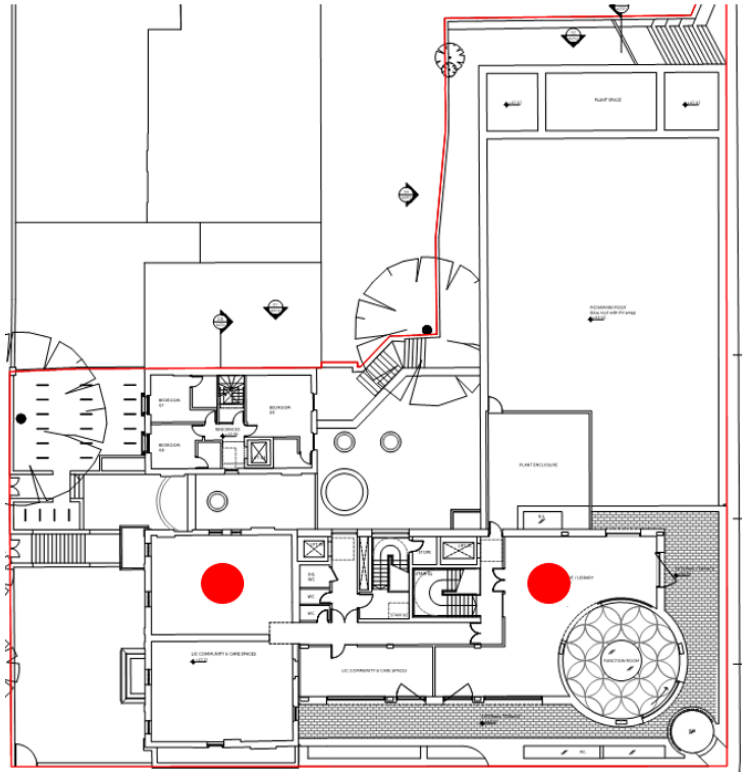


Figure 11 – 3rd Floor Analysed Rooms (Highlighted with Red Circle)

Internal Gains & Operating Schedules

Table 19 outlines the proposed internal gains assigned to the overheating energy model based on the initial design information available. Based on CIBSE Guide A (2015a); maximum sensible heat gains of 75 W/person and maximum latent heat gains of 55 W/person were assumed in habitable spaces.

Space	Occupancy (No. of people)	Lighting Gain (W/m^2)	Equipment Gain (W/m^2)
0F_Community Hub	38	7.2	9.1
1F_Community & Care Spaces 1	17	7.2	9.1
1F_Function Space	22	7.2	1.8
1F_McNamara Hall	120	5.4	9.1
2F_Function Room	25	7.2	9.1
3F_Archive_Library	10	7.2	9.1
3F_Community Care Space 2	15	7.2	9.1

Table 19 – Proposed Internal Gains

Equipment gains were taken from standard NCM templates for the relevant space type, e.g. Performance Theatre. NCM stands for the National Calculation Methodology. The methodology is

based on research carried out by Building Research Establishment (BRE) and CIBSE on the activities in 23 different classes of building. This research has culminated in the generation of thousands of profiles for internal gains (occupancy, lighting, and equipment), temperature set points, cooling set points, ventilation rates, auxiliary energy, domestic hot water demand etc.

Cooling System

There is no mechanical cooling system modelled in the building.

Window Openings

All windows within the building were modelled as openable with the room temperature exceeded 22°C and closed when the room temperature exceeded 28°C.

9.2.2 Overheating Results

The following overheating results, as outlined in Table 20, 21 and 22 for each of the weather files, are calculated based on 0.10 m/s summer (elevated) air speed in TM52 Adaptive Comfort for a Category II building (new building) and Category III (existing building).

Note, a room or building that fails any two of the three criteria is classed as overheating.

Room Name	Criterion 1 (<3 for compliance)	Criterion 2 (<6 for compliance)	Criterion 3 (<4 for compliance)	Criteria Failing	TM52 Compliance (Y/N)
0F_Community Hub	5.6	25	4	1 & 2	N
1F_Community & Care Spaces 1	7	27	4	1 & 2	N
1F_Function Space	8.4	32	5	1 & 2 & 3	N
1F_McNamara Hall	4.4	15	7	1 & 2 & 3	N
2F_Function Room	8.1	30	5	1 & 2 & 3	N
3F_Archive_Library	8.4	45	7	1 & 2 & 3	N
3F_Community Care Space 2	4.9	23	4	1 & 2	N

Table 20 – TM52 Overheating Results – LWC DSY1

Room Name	Criterion 1 (<3 for compliance)	Criterion 2 (<6 for compliance)	Criterion 3 (<4 for compliance)	Criteria Failing	TM52 Compliance (Y/N)
0F_Community Hub	13.5	53	7	1 & 2 & 3	N
1F_Community & Care Spaces 1	13.4	56	8	1 & 2 & 3	N
1F_Function Space	15.3	65	8	1 & 2 & 3	N
1F_McNamara Hall	6.7	32	8	1 & 2 & 3	N
2F_Function Room	15.5	64	8	1 & 2 & 3	N
3F_Archive_Library	16.6	84	11	1 & 2 & 3	N
3F_Community Care Space 2	11.2	50	7	1 & 2 & 3	N

Table 21 – TM52 Overheating Results – LWC DSY2

Room Name	Criterion 1 (<3 for compliance)	Criterion 2 (<6 for compliance)	Criterion 3 (<4 for compliance)	Criteria Failing	TM52 Compliance (Y/N)
0F_Community Hub	17.6	51	7	1 & 2 & 3	N
1F_Community & Care Spaces 1	19.3	54	7	1 & 2 & 3	N
1F_Function Space	19.8	63	8	1 & 2 & 3	N
1F_McNamara Hall	10.5	24	7	1 & 2 & 3	N
2F_Function Room	20	62	7	1 & 2 & 3	N
3F_Archive_Library	20.5	80	10	1 & 2 & 3	N
3F_Community Care Space 2	17.7	49	6	1 & 2 & 3	N

Table 22 – TM52 Overheating Results – LWC DSY3

It is evident that all rooms fail the overheating criteria for each of the weather files. This is primarily due to the fact they are densely occupied spaces, with the window openings being restricted in the existing building. Therefore, active cooling will be required to maintain thermal comfort within these densely occupied spaces. However, the proposed cooling demand has been shown to be significantly lower than the notional building due to cooling hierarchy approach that has been adopted by the design team.

10. CONCLUSION

This Energy Statement has demonstrated how the proposed development will be designed in accordance with the energy hierarchy of the London Plan to deliver significant carbon dioxide savings as compared to a Building Regulation Part L 2013 baseline compliant building, and by using the most up to date carbon emission factors as presented in SAP 10. More specifically, the development is:

(a) Applying the energy hierarchy approach and included building design and technology energy efficiency measures.
(b) Demonstrating carbon dioxide emission reductions beyond 35% of the Building Regulation Part L 2013 baseline.
(c) Applying on-site renewable generation to minimise the carbon emissions of the building as close to zero as possible.

The energy strategy demonstrates that energy and carbon policy targets can be achieved through application of enhanced energy efficient building fabric and servicing design measures, and integration of heat pumps for the heating and cooling provision. The energy assessment of the strategy demonstrates that the proposed development (existing and new) can achieve an overall reduction in annual carbon dioxide (CO_2) emissions on-site of up to 54% compared to the Building Regulations Part L 2013 baseline. The overall savings from applying the principles of the energy hierarchy are summarised in Table 23, Table 24 and Table 25.

	Carbon Dioxide Emissions (Tonnes CO_2 per Annum) – with SAP 10 Carbon Emissions Factors			
	Regulated			**Unregulated**
	Existing Bldg	**New Bldg**	**Combined Bldg**	**Combined Bldg**
BASELINE: Part L 2013 Building Regulations Compliant Development	38	43	81	91
BE LEAN: After Energy Demand Reduction	22	33	55	91
BE CLEAN: After Heat Network/ CHP	22	33	55	91
BE GREEN: After Renewable Energy	14	24	38	91

Table 23 – CO_2 Emissions by Energy Hierarchy Stage

	Regulated CO_2 Emissions Savings – with SAP 10 Carbon Emissions Factors					
	Existing Bldg		New Bldg		Combined Bldg	
	Tonnes CO_2/year	%	Tonnes CO_2/year	%	Tonnes CO_2/year	%
London Irish Centre	24	63	20	45	43	54

Table 24 – Regulated CO_2 Emissions Saving

	Regulated CO_2 Emissions Savings – with SAP 10 Carbon Emissions Factors					
	Existing Bldg		New Bldg		Combined Bldg	
	Tonnes CO_2/year	%	Tonnes CO_2/year	%	Tonnes CO_2/year	%
Savings from Energy Demand Reduction	16	42	11	25	27	33
Savings from Heat Network/ CHP	0	0	0	0	0	0
Savings from Renewable Energy	8	22	9	21	17	21
Total Cumulative On Site Savings	**24**	**63**	**20**	**45**	**43**	**54**

Table 25 – Overall Regulated CO_2 Emissions Saving by Energy Hierarchy Stage

Based on the design measures implemented by the design team, the cooling demand of the proposed building is less than the notional building where an active cooling load exists at all stages of the energy hierarchy, i.e. Be Lean, Be Clean and Be Green. Table 26 summarises the cooling demand at the "Be Green" stage with a 33.4% reduction in cooling demand and 54.2% reduction in cooling consumption evident for the combined building when compared to the notional building.

A natural ventilation overheating analysis was carried out for a select number of spaces within the London Irish Centre. The purpose of the analysis is to assess whether these spaces will comply with the overheating criteria as outlined within CIBSE TM52:2013 (The limits of thermal comfort: avoiding overheating in European buildings). It is evident that all rooms fail the overheating criteria for each of the weather files. This is primarily due to the fact they are densely occupied spaces, with the window openings being restricted in the existing building. Therefore, active cooling will be required to maintain thermal comfort within these densely occupied spaces. However, the proposed cooling demand has been shown to be significantly lower than the notional building due to cooling hierarchy approach that has been adopted by the design team. Furthermore, natural ventilation will be introduced as much as possible to reduce the active cooling demand.

Building	Cooling Demand (MJ/m^2)	Cooling Consumption (kWh/m^2)
Existing Building (Split System)		
Actual	131	7.1
Notional	187.8	14.5
% Reduction	30.2%	51.0%
New Building (Split System + VAV)		
Actual	229.4	12.1
Notional	332.7	25.7
% Reduction	31.0%	52.9%
Combined Building (Split System + VAV)		
Actual	224.6	11.9
Notional	337.3	26
% Reduction	33.4%	54.2%

Table 26 – Actual and Notional Building Cooling Demand Summary

Overall, it can be concluded that the appropriate and available measures will be taken to ensure the London Irish Centre will have the lowest associated carbon emissions possible.

APPENDIX A – MODELLING ASSUMPTIONS FOR London Irish Centre

NON-RESIDENTIAL	Parameter	Specification
Fabric thermal parameters	New Roof	0.13 W/m^2.K
	Existing Roof	0.69 W/m^2.K – Calculation based on pitched roof with no insulation
	Upgraded Existing Roof	0.16 W/m^2.K
	Existing Wall	1.10 W/m^2.K – Source: Technical Paper 10, Glasgow Caledonian University: U-values and Traditional Buildings
	New External walls	0.13 W/m^2.K
	Upgraded Existing Walls	0.15 W/m^2.K
	Existing Ground Contact Floor	0.43 W/m^2.K – Calculation based on perimeter and area ratio with no floor insulation
	New Ground Contact floor	0.13 W/m^2.K
	Upgraded Existing Ground Contact Floor	0.25 W/m^2.K
	New Exposed Floor	0.13 W/m^2.K
	Upgraded Existing Exposed Floor	0.13 W/m^2.K
	New & Upgraded Existing Doors	1.40 W/m^2.K
	Existing Windows	5.60 W/m^2.K – Calculation based on single glazing with wood frames and no thermal break
	New Windows	1.00 W/m^2.K T-Solar=0.36 L-Solar-0.65
	New Upgraded Windows	1.40 W/m^2.K T-Solar=0.36 L-Solar-0.65
	Air permeability	3.5 m^3/(h.m^2)@50pa
Heating & Cooling	Heat Pump – Space Heating & Cooling	Heating SCOP=4.3, Cooling SEER=6.9
	Heat Pump - Water Heating	SCOP = 2.4 Cylinder storage: 300L x2, Insulation thickness-40mm
Ventilation	Local Extract only ventilation	Toilets, Servery, Store SFP=0.25W/l/s
	MVHR	Multifunctional Space,

		74% heat recovery efficiency SFP=1.36
	MVHR	Mcmanara Hall, Community hub & lounge, LIC Community & Care Spaces, Mezzanine Function space, Function room 78% heat recovery efficiency SFP=1.36 (1.3 for Mcmanara Hall)
	MVHR	Wellbeing Centre, Archive Library 74% heat recovery efficiency SFP=1.52
	Mechanical Ventilation	Kitchen, SFP=1W/l/s
Electrical Demand	Electric Power Factor	>0.95
	Lighting	125 lm/circuit Watt LED with light output ratio of 1 Air extracting luminaires Occupancy sensing: Auto-On-Off, with parasitic power of 0.05W/m^2 Constant illuminance control Photoelectric control with dimming – standalone sensors with parasitic power of 0.05W/m^2 Separately sub-metered with alarm for 'out of range' values

APPENDIX B – Proposed PV Module

X SERIES

SUNPOWER®

SunPower X-Series: X22-370

SunPower® Residential DC Panel

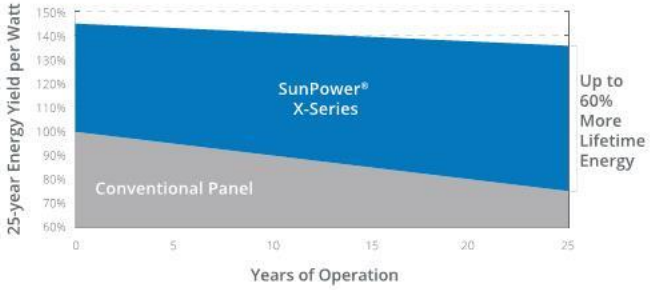
SunPower X-Series panels combine the top efficiency, durability and warranty available in the market today, resulting in more long-term energy and savings. [1,2]

Maximum Power. Minimalist Design.

Industry-leading efficiency means more power and savings per available space. With fewer panels required, less is truly more.

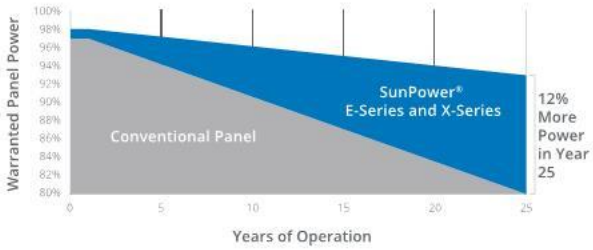
Highest Lifetime Energy and Savings

Designed to deliver 60% more energy in the same space over 25 years in real-world conditions like partial shade and high temperatures. [2]



Best Reliability, Best Warranty

With more than 25 million panels deployed around the world, SunPower technology is proven to last. That's why we stand behind our panel with the industry's best 25-year Combined Power and Product Warranty, including the highest Power Warranty in solar.



Fundamentally Different. And Better.

The SunPower Maxeon® Solar Cell

- Enables highest efficiency panels available [2]
- Unmatched reliability [3]
- Patented solid metal foundation prevents breakage and corrosion

LEED

cradle to cradle CERTIFIED SILVER

As Sustainable As Its Energy

- Ranked #1 in Silicon Valley Toxics Coalition 2015 Solar Scorecard [4]
- First solar panels to achieve Cradle to Cradle Certified™ Silver recognition [5]
- Contributes to more LEED categories than conventional panels [6]

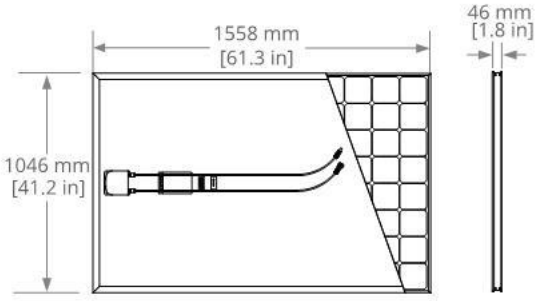
sunpower.com

X-Series: X22-370 SunPower® Residential DC Panel

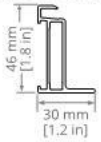
Electrical Data	
	SPR-X22-370
Nominal Power (Pnom) [7]	370 W
Power Tolerance	+5/0%
Panel Efficiency	22.7%
Rated Voltage (Vmpp)	59.1 V
Rated Current (Impp)	6.26 A
Open-Circuit Voltage (Voc)	69.5 V
Short-Circuit Current (Isc)	6.66 A
Max. System Voltage	600 V UL & 1000 V IEC
Maximum Series Fuse	15 A
Power Temp Coef.	−0.29% / ° C
Voltage Temp Coef.	−167.4 mV / ° C
Current Temp Coef.	2.9 mA / ° C

Operating Condition And Mechanical Data	
Temperature	−40° F to +185° F (−40° C to +85° C)
Impact Resistance	1 inch (25 mm) diameter hail at 52 mph (23 m/s)
Appearance	Class A+
Solar Cells	96 Monocrystalline Maxeon Gen III
Tempered Glass	High-transmission tempered anti-reflective
Junction Box	IP-65, MC4 compatible
Weight	41 lbs (18.6 kg)
Max. Load	G5 Frame: Wind: 62 psf, 3000 Pa front & back Snow: 125 psf, 6000 Pa front G3 Frame: Wind: 50 psf, 2400 Pa front & back Snow: 112 psf, 5400 Pa front
Frame	Class 1 black anodized (highest AAMA rating)

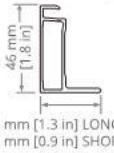
Tests And Certifications	
Standard Tests [8]	UL1703 (Type 2 Fire Rating), IEC 61215, IEC 61730
Quality Management Certs	ISO 9001:2015, ISO 14001:2015
EHS Compliance	RoHS, OHSAS 18001:2007, lead free, Recycle Scheme, REACH SVHC-163
Sustainability	Cradle to Cradle Certified™ Silver. "Declare." listed.
Ammonia Test	IEC 62716
Desert Test	10.1109/PVSC.2013.6744437
Salt Spray Test	IEC 61701 (maximum severity)
PID Test	1000V: IEC 62804; PVEL 600 hr duration
Available Listings	UL, TUV, MCS, FSEC, CEC



G5 FRAME PROFILE
InvisiMount™ Compatible



G3 FRAME PROFILE
Not InvisiMount Compatible



32 mm [1.3 in] LONG SIDE
22 mm [0.9 in] SHORT SIDE

G5 frames have no mounting holes. Please read the safety and installation guide.

1 SunPower 360 W compared to a Conventional Panel on same-sized arrays (260 W, 16% efficient, approx. 1.6 m²), 4% more energy per watt (based on PVSyst pan files), 0.75%/yr slower degradation (Campeau, Z. et al. "SunPower Module Degradation Rate," SunPower white paper, 2013).
2 Based on search of datasheet values from websites of top 10 manufacturers per IHS, as of January 2017.
3 #1 rank in "Fraunhofer PV Durability Initiative for Solar Modules: Part 3". PVTech Power Magazine, 2015. Campeau, Z. et al. "SunPower Module Degradation Rate," SunPower white paper, 2013.
4 SunPower is rated #1 on Silicon Valley Toxics Coalition's Solar Scorecard.
5 Cradle to Cradle Certified is a multi-attribute certification program that assesses products and materials for safety to human and environmental health, design for future use cycles, and sustainable manufacturing.
6 X-Series and E-Series panels additionally contribute to LEED Materials and Resources credit categories.
7 Standard Test Conditions (1000 W/m² irradiance, AM 1.5, 25° C). NREL calibration Standard: SOMS current, LACCS FF and Voltage.
8 Type 2 fire rating per UL1703:2013, Class C fire rating per UL1703:2002.

See www.sunpower.com/company for more reference information.
For more details, see extended datasheet: www.sunpower.com/solar-resources.
Specifications included in this datasheet are subject to change without notice.

SUNPOWER®

1-800-SUNPOWER

527787 Rev A / LTR_US

sunpower.com

APPENDIX C – NON RESIDENTIAL ENERGY MODELLING OUTPUTS

The modelling of the building has been undertaken using approved National Calculation Methodology compliant software (IESVE 2019). BRUKL reports indicating the BER and TER of the modelled building at each stage of the energy hierarchy is including in Appendix C.

Existing Building – Baseline

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

London Irish Centre — As designed

Date: Wed Jul 29 11:55:20 2020

Administrative information

Building Details

Address: London Irish Centre, London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.a.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.12

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

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name:

Telephone number:

Address: , ,

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, $kgCO_2/m^2.annum$	35.9
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	35.9
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	46.5
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	1.04	1.1	0F00000F_W1
Floor	0.25	0.43	0.43	0F00000F_F
Roof	0.25	0.69	0.69	0F00000F_C
Windows***, roof windows, and rooflights	2.2	5.6	5.6	0F000015_W1_O0
Personnel doors	2.2	1.4	1.4	0F000013_W2_O0
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"

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

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

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

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- Radiators - Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	-	-	-	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

2- Door Curtain - NG Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

3- MVHR - Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	6.9	-	-	-
Standard value	0.91*	2.6	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

1- SYST0004-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.92	0.018
Standard value	0.8	N/A

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
0F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
0F_Kitchen	-	-	-	1.4	-	-	-	-	-	0.78	0.5

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
0F_Snug_Cafe	-	-	-	1.4	-	-	-	-	-	0.78	0.5
0F_Wellbeing Centre	-	-	-	1.5	-	-	-	-	-	0.74	0.5
1F_Community & Care Spaces 1	-	-	-	1.4	-	-	-	-	-	0.78	0.5
2F_Community Care Space 2	-	-	-	1.4	-	-	-	-	-	0.78	0.5
3F_Community Care Space 2	-	-	-	1.5	-	-	-	-	-	0.74	0.5

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
0F_Comms Room	60	-	-	119
0F_Cycle Store	60	-	-	29
0F_Drinks Store	60	-	-	43
0F_Elec	60	-	-	84
0F_Plant	60	-	-	170
0F_WC 1	-	60	-	163
1F_Bedroom 1	-	60	-	49
1F_Bedroom 2	-	60	-	49
1F_Bedroom 3	-	60	-	81
1F_Corridor 6	-	60	-	35
1F_Stairs 4	-	60	-	30
2F_Bedroom 4	-	60	-	51
2F_Bedroom 5	-	60	-	50
2F_Bedroom 6	-	60	-	78
2F_Corridor 5	-	60	-	36
2F_Stairs 4	-	60	-	32
3F_Bedroom 7	-	60	-	51
3F_Bedroom 8	-	60	-	50
3F_Bedroom 9	-	60	-	78
3F_Corridor 1	-	60	-	36
3F_Stairs 3	-	60	-	32
0F_Corridor 1	-	60	-	199
0F_Kitchen	-	60	-	925
0F_Snug_Cafe	-	60	-	101
0F_Wellbeing Centre	-	60	-	637
1F_Community & Care Spaces 1	-	60	-	1189
2F_Community Care Space 2	-	60	-	1092
3F_Community Care Space 2	-	60	-	1088

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
1F_Bedroom 1	NO (-76.1%)	NO
1F_Bedroom 2	NO (-67%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
1F_Bedroom 3	NO (-68.5%)	NO
2F_Bedroom 4	NO (-81.7%)	NO
2F_Bedroom 5	NO (-82%)	NO
2F_Bedroom 6	NO (-76.4%)	NO
3F_Bedroom 7	NO (-85.9%)	NO
3F_Bedroom 8	NO (-86.1%)	NO
3F_Bedroom 9	NO (-81.9%)	NO
0F_Kitchen	N/A	N/A
0F_Snug_Cafe	N/A	N/A
0F_Wellbeing Centre	NO (-48.1%)	NO
1F_Community & Care Spaces 1	NO (-62.2%)	NO
2F_Community Care Space 2	NO (-77.6%)	NO
3F_Community Care Space 2	NO (-82.9%)	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?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	1009.1	1009.1
External area [m²]	1554.9	1554.9
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	10	3
Average conductance [W/K]	1678.05	823.1
Average U-value [W/m²K]	1.08	0.53
Alpha value* [%]	5.98	16.96

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
16	**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
84	**D2 General Assembly and Leisure, Night Clubs, and Theatres**
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	91.38	39.12
Cooling	3.35	8.9
Auxiliary	7.38	4.57
Lighting	17.18	15.55
Hot water	58.67	59.16
Equipment*	37.32	37.32
TOTAL**	177.96	127.3

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

Energy Production by Technology [kWh/m²]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	358.54	269.61
Primary energy* [kWh/m²]	266.62	206.78
Total emissions [kg/m²]	46.5	35.9

* 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	522.8	23.8	168.1	0	3.3	0.86	0	0.92	0
	Notional	265.4	106.5	90	0	3.7	0.82	0	----	----
[ST] Other local room heater - fanned, [HS] Room heater, [HFT] Natural Gas, [CFT] Electricity										
	Actual	243.5	43.8	91.9	0	0.9	0.74	0	0.92	0
	Notional	130.1	67.9	44.1	0	0	0.82	0	----	----
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	163.1	101.3	50.2	5.5	10.2	0.9	5.16	0.92	6.9
	Notional	33.6	187.8	11.4	14.5	5.5	0.82	3.6	----	----

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	0.04	1F000011_W10_A0
Floor	0.2	0.13	2F00000C_F
Roof	0.15	0.02	0F000013_C_A1
Windows, roof windows, and rooflights	1.5	5.6	0F000015_W1_O0
Personnel doors	1.5	1.4	0F000013_W2_O0
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"

$U_{i\text{-}Typ}$ = 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	10

Existing Building – Be Lean

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

London Irish Centre — As designed

Date: Wed Jul 29 11:58:02 2020

Administrative information

Building Details

Address: London Irish Centre, London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.a.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.12

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

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name:

Telephone number:

Address: , ,

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	35.9
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	35.9
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	28.2
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	0.14	0.15	0F00000F_W1
Floor	0.25	0.25	0.25	0F00000F_F
Roof	0.25	0.16	0.16	0F00000F_C
Windows***, roof windows, and rooflights	2.2	1.4	1.4	0F000015_W1_O0
Personnel doors	2.2	1.4	1.4	0F000013_W2_O0
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"

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

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

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	3.5

Building services

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

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

1- Radiators - Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	-	-	-	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

2- Door Curtain - NG Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

3- MVHR - Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	6.9	-	-	-
Standard value	0.91*	2.6	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

1- SYST0004-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.92	0.018
Standard value	0.8	N/A

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
0F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
0F_Kitchen	-	-	-	1.4	-	-	-	-	-	0.78	0.5

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
0F_Snug_Cafe	-	-	-	1.4	-	-	-	-	-	0.78	0.5
0F_Wellbeing Centre	-	-	-	1.5	-	-	-	-	-	0.74	0.5
1F_Community & Care Spaces 1	-	-	-	1.4	-	-	-	-	-	0.78	0.5
2F_Community Care Space 2	-	-	-	1.4	-	-	-	-	-	0.78	0.5
3F_Community Care Space 2	-	-	-	1.5	-	-	-	-	-	0.74	0.5

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
0F_Comms Room	125	-	-	57
0F_Cycle Store	125	-	-	14
0F_Drinks Store	125	-	-	21
0F_Elec	125	-	-	40
0F_Plant	125	-	-	82
0F_WC 1	-	125	-	78
1F_Bedroom 1	-	125	-	24
1F_Bedroom 2	-	125	-	24
1F_Bedroom 3	-	125	-	39
1F_Corridor 6	-	125	-	17
1F_Stairs 4	-	125	-	15
2F_Bedroom 4	-	125	-	25
2F_Bedroom 5	-	125	-	24
2F_Bedroom 6	-	125	-	37
2F_Corridor 5	-	125	-	17
2F_Stairs 4	-	125	-	15
3F_Bedroom 7	-	125	-	25
3F_Bedroom 8	-	125	-	24
3F_Bedroom 9	-	125	-	37
3F_Corridor 1	-	125	-	17
3F_Stairs 3	-	125	-	15
0F_Corridor 1	-	125	-	95
0F_Kitchen	-	125	-	444
0F_Snug_Cafe	-	125	-	49
0F_Wellbeing Centre	-	125	-	306
1F_Community & Care Spaces 1	-	125	-	571
2F_Community Care Space 2	-	125	-	524
3F_Community Care Space 2	-	125	-	522

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
1F_Bedroom 1	NO (-85.1%)	NO
1F_Bedroom 2	NO (-79.4%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
1F_Bedroom 3	NO (-80.4%)	NO
2F_Bedroom 4	NO (-88.6%)	NO
2F_Bedroom 5	NO (-88.8%)	NO
2F_Bedroom 6	NO (-85.3%)	NO
3F_Bedroom 7	NO (-91.2%)	NO
3F_Bedroom 8	NO (-91.4%)	NO
3F_Bedroom 9	NO (-88.7%)	NO
0F_Kitchen	N/A	N/A
0F_Snug_Cafe	N/A	N/A
0F_Wellbeing Centre	NO (-67.6%)	NO
1F_Community & Care Spaces 1	NO (-76.4%)	NO
2F_Community Care Space 2	NO (-86%)	NO
3F_Community Care Space 2	NO (-89.3%)	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?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	1009.1	1009.1
External area [m²]	1554.9	1554.9
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	4	3
Average conductance [W/K]	376.82	823.1
Average U-value [W/m²K]	0.24	0.53
Alpha value* [%]	26.64	16.96

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
16	**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
84	**D2 General Assembly and Leisure, Night Clubs, and Theatres**
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	24.71	39.12
Cooling	4.34	8.9
Auxiliary	7.36	4.57
Lighting	8.46	15.55
Hot water	58.67	59.16
Equipment*	37.32	37.32
TOTAL**	103.54	127.3

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

Energy Production by Technology [kWh/m²]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	166.02	269.61
Primary energy* [kWh/m²]	162.07	206.78
Total emissions [kg/m²]	28.2	35.9

* 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	172.9	22.5	55.6	0	3.3	0.86	0	0.92	0
	Notional	265.4	106.5	90	0	3.7	0.82	0	----	----
[ST] Other local room heater - fanned, [HS] Room heater, [HFT] Natural Gas, [CFT] Electricity										
	Actual	138.5	38.2	52.3	0	0.5	0.74	0	0.92	0
	Notional	130.1	67.9	44.1	0	0	0.82	0	----	----
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	18.3	131	5.6	7.1	10.2	0.9	5.16	0.92	6.9
	Notional	33.6	187.8	11.4	14.5	5.5	0.82	3.6	----	----

Key to terms

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

Key Features

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

Building fabric

Element	$U_{l\text{-}Typ}$	$U_{l\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.01	1F000011_W10_A0
Floor	0.2	0.13	2F00000C_F
Roof	0.15	-	0F000013_C_A1
Windows, roof windows, and rooflights	1.5	1.4	0F000015_W1_O0
Personnel doors	1.5	1.4	0F000013_W2_O0
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"

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

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

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3.5

Existing Building – Be Clean

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

London Irish Centre — As designed

Date: Wed Jul 29 11:58:02 2020

Administrative information

Building Details

Address: London Irish Centre, London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.a.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.12

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

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name:

Telephone number:

Address: , ,

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	35.9
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	35.9
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	28.2
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	0.14	0.15	0F00000F_W1
Floor	0.25	0.25	0.25	0F00000F_F
Roof	0.25	0.16	0.16	0F00000F_C
Windows***, roof windows, and rooflights	2.2	1.4	1.4	0F000015_W1_O0
Personnel doors	2.2	1.4	1.4	0F000013_W2_O0
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"

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

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

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	3.5

Building services

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

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

1- Radiators - Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	-	-	-	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

2- Door Curtain - NG Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

3- MVHR - Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	6.9	-	-	-
Standard value	0.91*	2.6	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

1- SYST0004-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.92	0.018
Standard value	0.8	N/A

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
0F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
0F_Kitchen	-	-	-	1.4	-	-	-	-	-	0.78	0.5

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
0F_Snug_Cafe	-	-	-	1.4	-	-	-	-	-	0.78	0.5
0F_Wellbeing Centre	-	-	-	1.5	-	-	-	-	-	0.74	0.5
1F_Community & Care Spaces 1	-	-	-	1.4	-	-	-	-	-	0.78	0.5
2F_Community Care Space 2	-	-	-	1.4	-	-	-	-	-	0.78	0.5
3F_Community Care Space 2	-	-	-	1.5	-	-	-	-	-	0.74	0.5

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
0F_Comms Room	125	-	-	57
0F_Cycle Store	125	-	-	14
0F_Drinks Store	125	-	-	21
0F_Elec	125	-	-	40
0F_Plant	125	-	-	82
0F_WC 1	-	125	-	78
1F_Bedroom 1	-	125	-	24
1F_Bedroom 2	-	125	-	24
1F_Bedroom 3	-	125	-	39
1F_Corridor 6	-	125	-	17
1F_Stairs 4	-	125	-	15
2F_Bedroom 4	-	125	-	25
2F_Bedroom 5	-	125	-	24
2F_Bedroom 6	-	125	-	37
2F_Corridor 5	-	125	-	17
2F_Stairs 4	-	125	-	15
3F_Bedroom 7	-	125	-	25
3F_Bedroom 8	-	125	-	24
3F_Bedroom 9	-	125	-	37
3F_Corridor 1	-	125	-	17
3F_Stairs 3	-	125	-	15
0F_Corridor 1	-	125	-	95
0F_Kitchen	-	125	-	444
0F_Snug_Cafe	-	125	-	49
0F_Wellbeing Centre	-	125	-	306
1F_Community & Care Spaces 1	-	125	-	571
2F_Community Care Space 2	-	125	-	524
3F_Community Care Space 2	-	125	-	522

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
1F_Bedroom 1	NO (-85.1%)	NO
1F_Bedroom 2	NO (-79.4%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
1F_Bedroom 3	NO (-80.4%)	NO
2F_Bedroom 4	NO (-88.6%)	NO
2F_Bedroom 5	NO (-88.8%)	NO
2F_Bedroom 6	NO (-85.3%)	NO
3F_Bedroom 7	NO (-91.2%)	NO
3F_Bedroom 8	NO (-91.4%)	NO
3F_Bedroom 9	NO (-88.7%)	NO
0F_Kitchen	N/A	N/A
0F_Snug_Cafe	N/A	N/A
0F_Wellbeing Centre	NO (-67.6%)	NO
1F_Community & Care Spaces 1	NO (-76.4%)	NO
2F_Community Care Space 2	NO (-86%)	NO
3F_Community Care Space 2	NO (-89.3%)	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?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	1009.1	1009.1
External area [m²]	1554.9	1554.9
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	4	3
Average conductance [W/K]	376.82	823.1
Average U-value [W/m²K]	0.24	0.53
Alpha value* [%]	26.64	16.96

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
16	**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
84	**D2 General Assembly and Leisure, Night Clubs, and Theatres**
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	24.71	39.12
Cooling	4.34	8.9
Auxiliary	7.36	4.57
Lighting	8.46	15.55
Hot water	58.67	59.16
Equipment*	37.32	37.32
TOTAL**	103.54	127.3

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

Energy Production by Technology [kWh/m²]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	166.02	269.61
Primary energy* [kWh/m²]	162.07	206.78
Total emissions [kg/m²]	28.2	35.9

* 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	172.9	22.5	55.6	0	3.3	0.86	0	0.92	0
	Notional	265.4	106.5	90	0	3.7	0.82	0	----	----
[ST] Other local room heater - fanned, [HS] Room heater, [HFT] Natural Gas, [CFT] Electricity										
	Actual	138.5	38.2	52.3	0	0.5	0.74	0	0.92	0
	Notional	130.1	67.9	44.1	0	0	0.82	0	----	----
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	18.3	131	5.6	7.1	10.2	0.9	5.16	0.92	6.9
	Notional	33.6	187.8	11.4	14.5	5.5	0.82	3.6	----	----

Key to terms

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

Key Features

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

Building fabric

Element	$U_{l\text{-}Typ}$	$U_{l\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.01	1F000011_W10_A0
Floor	0.2	0.13	2F00000C_F
Roof	0.15	-	0F000013_C_A1
Windows, roof windows, and rooflights	1.5	1.4	0F000015_W1_O0
Personnel doors	1.5	1.4	0F000013_W2_O0
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"

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

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

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3.5

Existing Building – Be Green

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

London Irish Centre — As designed

Date: Wed Jul 29 12:00:47 2020

Administrative information

Building Details

Address: London Irish Centre, London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.a.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.12

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

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name:

Telephone number:

Address: , ,

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	35.9
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	35.9
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	30.3
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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.14	0.15	0F00000F_W1
Floor	0.25	0.25	0.25	0F00000F_F
Roof	0.25	0.16	0.16	0F00000F_C
Windows***, roof windows, and rooflights	2.2	1.4	1.4	0F000015_W1_O0
Personnel doors	2.2	1.4	1.4	0F000013_W2_O0
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"

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

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

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	3.5

Building services

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

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

1- Radiators - Electric

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

2- Door Curtain - Electric

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

3- MVHR - ASHP

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.3	6.9	-	-	-
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- SYST0005-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	2.4	0.018
Standard value	2*	N/A

* Standard shown is for all types except absorption and gas engine heat pumps.

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
0F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
0F_Kitchen	-	-	-	1.4	-	-	-	-	-	0.78	0.5
0F_Snug_Cafe	-	-	-	1.4	-	-	-	-	-	0.78	0.5

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
0F_Wellbeing Centre	-	-	-	1.5	-	-	-	-	-	0.74	0.5
1F_Community & Care Spaces 1	-	-	-	1.4	-	-	-	-	-	0.78	0.5
2F_Community Care Space 2	-	-	-	1.4	-	-	-	-	-	0.78	0.5
3F_Community Care Space 2	-	-	-	1.5	-	-	-	-	-	0.74	0.5

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
0F_Comms Room	125	-	-	57
0F_Cycle Store	125	-	-	14
0F_Drinks Store	125	-	-	21
0F_Elec	125	-	-	40
0F_Plant	125	-	-	82
0F_WC 1	-	125	-	78
1F_Bedroom 1	-	125	-	24
1F_Bedroom 2	-	125	-	24
1F_Bedroom 3	-	125	-	39
1F_Corridor 6	-	125	-	17
1F_Stairs 4	-	125	-	15
2F_Bedroom 4	-	125	-	25
2F_Bedroom 5	-	125	-	24
2F_Bedroom 6	-	125	-	37
2F_Corridor 5	-	125	-	17
2F_Stairs 4	-	125	-	15
3F_Bedroom 7	-	125	-	25
3F_Bedroom 8	-	125	-	24
3F_Bedroom 9	-	125	-	37
3F_Corridor 1	-	125	-	17
3F_Stairs 3	-	125	-	15
0F_Corridor 1	-	125	-	95
0F_Kitchen	-	125	-	444
0F_Snug_Cafe	-	125	-	49
0F_Wellbeing Centre	-	125	-	306
1F_Community & Care Spaces 1	-	125	-	571
2F_Community Care Space 2	-	125	-	524
3F_Community Care Space 2	-	125	-	522

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
1F_Bedroom 1	NO (-85.1%)	NO
1F_Bedroom 2	NO (-79.4%)	NO
1F_Bedroom 3	NO (-80.4%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
2F_Bedroom 4	NO (-88.6%)	NO
2F_Bedroom 5	NO (-88.8%)	NO
2F_Bedroom 6	NO (-85.3%)	NO
3F_Bedroom 7	NO (-91.2%)	NO
3F_Bedroom 8	NO (-91.4%)	NO
3F_Bedroom 9	NO (-88.7%)	NO
0F_Kitchen	N/A	N/A
0F_Snug_Cafe	N/A	N/A
0F_Wellbeing Centre	NO (-67.6%)	NO
1F_Community & Care Spaces 1	NO (-76.4%)	NO
2F_Community Care Space 2	NO (-86%)	NO
3F_Community Care Space 2	NO (-89.3%)	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?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	1009.1	1009.1
External area [m²]	1554.9	1554.9
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	4	3
Average conductance [W/K]	376.82	823.1
Average U-value [W/m²K]	0.24	0.53
Alpha value* [%]	26.64	16.96

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
16	**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
84	**D2 General Assembly and Leisure, Night Clubs, and Theatres**
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	23.82	34.48
Cooling	4.34	8.9
Auxiliary	6.57	3.99
Lighting	8.46	15.55
Hot water	22.49	19.94
Equipment*	37.32	37.32
TOTAL**	65.68	82.86

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	5.73	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	167.91	269.61
Primary energy* [kWh/m²]	196.61	187.19
Total emissions [kg/m²]	30.3	35.9

* 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] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	178.1	22.9	61.9	0	0.9	0.8	0	1	0
	Notional	265.4	106.5	90	0	1.9	0.82	0	----	----
[ST] Other local room heater - fanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	138.5	38.2	48.1	0	0.5	0.8	0	1	0
	Notional	130.1	67.9	44.1	0	0	0.82	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	18.3	131	1.2	7.1	10.2	4.22	5.16	4.3	6.9
	Notional	33.6	187.8	3.8	14.5	5.5	2.43	3.6	----	----

Key to terms

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

Key Features

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

Building fabric

Element	$U_{l\text{-}Typ}$	$U_{l\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.01	1F000011_W10_A0
Floor	0.2	0.13	2F00000C_F
Roof	0.15	-	0F000013_C_A1
Windows, roof windows, and rooflights	1.5	1.4	0F000015_W1_O0
Personnel doors	1.5	1.4	0F000013_W2_O0
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"

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

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

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3.5

New Building – Baseline

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

London Irish Centre — As designed

Date: Wed Jul 29 12:04:53 2020

Administrative information

Building Details

Address: London Irish Centre, London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.a.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.12

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

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name:

Telephone number:

Address: , ,

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

CO_2 emission rate from the notional building, kgCO_2/m².annum	24.1
Target CO_2 emission rate (TER), kgCO_2/m².annum	24.1
Building CO_2 emission rate (BER), kgCO_2/m².annum	24
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	0.3	1.79	0F00000C_W4_A0
Floor	0.25	0.22	1.09	0F000009_F_A0
Roof	0.25	0.18	1.09	1F000015_C_A2
Windows***, roof windows, and rooflights	2.2	1	1	1F00002C_W1_O0
Personnel doors	2.2	1.4	1.4	1F000000_W1_O0
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"

$U_{a\text{-}Limit}$ = 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
m³/(h.m²) at 50 Pa	10	10

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- Radiators - Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	-	-	-	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

2- MVHR - Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	6.9	-	-	-
Standard value	0.91*	2.6	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

3- Door Curtain - NG Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

4- AHU - Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	6.9	-	1.3	-
Standard value	0.91*	N/A	N/A	1.6^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

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

1- SYST0004-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.92	0.018
Standard value	0.8	N/A

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
-1F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
0F_WC 2	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_Female WC	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_Male WC	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_WC 3	-	-	0.3	-	-	-	-	-	-	-	N/A
2F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
2F_WC 2	-	-	0.3	-	-	-	-	-	-	-	N/A
3F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
-1F_Multifunction Space 1	-	-	-	1.4	-	-	-	-	-	0.74	0.5
-1F_Multifunction Space 2	-	-	-	1.4	-	-	-	-	-	0.74	0.5
0F_Community Hub	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Community & Care Spaces 2	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Function Space	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Kitchen	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Staff Room	-	-	-	1.4	-	-	-	-	-	0.78	0.5
2F_Function Room	-	-	-	1.4	-	-	-	-	-	0.78	0.5
3F_Archive_Library	-	-	-	1.5	-	-	-	-	-	0.74	0.5
3F_Community Care Space 1	-	-	-	1.5	-	-	-	-	-	0.74	0.5
3F_Function Room	-	-	-	1.5	-	-	-	-	-	0.74	0.5
2F_Community Care Space 1	-	-	-	1.4	-	-	-	-	-	0.78	0.5

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
-1F_Cloak Room	60	-	-	36
-1F_Lobby	-	60	-	110
-1F_Plant	60	-	-	129
-1F_Stairs 1	-	60	-	54
-1F_Stairs 2	-	60	-	54
-1F_Store 1	60	-	-	27
-1F_Store 2	60	-	-	35
-1F_Store 3	60	-	-	11
-1F_WC 1	-	60	-	137
0F_Corridor 2	-	60	-	61
0F_Meeting Rooms	60	-	-	377
0F_Stairs 1	-	60	-	56
0F_Stairs 2	-	60	-	60
0F_Store 1	60	-	-	12
0F_WC 2	-	60	-	48
1F_Corridor 1	-	60	-	37
1F_Corridor 2	-	60	-	40
1F_Corridor 3	-	60	-	139

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
1F_Corridor 4	-	60	-	60
1F_Corridor 5	-	60	-	47
1F_Corridor 7	-	60	-	101
1F_Female WC	-	60	-	176
1F_Male WC	-	60	-	133
1F_Meeting Rooms	60	-	-	365
1F_Stairs 1	-	60	-	55
1F_Stairs 2	-	60	-	63
1F_Stairs 3	-	60	-	56
1F_Store 1	60	-	-	8
1F_Store 2	60	-	-	13
1F_Store 3	60	-	-	13
1F_WC 1	-	60	-	71
1F_WC 3	-	60	-	46
2F_Corridor 1	-	60	-	49
2F_Corridor 2	-	60	-	62
2F_Corridor 3	-	60	-	106
2F_Corridor 4	-	60	-	50
2F_Stairs 1	-	60	-	57
2F_Stairs 2	-	60	-	65
2F_Stairs 3	-	60	-	58
2F_Store 1	60	-	-	29
2F_Store 2	60	-	-	37
2F_Store 3	60	-	-	13
2F_WC 1	-	60	-	163
2F_WC 2	-	60	-	74
3F_Corridor 2	-	60	-	41
3F_Corridor 3	-	60	-	97
3F_Corridor 4	-	60	-	47
3F_Stairs 1	-	60	-	57
3F_Stairs 2	-	60	-	61
3F_Store 1	60	-	-	12
3F_WC 1	-	60	-	74
-1F_Multifunction Space 1	-	60	-	936
-1F_Multifunction Space 2	-	60	-	811
0F_Community Hub	-	60	-	2663
1F_Community & Care Spaces 2	-	60	-	908
1F_Function Space	-	60	-	1556
1F_Kitchen	-	60	-	938
1F_Staff Room	-	60	-	84
2F_Function Room	-	60	-	1702
3F_Archive_Library	-	60	-	764
3F_Community Care Space 1	-	60	-	293

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
3F_Function Room	-	60	-	414
2F_Community Care Space 1	-	60	-	788
0F_Entrance Lobby	-	60	-	26
1F_Green Room	-	60	-	85
1F_Stage	-	60	-	300
2F_McNamara Hall Balcony	-	60	-	1286
1F_McNamara Hall	-	60	-	2648

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?
0F_Meeting Rooms	N/A	N/A
1F_Meeting Rooms	N/A	N/A
-1F_Multifunction Space 1	N/A	N/A
-1F_Multifunction Space 2	N/A	N/A
0F_Community Hub	NO (-59.1%)	NO
1F_Community & Care Spaces 2	NO (-76.8%)	NO
1F_Function Space	NO (-60.4%)	NO
1F_Kitchen	N/A	N/A
1F_Staff Room	NO (-78.3%)	NO
2F_Function Room	NO (-66.4%)	NO
3F_Archive_Library	NO (-41.9%)	NO
3F_Community Care Space 1	NO (-9.3%)	NO
3F_Function Room	NO (-67.2%)	NO
2F_Community Care Space 1	NO (-50.3%)	NO
1F_Green Room	N/A	N/A
1F_Stage	N/A	N/A
2F_McNamara Hall Balcony	N/A	N/A
1F_McNamara Hall	NO (-73.4%)	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?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	2900.5	2900.5
External area [m²]	4075.1	4075.1
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	10	3
Average conductance [W/K]	1181.04	1784.59
Average U-value [W/m²K]	0.29	0.44
Alpha value* [%]	16.18	14.46

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential 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
100	**D2 General Assembly and Leisure, Night Clubs, and Theatres**
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	26.53	20.47
Cooling	4.73	9.19
Auxiliary	8.42	8.55
Lighting	19.3	18
Hot water	8.5	7.42
Equipment*	15.68	15.68
TOTAL**	67.47	63.63

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

Energy Production by Technology [kWh/m²]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	186.96	211.05
Primary energy* [kWh/m²]	139.85	140.99
Total emissions [kg/m²]	24	24.1

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	157.8	63.1	50.7	0	4	0.86	0	0.92	0
	Notional	132.1	107.1	44.8	0	5.3	0.82	0	----	----
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	22	139.2	6.8	7.5	9.8	0.9	5.16	0.92	6.9
	Notional	21.4	170.3	7.2	13.1	5.6	0.82	3.6	----	----
[ST] Other local room heater - fanned, [HS] Room heater, [HFT] Natural Gas, [CFT] Electricity										
	Actual	197.1	280.1	74.4	0	0.7	0.74	0	0.92	0
	Notional	303.2	298.6	102.8	0	0	0.82	0	----	----
[ST] Indoor packaged cabinet (VAV), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	116.8	86	43.4	4.4	11.6	0.75	5.43	0.92	6.9
	Notional	55.1	161.7	18.7	12.5	21.8	0.82	3.6	----	----

Key to terms

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

Key Features

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

Building fabric

Element	$U_{l\text{-}Typ}$	$U_{l\text{-}Mln}$	Surface where the minimum value occurs*
Wall	0.23	0.01	1F00000C_W4_A2
Floor	0.2	0.01	1F000022_F_A1
Roof	0.15	0.01	0F000009_C_A0
Windows, roof windows, and rooflights	1.5	1	1F00002C_W1_O0
Personnel doors	1.5	1.4	1F000000_W1_O0
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"

$U_{l\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{l\text{-}Mln}$ = 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	10

New Building – Be Lean

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

London Irish Centre — As designed

Date: Wed Jul 29 12:08:16 2020

Administrative information

Building Details

Address: London Irish Centre, London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.a.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.12

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

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name:

Telephone number:

Address: , ,

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

CO_2 emission rate from the notional building, kgCO_2/m².annum	24.1
Target CO_2 emission rate (TER), kgCO_2/m².annum	24.1
Building CO_2 emission rate (BER), kgCO_2/m².annum	17.7
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.17	1.79	0F00000C_W4_A0
Floor	0.25	0.18	1.09	0F000009_F_A0
Roof	0.25	0.13	1.09	1F000015_C_A2
Windows***, roof windows, and rooflights	2.2	1	1	1F00002C_W1_O0
Personnel doors	2.2	1.4	1.4	1F000000_W1_O0
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"

$U_{a\text{-}Limit}$ = 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
m³/(h.m²) at 50 Pa	10	3.5

Building services

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

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

1- Radiators - Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	-	-	-	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

2- MVHR - Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	6.9	-	-	-
Standard value	0.91*	2.6	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

3- Door Curtain - NG Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

4- AHU - Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	6.9	-	1.3	-
Standard value	0.91*	N/A	N/A	1.6^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

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

1- SYST0004-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.92	0.018
Standard value	0.8	N/A

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
-1F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
0F_WC 2	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_Female WC	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_Male WC	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_WC 3	-	-	0.3	-	-	-	-	-	-	-	N/A
2F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
2F_WC 2	-	-	0.3	-	-	-	-	-	-	-	N/A
3F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
-1F_Multifunction Space 1	-	-	-	1.4	-	-	-	-	-	0.74	0.5
-1F_Multifunction Space 2	-	-	-	1.4	-	-	-	-	-	0.74	0.5
0F_Community Hub	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Community & Care Spaces 2	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Function Space	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Kitchen	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Staff Room	-	-	-	1.4	-	-	-	-	-	0.78	0.5
2F_Function Room	-	-	-	1.4	-	-	-	-	-	0.78	0.5
3F_Archive_Library	-	-	-	1.5	-	-	-	-	-	0.74	0.5
3F_Community Care Space 1	-	-	-	1.5	-	-	-	-	-	0.74	0.5
3F_Function Room	-	-	-	1.5	-	-	-	-	-	0.74	0.5
2F_Community Care Space 1	-	-	-	1.4	-	-	-	-	-	0.78	0.5

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
-1F_Cloak Room	125	-	-	17
-1F_Lobby	-	125	-	53
-1F_Plant	125	-	-	62
-1F_Stairs 1	-	125	-	26
-1F_Stairs 2	-	125	-	26
-1F_Store 1	125	-	-	13
-1F_Store 2	125	-	-	17
-1F_Store 3	125	-	-	5
-1F_WC 1	-	125	-	66
0F_Corridor 2	-	125	-	30
0F_Meeting Rooms	125	-	-	181
0F_Stairs 1	-	125	-	27
0F_Stairs 2	-	125	-	29
0F_Store 1	125	-	-	6
0F_WC 2	-	125	-	23
1F_Corridor 1	-	125	-	18
1F_Corridor 2	-	125	-	19
1F_Corridor 3	-	125	-	67

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
1F_Corridor 4	-	125	-	29
1F_Corridor 5	-	125	-	23
1F_Corridor 7	-	125	-	49
1F_Female WC	-	125	-	85
1F_Male WC	-	125	-	64
1F_Meeting Rooms	125	-	-	175
1F_Stairs 1	-	125	-	27
1F_Stairs 2	-	125	-	30
1F_Stairs 3	-	125	-	27
1F_Store 1	125	-	-	4
1F_Store 2	125	-	-	6
1F_Store 3	125	-	-	6
1F_WC 1	-	125	-	34
1F_WC 3	-	125	-	22
2F_Corridor 1	-	125	-	23
2F_Corridor 2	-	125	-	30
2F_Corridor 3	-	125	-	51
2F_Corridor 4	-	125	-	24
2F_Stairs 1	-	125	-	27
2F_Stairs 2	-	125	-	31
2F_Stairs 3	-	125	-	28
2F_Store 1	125	-	-	14
2F_Store 2	125	-	-	18
2F_Store 3	125	-	-	6
2F_WC 1	-	125	-	78
2F_WC 2	-	125	-	36
3F_Corridor 2	-	125	-	20
3F_Corridor 3	-	125	-	46
3F_Corridor 4	-	125	-	22
3F_Stairs 1	-	125	-	27
3F_Stairs 2	-	125	-	29
3F_Store 1	125	-	-	6
3F_WC 1	-	125	-	36
-1F_Multifunction Space 1	-	125	-	449
-1F_Multifunction Space 2	-	125	-	389
0F_Community Hub	-	125	-	1278
1F_Community & Care Spaces 2	-	125	-	436
1F_Function Space	-	125	-	747
1F_Kitchen	-	125	-	450
1F_Staff Room	-	125	-	40
2F_Function Room	-	125	-	817
3F_Archive_Library	-	125	-	367
3F_Community Care Space 1	-	125	-	141

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
3F_Function Room	-	125	-	199
2F_Community Care Space 1	-	125	-	378
0F_Entrance Lobby	-	125	-	12
1F_Green Room	-	125	-	41
1F_Stage	-	125	-	144
2F_McNamara Hall Balcony	-	125	-	617
1F_McNamara Hall	-	125	-	1271

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?
0F_Meeting Rooms	N/A	N/A
1F_Meeting Rooms	N/A	N/A
-1F_Multifunction Space 1	N/A	N/A
-1F_Multifunction Space 2	N/A	N/A
0F_Community Hub	NO (-59.1%)	NO
1F_Community & Care Spaces 2	NO (-76.8%)	NO
1F_Function Space	NO (-60.4%)	NO
1F_Kitchen	N/A	N/A
1F_Staff Room	NO (-78.3%)	NO
2F_Function Room	NO (-66.4%)	NO
3F_Archive_Library	NO (-41.9%)	NO
3F_Community Care Space 1	NO (-9.3%)	NO
3F_Function Room	NO (-67.2%)	NO
2F_Community Care Space 1	NO (-50.3%)	NO
1F_Green Room	N/A	N/A
1F_Stage	N/A	N/A
2F_McNamara Hall Balcony	N/A	N/A
1F_McNamara Hall	NO (-73.4%)	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?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	2900.5	2900.5
External area [m²]	4031.1	4031.1
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	4	3
Average conductance [W/K]	872.99	1774.25
Average U-value [W/m²K]	0.22	0.44
Alpha value* [%]	21.89	14.54

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential 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
100	**D2 General Assembly and Leisure, Night Clubs, and Theatres**
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	19.7	20.34
Cooling	4.92	9.2
Auxiliary	8.42	8.54
Lighting	9.57	18
Hot water	8.5	7.42
Equipment*	15.68	15.68
TOTAL**	51.1	63.51

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

Energy Production by Technology [kWh/m²]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	167.09	211.09
Primary energy* [kWh/m²]	102.97	140.88
Total emissions [kg/m²]	17.7	24.1

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	131.6	53.1	42.3	0	4	0.86	0	0.92	0
	Notional	131.2	107.8	44.5	0	5.3	0.82	0	----	----
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	9.5	147.5	2.9	7.9	9.8	0.9	5.16	0.92	6.9
	Notional	21.2	170.7	7.2	13.2	5.6	0.82	3.6	----	----
[ST] Other local room heater - fanned, [HS] Room heater, [HFT] Natural Gas, [CFT] Electricity										
	Actual	145.4	279.1	54.9	0	0.5	0.74	0	0.92	0
	Notional	303.2	298.6	102.8	0	0	0.82	0	----	----
[ST] Indoor packaged cabinet (VAV), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	83.2	81.9	30.9	4.2	11.6	0.75	5.43	0.92	6.9
	Notional	54.8	162	18.6	12.5	21.8	0.82	3.6	----	----

Key to terms

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

Key Features

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

Building fabric

Element	$U_{l\text{-}Typ}$	$U_{l\text{-}Mln}$	Surface where the minimum value occurs*
Wall	0.23	0.01	1F00000C_W4_A2
Floor	0.2	0.01	1F000022_F_A1
Roof	0.15	-	0F000009_C_A0
Windows, roof windows, and rooflights	1.5	1	1F00002C_W1_O0
Personnel doors	1.5	1.4	1F000000_W1_O0
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"

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

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

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3.5

New Building – Be Clean

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

London Irish Centre — As designed

Date: Wed Jul 29 12:08:16 2020

Administrative information

Building Details

Address: London Irish Centre, London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.a.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.12

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

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name:

Telephone number:

Address: , ,

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	24.1
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	24.1
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	17.7
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.17	1.79	0F00000C_W4_A0
Floor	0.25	0.18	1.09	0F000009_F_A0
Roof	0.25	0.13	1.09	1F000015_C_A2
Windows***, roof windows, and rooflights	2.2	1	1	1F00002C_W1_O0
Personnel doors	2.2	1.4	1.4	1F000000_W1_O0
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"

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

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

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	3.5

Building services

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

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

1- Radiators - Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	-	-	-	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

2- MVHR - Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	6.9	-	-	-
Standard value	0.91*	2.6	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

3- Door Curtain - NG Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

4- AHU - Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	6.9	-	1.3	-
Standard value	0.91*	N/A	N/A	1.6^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

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

1- SYST0004-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.92	0.018
Standard value	0.8	N/A

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
-1F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
0F_WC 2	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_Female WC	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_Male WC	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_WC 3	-	-	0.3	-	-	-	-	-	-	-	N/A
2F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
2F_WC 2	-	-	0.3	-	-	-	-	-	-	-	N/A
3F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
-1F_Multifunction Space 1	-	-	-	1.4	-	-	-	-	-	0.74	0.5
-1F_Multifunction Space 2	-	-	-	1.4	-	-	-	-	-	0.74	0.5
0F_Community Hub	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Community & Care Spaces 2	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Function Space	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Kitchen	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Staff Room	-	-	-	1.4	-	-	-	-	-	0.78	0.5
2F_Function Room	-	-	-	1.4	-	-	-	-	-	0.78	0.5
3F_Archive_Library	-	-	-	1.5	-	-	-	-	-	0.74	0.5
3F_Community Care Space 1	-	-	-	1.5	-	-	-	-	-	0.74	0.5
3F_Function Room	-	-	-	1.5	-	-	-	-	-	0.74	0.5
2F_Community Care Space 1	-	-	-	1.4	-	-	-	-	-	0.78	0.5

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
-1F_Cloak Room	125	-	-	17
-1F_Lobby	-	125	-	53
-1F_Plant	125	-	-	62
-1F_Stairs 1	-	125	-	26
-1F_Stairs 2	-	125	-	26
-1F_Store 1	125	-	-	13
-1F_Store 2	125	-	-	17
-1F_Store 3	125	-	-	5
-1F_WC 1	-	125	-	66
0F_Corridor 2	-	125	-	30
0F_Meeting Rooms	125	-	-	181
0F_Stairs 1	-	125	-	27
0F_Stairs 2	-	125	-	29
0F_Store 1	125	-	-	6
0F_WC 2	-	125	-	23
1F_Corridor 1	-	125	-	18
1F_Corridor 2	-	125	-	19
1F_Corridor 3	-	125	-	67

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
1F_Corridor 4	-	125	-	29
1F_Corridor 5	-	125	-	23
1F_Corridor 7	-	125	-	49
1F_Female WC	-	125	-	85
1F_Male WC	-	125	-	64
1F_Meeting Rooms	125	-	-	175
1F_Stairs 1	-	125	-	27
1F_Stairs 2	-	125	-	30
1F_Stairs 3	-	125	-	27
1F_Store 1	125	-	-	4
1F_Store 2	125	-	-	6
1F_Store 3	125	-	-	6
1F_WC 1	-	125	-	34
1F_WC 3	-	125	-	22
2F_Corridor 1	-	125	-	23
2F_Corridor 2	-	125	-	30
2F_Corridor 3	-	125	-	51
2F_Corridor 4	-	125	-	24
2F_Stairs 1	-	125	-	27
2F_Stairs 2	-	125	-	31
2F_Stairs 3	-	125	-	28
2F_Store 1	125	-	-	14
2F_Store 2	125	-	-	18
2F_Store 3	125	-	-	6
2F_WC 1	-	125	-	78
2F_WC 2	-	125	-	36
3F_Corridor 2	-	125	-	20
3F_Corridor 3	-	125	-	46
3F_Corridor 4	-	125	-	22
3F_Stairs 1	-	125	-	27
3F_Stairs 2	-	125	-	29
3F_Store 1	125	-	-	6
3F_WC 1	-	125	-	36
-1F_Multifunction Space 1	-	125	-	449
-1F_Multifunction Space 2	-	125	-	389
0F_Community Hub	-	125	-	1278
1F_Community & Care Spaces 2	-	125	-	436
1F_Function Space	-	125	-	747
1F_Kitchen	-	125	-	450
1F_Staff Room	-	125	-	40
2F_Function Room	-	125	-	817
3F_Archive_Library	-	125	-	367
3F_Community Care Space 1	-	125	-	141

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
3F_Function Room	-	125	-	199
2F_Community Care Space 1	-	125	-	378
0F_Entrance Lobby	-	125	-	12
1F_Green Room	-	125	-	41
1F_Stage	-	125	-	144
2F_McNamara Hall Balcony	-	125	-	617
1F_McNamara Hall	-	125	-	1271

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?
0F_Meeting Rooms	N/A	N/A
1F_Meeting Rooms	N/A	N/A
-1F_Multifunction Space 1	N/A	N/A
-1F_Multifunction Space 2	N/A	N/A
0F_Community Hub	NO (-59.1%)	NO
1F_Community & Care Spaces 2	NO (-76.8%)	NO
1F_Function Space	NO (-60.4%)	NO
1F_Kitchen	N/A	N/A
1F_Staff Room	NO (-78.3%)	NO
2F_Function Room	NO (-66.4%)	NO
3F_Archive_Library	NO (-41.9%)	NO
3F_Community Care Space 1	NO (-9.3%)	NO
3F_Function Room	NO (-67.2%)	NO
2F_Community Care Space 1	NO (-50.3%)	NO
1F_Green Room	N/A	N/A
1F_Stage	N/A	N/A
2F_McNamara Hall Balcony	N/A	N/A
1F_McNamara Hall	NO (-73.4%)	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?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	2900.5	2900.5
External area [m²]	4031.1	4031.1
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	4	3
Average conductance [W/K]	872.99	1774.25
Average U-value [W/m²K]	0.22	0.44
Alpha value* [%]	21.89	14.54

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential 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
100	**D2 General Assembly and Leisure, Night Clubs, and Theatres**
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	19.7	20.34
Cooling	4.92	9.2
Auxiliary	8.42	8.54
Lighting	9.57	18
Hot water	8.5	7.42
Equipment*	15.68	15.68
TOTAL**	51.1	63.51

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

Energy Production by Technology [kWh/m²]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	167.09	211.09
Primary energy* [kWh/m²]	102.97	140.88
Total emissions [kg/m²]	17.7	24.1

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	131.6	53.1	42.3	0	4	0.86	0	0.92	0
	Notional	131.2	107.8	44.5	0	5.3	0.82	0	----	----
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	9.5	147.5	2.9	7.9	9.8	0.9	5.16	0.92	6.9
	Notional	21.2	170.7	7.2	13.2	5.6	0.82	3.6	----	----
[ST] Other local room heater - fanned, [HS] Room heater, [HFT] Natural Gas, [CFT] Electricity										
	Actual	145.4	279.1	54.9	0	0.5	0.74	0	0.92	0
	Notional	303.2	298.6	102.8	0	0	0.82	0	----	----
[ST] Indoor packaged cabinet (VAV), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	83.2	81.9	30.9	4.2	11.6	0.75	5.43	0.92	6.9
	Notional	54.8	162	18.6	12.5	21.8	0.82	3.6	----	----

Key to terms

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

Key Features

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

Building fabric

Element	$U_{l\text{-}Typ}$	$U_{l\text{-}Mln}$	Surface where the minimum value occurs*
Wall	0.23	0.01	1F00000C_W4_A2
Floor	0.2	0.01	1F000022_F_A1
Roof	0.15	-	0F000009_C_A0
Windows, roof windows, and rooflights	1.5	1	1F00002C_W1_O0
Personnel doors	1.5	1.4	1F000000_W1_O0
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"

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

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

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3.5

New Building – Be Green

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

London Irish Centre — As designed

Date: Wed Jul 29 12:11:56 2020

Administrative information

Building Details

Address: London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.a.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.12

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

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name:

Telephone number:

Address: , ,

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

CO_2 emission rate from the notional building, kgCO_2/m².annum	24.5
Target CO_2 emission rate (TER), kgCO_2/m².annum	24.5
Building CO_2 emission rate (BER), kgCO_2/m².annum	17.7
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.17	1.79	0F00000C_W4_A0
Floor	0.25	0.18	1.09	0F000009_F_A0
Roof	0.25	0.13	1.09	1F000015_C_A2
Windows***, roof windows, and rooflights	2.2	1	1	1F00002C_W1_O0
Personnel doors	2.2	1.4	1.4	1F000000_W1_O0
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"

$U_{a\text{-}Limit}$ = 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
m³/(h.m²) at 50 Pa	10	3.5

Building services

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

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

1- Radiators - Electric

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

2- MVHR - ASHP

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.3	6.9	-	-	-
Standard value	2.5*	2.6	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

3- Door Curtain - Electric

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

4- AHU - ASHP

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.3	6.9	-	1.3	-
Standard value	2.5*	N/A	N/A	1.6^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

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

1- SYST0005-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	2.4	0.018
Standard value	2*	N/A

* Standard shown is for all types except absorption and gas engine heat pumps.

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
-1F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
0F_WC 2	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_Female WC	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_Male WC	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_WC 3	-	-	0.3	-	-	-	-	-	-	-	N/A
2F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
2F_WC 2	-	-	0.3	-	-	-	-	-	-	-	N/A
3F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
-1F_Multifunction Space 1	-	-	-	1.4	-	-	-	-	-	0.74	0.5
-1F_Multifunction Space 2	-	-	-	1.4	-	-	-	-	-	0.74	0.5
0F_Community Hub	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Community & Care Spaces 2	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Function Space	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Kitchen	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Staff Room	-	-	-	1.4	-	-	-	-	-	0.78	0.5
2F_Function Room	-	-	-	1.4	-	-	-	-	-	0.78	0.5
3F_Archive_Library	-	-	-	1.5	-	-	-	-	-	0.74	0.5
3F_Community Care Space 1	-	-	-	1.5	-	-	-	-	-	0.74	0.5
3F_Function Room	-	-	-	1.5	-	-	-	-	-	0.74	0.5
2F_Community Care Space 1	-	-	-	1.4	-	-	-	-	-	0.78	0.5

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
-1F_Cloak Room	125	-	-	17
-1F_Lobby	-	125	-	53
-1F_Plant	125	-	-	62
-1F_Stairs 1	-	125	-	26
-1F_Stairs 2	-	125	-	26
-1F_Store 1	125	-	-	13
-1F_Store 2	125	-	-	17
-1F_Store 3	125	-	-	5
-1F_WC 1	-	125	-	66
0F_Corridor 2	-	125	-	30
0F_Meeting Rooms	125	-	-	181
0F_Stairs 1	-	125	-	27
0F_Stairs 2	-	125	-	29
0F_Store 1	125	-	-	6
0F_WC 2	-	125	-	23
1F_Corridor 1	-	125	-	18
1F_Corridor 2	-	125	-	19
1F_Corridor 3	-	125	-	67

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
1F_Corridor 4	-	125	-	29
1F_Corridor 5	-	125	-	23
1F_Corridor 7	-	125	-	49
1F_Female WC	-	125	-	85
1F_Male WC	-	125	-	64
1F_Meeting Rooms	125	-	-	175
1F_Stairs 1	-	125	-	27
1F_Stairs 2	-	125	-	30
1F_Stairs 3	-	125	-	27
1F_Store 1	125	-	-	4
1F_Store 2	125	-	-	6
1F_Store 3	125	-	-	6
1F_WC 1	-	125	-	34
1F_WC 3	-	125	-	22
2F_Corridor 1	-	125	-	23
2F_Corridor 2	-	125	-	30
2F_Corridor 3	-	125	-	51
2F_Corridor 4	-	125	-	24
2F_Stairs 1	-	125	-	27
2F_Stairs 2	-	125	-	31
2F_Stairs 3	-	125	-	28
2F_Store 1	125	-	-	14
2F_Store 2	125	-	-	18
2F_Store 3	125	-	-	6
2F_WC 1	-	125	-	78
2F_WC 2	-	125	-	36
3F_Corridor 2	-	125	-	20
3F_Corridor 3	-	125	-	46
3F_Corridor 4	-	125	-	22
3F_Stairs 1	-	125	-	27
3F_Stairs 2	-	125	-	29
3F_Store 1	125	-	-	6
3F_WC 1	-	125	-	36
-1F_Multifunction Space 1	-	125	-	449
-1F_Multifunction Space 2	-	125	-	389
0F_Community Hub	-	125	-	1278
1F_Community & Care Spaces 2	-	125	-	436
1F_Function Space	-	125	-	747
1F_Kitchen	-	125	-	450
1F_Staff Room	-	125	-	40
2F_Function Room	-	125	-	817
3F_Archive_Library	-	125	-	367
3F_Community Care Space 1	-	125	-	141

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
3F_Function Room	-	125	-	199
2F_Community Care Space 1	-	125	-	378
0F_Entrance Lobby	-	125	-	12
1F_Green Room	-	125	-	41
1F_Stage	-	125	-	144
2F_McNamara Hall Balcony	-	125	-	617
1F_McNamara Hall	-	125	-	1271

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?
0F_Meeting Rooms	N/A	N/A
1F_Meeting Rooms	N/A	N/A
-1F_Multifunction Space 1	N/A	N/A
-1F_Multifunction Space 2	N/A	N/A
0F_Community Hub	NO (-59.1%)	NO
1F_Community & Care Spaces 2	NO (-76.8%)	NO
1F_Function Space	NO (-60.4%)	NO
1F_Kitchen	N/A	N/A
1F_Staff Room	NO (-78.3%)	NO
2F_Function Room	NO (-66.4%)	NO
3F_Archive_Library	NO (-41.9%)	NO
3F_Community Care Space 1	NO (-9.3%)	NO
3F_Function Room	NO (-67.2%)	NO
2F_Community Care Space 1	NO (-50.3%)	NO
1F_Green Room	N/A	N/A
1F_Stage	N/A	N/A
2F_McNamara Hall Balcony	N/A	N/A
1F_McNamara Hall	NO (-73.4%)	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?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	2900.5	2900.5
External area [m²]	4031.1	4031.1
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	4	3
Average conductance [W/K]	872.99	1774.25
Average U-value [W/m²K]	0.22	0.44
Alpha value* [%]	21.89	14.54

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential 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
100	**D2 General Assembly and Leisure, Night Clubs, and Theatres**
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	15.35	15.54
Cooling	4.92	9.2
Auxiliary	7.79	8.07
Lighting	9.57	18
Hot water	3.26	2.5
Equipment*	15.68	15.68
TOTAL**	40.88	53.32

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	5.73	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	168.73	211.09
Primary energy* [kWh/m²]	122.37	134.79
Total emissions [kg/m²]	17.7	24.5

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	136	54.3	47.2	0	1.8	0.8	0	1	0
	Notional	131.2	107.8	44.5	0	3.7	0.82	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	9.5	147.5	0.6	7.9	9.8	4.22	5.16	4.3	6.9
	Notional	21.2	170.7	2.4	13.2	5.6	2.43	3.6	----	----
[ST] Other local room heater - fanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	145.4	279.1	50.5	0	0.5	0.8	0	1	0
	Notional	303.2	298.6	102.8	0	0	0.82	0	----	----
[ST] Indoor packaged cabinet (VAV), [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	83.2	81.9	6.6	4.2	11.6	3.49	5.43	4.3	6.9
	Notional	54.8	162	6.3	12.5	21.8	2.43	3.6	----	----

Key to terms

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

Key Features

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

Building fabric

Element	$U_{l\text{-}Typ}$	$U_{l\text{-}Mln}$	Surface where the minimum value occurs*
Wall	0.23	0.01	1F00000C_W4_A2
Floor	0.2	0.01	1F000022_F_A1
Roof	0.15	-	0F000009_C_A0
Windows, roof windows, and rooflights	1.5	1	1F00002C_W1_O0
Personnel doors	1.5	1.4	1F000000_W1_O0
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"

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

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

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3.5

Combined Building – Baseline

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

London Irish Centre — As designed

Date: Wed Jul 29 12:14:56 2020

Administrative information

Building Details

Address: London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.a.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.12

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

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name:

Telephone number:

Address: , ,

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, $kgCO_2/m^2.annum$	27.2
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	27.2
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	29.7
Are emissions from the building less than or equal to the target?	BER > TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.52	1.79	0F00000C_W4_A0
Floor	0.25	0.29	1.09	0F000009_F_A0
Roof	0.25	0.27	1.09	1F000015_C_A2
Windows***, roof windows, and rooflights	2.2	2.22	5.6	0F000015_W1_O0
Personnel doors	2.2	1.4	1.4	0F000013_W2_O0
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"

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

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

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

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- Radiators - Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	-	-	-	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

2- MVHR - Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	6.9	-	-	-
Standard value	0.91*	2.6	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

3- Door Curtain - NG Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

4- AHU - Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	6.9	-	1.3	-
Standard value	0.91*	N/A	N/A	1.6^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

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

1- SYST0004-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.92	0.018
Standard value	0.8	N/A

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
-1F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
0F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
0F_WC 2	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_Female WC	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_Male WC	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_WC 3	-	-	0.3	-	-	-	-	-	-	-	N/A
2F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
2F_WC 2	-	-	0.3	-	-	-	-	-	-	-	N/A
3F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
-1F_Multifunction Space 1	-	-	-	1.4	-	-	-	-	-	0.74	0.5
-1F_Multifunction Space 2	-	-	-	1.4	-	-	-	-	-	0.74	0.5
0F_Community Hub	-	-	-	1.4	-	-	-	-	-	0.78	0.5
0F_Kitchen	-	-	-	1.4	-	-	-	-	-	0.78	0.5
0F_Snug_Cafe	-	-	-	1.4	-	-	-	-	-	0.78	0.5
0F_Wellbeing Centre	-	-	-	1.5	-	-	-	-	-	0.74	0.5
1F_Community & Care Spaces 1	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Community & Care Spaces 2	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Function Space	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Kitchen	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Staff Room	-	-	-	1.4	-	-	-	-	-	0.78	0.5
2F_Function Room	-	-	-	1.4	-	-	-	-	-	0.78	0.5
3F_Archive_Library	-	-	-	1.5	-	-	-	-	-	0.74	0.5
3F_Community Care Space 1	-	-	-	1.5	-	-	-	-	-	0.74	0.5
3F_Function Room	-	-	-	1.5	-	-	-	-	-	0.74	0.5
2F_Community Care Space 2	-	-	-	1.4	-	-	-	-	-	0.78	0.5
2F_Community Care Space 1	-	-	-	1.4	-	-	-	-	-	0.78	0.5
3F_Community Care Space 2	-	-	-	1.5	-	-	-	-	-	0.74	0.5

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
-1F_Cloak Room	60	-	-	36
-1F_Lobby	-	60	-	110
-1F_Plant	60	-	-	129
-1F_Stairs 1	-	60	-	54
-1F_Stairs 2	-	60	-	54
-1F_Store 1	60	-	-	27
-1F_Store 2	60	-	-	35
-1F_Store 3	60	-	-	11
-1F_WC 1	-	60	-	137
0F_Comms Room	60	-	-	119
0F_Corridor 2	-	60	-	61

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
0F_Cycle Store	60	-	-	29
0F_Drinks Store	60	-	-	43
0F_Elec	60	-	-	84
0F_Meeting Rooms	60	-	-	377
0F_Plant	60	-	-	170
0F_Stairs 1	-	60	-	56
0F_Stairs 2	-	60	-	60
0F_Store 1	60	-	-	12
0F_WC 1	-	60	-	163
0F_WC 2	-	60	-	48
1F_Bedroom 1	-	60	-	49
1F_Bedroom 2	-	60	-	49
1F_Bedroom 3	-	60	-	81
1F_Corridor 1	-	60	-	37
1F_Corridor 2	-	60	-	40
1F_Corridor 3	-	60	-	139
1F_Corridor 4	-	60	-	60
1F_Corridor 5	-	60	-	47
1F_Corridor 6	-	60	-	35
1F_Corridor 7	-	60	-	101
1F_Female WC	-	60	-	176
1F_Male WC	-	60	-	133
1F_Meeting Rooms	60	-	-	365
1F_Stairs 1	-	60	-	55
1F_Stairs 2	-	60	-	63
1F_Stairs 3	-	60	-	56
1F_Stairs 4	-	60	-	30
1F_Store 1	60	-	-	8
1F_Store 2	60	-	-	13
1F_Store 3	60	-	-	13
1F_WC 1	-	60	-	71
1F_WC 3	-	60	-	46
2F_Bedroom 4	-	60	-	51
2F_Bedroom 5	-	60	-	50
2F_Bedroom 6	-	60	-	78
2F_Corridor 1	-	60	-	49
2F_Corridor 2	-	60	-	62
2F_Corridor 3	-	60	-	106
2F_Corridor 4	-	60	-	50
2F_Corridor 5	-	60	-	36
2F_Stairs 1	-	60	-	57
2F_Stairs 2	-	60	-	65
2F_Stairs 3	-	60	-	58

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
2F_Stairs 4	-	60	-	32
2F_Store 1	60	-	-	29
2F_Store 2	60	-	-	37
2F_Store 3	60	-	-	13
2F_WC 1	-	60	-	163
2F_WC 2	-	60	-	74
3F_Bedroom 7	-	60	-	51
3F_Bedroom 8	-	60	-	50
3F_Bedroom 9	-	60	-	78
3F_Corridor 1	-	60	-	36
3F_Corridor 2	-	60	-	41
3F_Corridor 3	-	60	-	97
3F_Corridor 4	-	60	-	47
3F_Stairs 1	-	60	-	57
3F_Stairs 2	-	60	-	61
3F_Stairs 3	-	60	-	32
3F_Store 1	60	-	-	12
3F_WC 1	-	60	-	74
-1F_Multifunction Space 1	-	60	-	936
-1F_Multifunction Space 2	-	60	-	811
0F_Community Hub	-	60	-	2663
0F_Kitchen	-	60	-	925
0F_Snug_Cafe	-	60	-	101
0F_Wellbeing Centre	-	60	-	637
1F_Community & Care Spaces 1	-	60	-	1189
1F_Community & Care Spaces 2	-	60	-	908
1F_Function Space	-	60	-	1556
1F_Kitchen	-	60	-	938
1F_Staff Room	-	60	-	84
2F_Function Room	-	60	-	1702
3F_Archive_Library	-	60	-	764
3F_Community Care Space 1	-	60	-	293
3F_Function Room	-	60	-	414
2F_Community Care Space 2	-	60	-	1092
2F_Community Care Space 1	-	60	-	788
3F_Community Care Space 2	-	60	-	1088
0F_Corridor 1	-	60	-	199
0F_Entrance Lobby	-	60	-	26
1F_Green Room	-	60	-	85
1F_Stage	-	60	-	300
2F_McNamara Hall Balcony	-	60	-	1286
1F_McNamara Hall	-	60	-	2648

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?
0F_Meeting Rooms	N/A	N/A
1F_Bedroom 1	NO (-76.1%)	NO
1F_Bedroom 2	NO (-67%)	NO
1F_Bedroom 3	NO (-68.5%)	NO
1F_Meeting Rooms	N/A	N/A
2F_Bedroom 4	NO (-81.7%)	NO
2F_Bedroom 5	NO (-82%)	NO
2F_Bedroom 6	NO (-76.4%)	NO
3F_Bedroom 7	NO (-85.9%)	NO
3F_Bedroom 8	NO (-86.1%)	NO
3F_Bedroom 9	NO (-81.9%)	NO
-1F_Multifunction Space 1	N/A	N/A
-1F_Multifunction Space 2	N/A	N/A
0F_Community Hub	NO (-59.1%)	NO
0F_Kitchen	N/A	N/A
0F_Snug_Cafe	N/A	N/A
0F_Wellbeing Centre	NO (-48.1%)	NO
1F_Community & Care Spaces 1	NO (-62.2%)	NO
1F_Community & Care Spaces 2	NO (-76.8%)	NO
1F_Function Space	NO (-60.4%)	NO
1F_Kitchen	N/A	N/A
1F_Staff Room	NO (-78.3%)	NO
2F_Function Room	NO (-66.4%)	NO
3F_Archive_Library	NO (-41.9%)	NO
3F_Community Care Space 1	NO (-9.3%)	NO
3F_Function Room	NO (-67.2%)	NO
2F_Community Care Space 2	NO (-77.6%)	NO
2F_Community Care Space 1	NO (-50.3%)	NO
3F_Community Care Space 2	NO (-82.9%)	NO
1F_Green Room	N/A	N/A
1F_Stage	N/A	N/A
2F_McNamara Hall Balcony	N/A	N/A
1F_McNamara Hall	NO (-73.4%)	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?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	3909.7	3909.7
External area [m²]	5673	5673
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	10	3
Average conductance [W/K]	2849.65	2619.72
Average U-value [W/m²K]	0.5	0.46
Alpha value* [%]	9.98	15

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
4	**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
96	**D2 General Assembly and Leisure, Night Clubs, and Theatres**
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	43.11	25.34
Cooling	4.48	9.11
Auxiliary	8.15	7.52
Lighting	18.75	17.37
Hot water	20.77	20.77
Equipment*	21.26	21.26
TOTAL**	**95.26**	**80.12**

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

Energy Production by Technology [kWh/m²]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	233.08	226.26
Primary energy* [kWh/m²]	171.87	158.03
Total emissions [kg/m²]	29.7	27.2

* 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	256.9	53.9	82.6	0	3.8	0.86	0	0.92	0
	Notional	169.2	107.2	57.4	0	4.8	0.82	0	----	----
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	62.4	131.3	19.2	7.1	9.9	0.9	5.16	0.92	6.9
	Notional	25	175.3	8.5	13.5	5.6	0.82	3.6	----	----
[ST] Other local room heater - fanned, [HS] Room heater, [HFT] Natural Gas, [CFT] Electricity										
	Actual	254.8	64.9	96.2	0	1	0.74	0	0.92	0
	Notional	169.1	83.2	57.3	0	0	0.82	0	----	----
[ST] Indoor packaged cabinet (VAV), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	122.3	87.7	45.5	4.5	11.6	0.75	5.43	0.92	6.9
	Notional	54.8	162	18.6	12.5	21.8	0.82	3.6	----	----

Key to terms

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

Key Features

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

Building fabric

Element	$U_{l\text{-}Typ}$	$U_{l\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.01	1F00000C_W4_A3
Floor	0.2	0.01	1F000022_F_A2
Roof	0.15	0.01	0F00000D_C_A2
Windows, roof windows, and rooflights	1.5	1	1F00002C_W1_O0
Personnel doors	1.5	1.4	0F000013_W2_O0
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"

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

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

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	10

Combined Building – Be Lean

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

London Irish Centre — As designed

Date: Wed Jul 29 12:19:04 2020

Administrative information

Building Details

Address: London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.a.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.12

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

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name:

Telephone number:

Address: , ,

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

CO_2 emission rate from the notional building, kgCO_2/m².annum	27.2
Target CO_2 emission rate (TER), kgCO_2/m².annum	27.2
Building CO_2 emission rate (BER), kgCO_2/m².annum	20.3
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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.16	1.79	0F00000C_W4_A0
Floor	0.25	0.2	1.09	0F000009_F_A0
Roof	0.25	0.14	1.09	1F000015_C_A2
Windows***, roof windows, and rooflights	2.2	1.11	1.4	0F000015_W1_O0
Personnel doors	2.2	1.4	1.4	0F000013_W2_O0
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"

$U_{a\text{-}Limit}$ = 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
m³/(h.m²) at 50 Pa	10	3.5

Building services

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

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

1- Radiators - Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	-	-	-	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

2- MVHR - Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	6.9	-	-	-
Standard value	0.91*	2.6	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

3- Door Curtain - NG Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

4- AHU - Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	6.9	-	1.3	-
Standard value	0.91*	N/A	N/A	1.6^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

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

1- SYST0004-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.92	0.018
Standard value	0.8	N/A

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
-1F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
0F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
0F_WC 2	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_Female WC	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_Male WC	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_WC 3	-	-	0.3	-	-	-	-	-	-	-	N/A
2F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
2F_WC 2	-	-	0.3	-	-	-	-	-	-	-	N/A
3F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
-1F_Multifunction Space 1	-	-	-	1.4	-	-	-	-	-	0.74	0.5
-1F_Multifunction Space 2	-	-	-	1.4	-	-	-	-	-	0.74	0.5
0F_Community Hub	-	-	-	1.4	-	-	-	-	-	0.78	0.5
0F_Kitchen	-	-	-	1.4	-	-	-	-	-	0.78	0.5
0F_Snug_Cafe	-	-	-	1.4	-	-	-	-	-	0.78	0.5
0F_Wellbeing Centre	-	-	-	1.5	-	-	-	-	-	0.74	0.5
1F_Community & Care Spaces 1	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Community & Care Spaces 2	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Function Space	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Kitchen	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Staff Room	-	-	-	1.4	-	-	-	-	-	0.78	0.5
2F_Function Room	-	-	-	1.4	-	-	-	-	-	0.78	0.5
3F_Archive_Library	-	-	-	1.5	-	-	-	-	-	0.74	0.5
3F_Community Care Space 1	-	-	-	1.5	-	-	-	-	-	0.74	0.5
3F_Function Room	-	-	-	1.5	-	-	-	-	-	0.74	0.5
2F_Community Care Space 2	-	-	-	1.4	-	-	-	-	-	0.78	0.5
2F_Community Care Space 1	-	-	-	1.4	-	-	-	-	-	0.78	0.5
3F_Community Care Space 2	-	-	-	1.5	-	-	-	-	-	0.74	0.5

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
-1F_Cloak Room	125	-	-	17
-1F_Lobby	-	125	-	53
-1F_Plant	125	-	-	62
-1F_Stairs 1	-	125	-	26
-1F_Stairs 2	-	125	-	26
-1F_Store 1	125	-	-	13
-1F_Store 2	125	-	-	17
-1F_Store 3	125	-	-	5
-1F_WC 1	-	125	-	66
0F_Comms Room	125	-	-	57
0F_Corridor 2	-	125	-	30

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
0F_Cycle Store	125	-	-	14
0F_Drinks Store	125	-	-	21
0F_Elec	125	-	-	40
0F_Meeting Rooms	125	-	-	181
0F_Plant	125	-	-	82
0F_Stairs 1	-	125	-	27
0F_Stairs 2	-	125	-	29
0F_Store 1	125	-	-	6
0F_WC 1	-	125	-	78
0F_WC 2	-	125	-	23
1F_Bedroom 1	-	125	-	24
1F_Bedroom 2	-	125	-	24
1F_Bedroom 3	-	125	-	39
1F_Corridor 1	-	125	-	18
1F_Corridor 2	-	125	-	19
1F_Corridor 3	-	125	-	67
1F_Corridor 4	-	125	-	29
1F_Corridor 5	-	125	-	23
1F_Corridor 6	-	125	-	17
1F_Corridor 7	-	125	-	49
1F_Female WC	-	125	-	85
1F_Male WC	-	125	-	64
1F_Meeting Rooms	125	-	-	175
1F_Stairs 1	-	125	-	27
1F_Stairs 2	-	125	-	30
1F_Stairs 3	-	125	-	27
1F_Stairs 4	-	125	-	15
1F_Store 1	125	-	-	4
1F_Store 2	125	-	-	6
1F_Store 3	125	-	-	6
1F_WC 1	-	125	-	34
1F_WC 3	-	125	-	22
2F_Bedroom 4	-	125	-	25
2F_Bedroom 5	-	125	-	24
2F_Bedroom 6	-	125	-	37
2F_Corridor 1	-	125	-	23
2F_Corridor 2	-	125	-	30
2F_Corridor 3	-	125	-	51
2F_Corridor 4	-	125	-	24
2F_Corridor 5	-	125	-	17
2F_Stairs 1	-	125	-	27
2F_Stairs 2	-	125	-	31
2F_Stairs 3	-	125	-	28

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
2F_Stairs 4	-	125	-	15
2F_Store 1	125	-	-	14
2F_Store 2	125	-	-	18
2F_Store 3	125	-	-	6
2F_WC 1	-	125	-	78
2F_WC 2	-	125	-	36
3F_Bedroom 7	-	125	-	25
3F_Bedroom 8	-	125	-	24
3F_Bedroom 9	-	125	-	37
3F_Corridor 1	-	125	-	17
3F_Corridor 2	-	125	-	20
3F_Corridor 3	-	125	-	46
3F_Corridor 4	-	125	-	22
3F_Stairs 1	-	125	-	27
3F_Stairs 2	-	125	-	29
3F_Stairs 3	-	125	-	15
3F_Store 1	125	-	-	6
3F_WC 1	-	125	-	36
-1F_Multifunction Space 1	-	125	-	449
-1F_Multifunction Space 2	-	125	-	389
0F_Community Hub	-	125	-	1278
0F_Kitchen	-	125	-	444
0F_Snug_Cafe	-	125	-	49
0F_Wellbeing Centre	-	125	-	306
1F_Community & Care Spaces 1	-	125	-	571
1F_Community & Care Spaces 2	-	125	-	436
1F_Function Space	-	125	-	747
1F_Kitchen	-	125	-	450
1F_Staff Room	-	125	-	40
2F_Function Room	-	125	-	817
3F_Archive_Library	-	125	-	367
3F_Community Care Space 1	-	125	-	141
3F_Function Room	-	125	-	199
2F_Community Care Space 2	-	125	-	524
2F_Community Care Space 1	-	125	-	378
3F_Community Care Space 2	-	125	-	522
0F_Corridor 1	-	125	-	95
0F_Entrance Lobby	-	125	-	12
1F_Green Room	-	125	-	41
1F_Stage	-	125	-	144
2F_McNamara Hall Balcony	-	125	-	617
1F_McNamara Hall	-	125	-	1271

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?
0F_Meeting Rooms	N/A	N/A
1F_Bedroom 1	NO (-85.1%)	NO
1F_Bedroom 2	NO (-79.4%)	NO
1F_Bedroom 3	NO (-80.4%)	NO
1F_Meeting Rooms	N/A	N/A
2F_Bedroom 4	NO (-88.6%)	NO
2F_Bedroom 5	NO (-88.8%)	NO
2F_Bedroom 6	NO (-85.3%)	NO
3F_Bedroom 7	NO (-91.2%)	NO
3F_Bedroom 8	NO (-91.4%)	NO
3F_Bedroom 9	NO (-88.7%)	NO
-1F_Multifunction Space 1	N/A	N/A
-1F_Multifunction Space 2	N/A	N/A
0F_Community Hub	NO (-59.1%)	NO
0F_Kitchen	N/A	N/A
0F_Snug_Cafe	N/A	N/A
0F_Wellbeing Centre	NO (-67.6%)	NO
1F_Community & Care Spaces 1	NO (-76.4%)	NO
1F_Community & Care Spaces 2	NO (-76.8%)	NO
1F_Function Space	NO (-60.4%)	NO
1F_Kitchen	N/A	N/A
1F_Staff Room	NO (-78.3%)	NO
2F_Function Room	NO (-66.4%)	NO
3F_Archive_Library	NO (-41.9%)	NO
3F_Community Care Space 1	NO (-9.3%)	NO
3F_Function Room	NO (-67.2%)	NO
2F_Community Care Space 2	NO (-86%)	NO
2F_Community Care Space 1	NO (-50.3%)	NO
3F_Community Care Space 2	NO (-89.3%)	NO
1F_Green Room	N/A	N/A
1F_Stage	N/A	N/A
2F_McNamara Hall Balcony	N/A	N/A
1F_McNamara Hall	NO (-73.4%)	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?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	3909.7	3909.7
External area [m²]	5673	5673
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	4	3
Average conductance [W/K]	1254.59	2619.72
Average U-value [W/m²K]	0.22	0.46
Alpha value* [%]	22.67	15

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
4	**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
96	**D2 General Assembly and Leisure, Night Clubs, and Theatres**
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	20.98	25.34
Cooling	4.77	9.11
Auxiliary	8.15	7.52
Lighting	9.28	17.37
Hot water	20.77	20.77
Equipment*	21.26	21.26
TOTAL**	63.95	80.12

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

Energy Production by Technology [kWh/m²]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	166.82	226.26
Primary energy* [kWh/m²]	117.39	158.03
Total emissions [kg/m²]	20.3	27.2

* 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	142.2	44.8	45.7	0	3.8	0.86	0	0.92	0
	Notional	169.2	107.2	57.4	0	4.8	0.82	0	----	----
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	12	142.8	3.7	7.7	9.9	0.9	5.16	0.92	6.9
	Notional	25	175.3	8.5	13.5	5.6	0.82	3.6	----	----
[ST] Other local room heater - fanned, [HS] Room heater, [HFT] Natural Gas, [CFT] Electricity										
	Actual	154.5	57.5	58.3	0	0.6	0.74	0	0.92	0
	Notional	169.1	83.2	57.3	0	0	0.82	0	----	----
[ST] Indoor packaged cabinet (VAV), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	83.1	81.9	30.9	4.2	11.6	0.75	5.43	0.92	6.9
	Notional	54.8	162	18.6	12.5	21.8	0.82	3.6	----	----

Key to terms

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

Key Features

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

Building fabric

Element	$U_{l\text{-}Typ}$	$U_{l\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.01	1F00000C_W4_A2
Floor	0.2	0.01	1F000022_F_A2
Roof	0.15	-	0F000009_C_A0
Windows, roof windows, and rooflights	1.5	1	1F00002C_W1_O0
Personnel doors	1.5	1.4	0F000013_W2_O0
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"

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

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

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3.5

Combined Building – Be Clean

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

London Irish Centre — As designed

Date: Wed Jul 29 12:19:04 2020

Administrative information

Building Details

Address: London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.a.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.12

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

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name:

Telephone number:

Address: , ,

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

CO_2 emission rate from the notional building, kgCO_2/m².annum	27.2
Target CO_2 emission rate (TER), kgCO_2/m².annum	27.2
Building CO_2 emission rate (BER), kgCO_2/m².annum	20.3
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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.16	1.79	0F00000C_W4_A0
Floor	0.25	0.2	1.09	0F000009_F_A0
Roof	0.25	0.14	1.09	1F000015_C_A2
Windows***, roof windows, and rooflights	2.2	1.11	1.4	0F000015_W1_O0
Personnel doors	2.2	1.4	1.4	0F000013_W2_O0
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"

$U_{a\text{-}Limit}$ = 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
m³/(h.m²) at 50 Pa	10	3.5

Building services

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

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

1- Radiators - Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	-	-	-	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

2- MVHR - Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	6.9	-	-	-
Standard value	0.91*	2.6	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

3- Door Curtain - NG Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

4- AHU - Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	6.9	-	1.3	-
Standard value	0.91*	N/A	N/A	1.6^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

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

1- SYST0004-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.92	0.018
Standard value	0.8	N/A

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
-1F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
0F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
0F_WC 2	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_Female WC	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_Male WC	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_WC 3	-	-	0.3	-	-	-	-	-	-	-	N/A
2F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
2F_WC 2	-	-	0.3	-	-	-	-	-	-	-	N/A
3F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
-1F_Multifunction Space 1	-	-	-	1.4	-	-	-	-	-	0.74	0.5
-1F_Multifunction Space 2	-	-	-	1.4	-	-	-	-	-	0.74	0.5
0F_Community Hub	-	-	-	1.4	-	-	-	-	-	0.78	0.5
0F_Kitchen	-	-	-	1.4	-	-	-	-	-	0.78	0.5
0F_Snug_Cafe	-	-	-	1.4	-	-	-	-	-	0.78	0.5
0F_Wellbeing Centre	-	-	-	1.5	-	-	-	-	-	0.74	0.5
1F_Community & Care Spaces 1	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Community & Care Spaces 2	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Function Space	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Kitchen	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Staff Room	-	-	-	1.4	-	-	-	-	-	0.78	0.5
2F_Function Room	-	-	-	1.4	-	-	-	-	-	0.78	0.5
3F_Archive_Library	-	-	-	1.5	-	-	-	-	-	0.74	0.5
3F_Community Care Space 1	-	-	-	1.5	-	-	-	-	-	0.74	0.5
3F_Function Room	-	-	-	1.5	-	-	-	-	-	0.74	0.5
2F_Community Care Space 2	-	-	-	1.4	-	-	-	-	-	0.78	0.5
2F_Community Care Space 1	-	-	-	1.4	-	-	-	-	-	0.78	0.5
3F_Community Care Space 2	-	-	-	1.5	-	-	-	-	-	0.74	0.5

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
-1F_Cloak Room	125	-	-	17
-1F_Lobby	-	125	-	53
-1F_Plant	125	-	-	62
-1F_Stairs 1	-	125	-	26
-1F_Stairs 2	-	125	-	26
-1F_Store 1	125	-	-	13
-1F_Store 2	125	-	-	17
-1F_Store 3	125	-	-	5
-1F_WC 1	-	125	-	66
0F_Comms Room	125	-	-	57
0F_Corridor 2	-	125	-	30

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
0F_Cycle Store	125	-	-	14
0F_Drinks Store	125	-	-	21
0F_Elec	125	-	-	40
0F_Meeting Rooms	125	-	-	181
0F_Plant	125	-	-	82
0F_Stairs 1	-	125	-	27
0F_Stairs 2	-	125	-	29
0F_Store 1	125	-	-	6
0F_WC 1	-	125	-	78
0F_WC 2	-	125	-	23
1F_Bedroom 1	-	125	-	24
1F_Bedroom 2	-	125	-	24
1F_Bedroom 3	-	125	-	39
1F_Corridor 1	-	125	-	18
1F_Corridor 2	-	125	-	19
1F_Corridor 3	-	125	-	67
1F_Corridor 4	-	125	-	29
1F_Corridor 5	-	125	-	23
1F_Corridor 6	-	125	-	17
1F_Corridor 7	-	125	-	49
1F_Female WC	-	125	-	85
1F_Male WC	-	125	-	64
1F_Meeting Rooms	125	-	-	175
1F_Stairs 1	-	125	-	27
1F_Stairs 2	-	125	-	30
1F_Stairs 3	-	125	-	27
1F_Stairs 4	-	125	-	15
1F_Store 1	125	-	-	4
1F_Store 2	125	-	-	6
1F_Store 3	125	-	-	6
1F_WC 1	-	125	-	34
1F_WC 3	-	125	-	22
2F_Bedroom 4	-	125	-	25
2F_Bedroom 5	-	125	-	24
2F_Bedroom 6	-	125	-	37
2F_Corridor 1	-	125	-	23
2F_Corridor 2	-	125	-	30
2F_Corridor 3	-	125	-	51
2F_Corridor 4	-	125	-	24
2F_Corridor 5	-	125	-	17
2F_Stairs 1	-	125	-	27
2F_Stairs 2	-	125	-	31
2F_Stairs 3	-	125	-	28

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
2F_Stairs 4	-	125	-	15
2F_Store 1	125	-	-	14
2F_Store 2	125	-	-	18
2F_Store 3	125	-	-	6
2F_WC 1	-	125	-	78
2F_WC 2	-	125	-	36
3F_Bedroom 7	-	125	-	25
3F_Bedroom 8	-	125	-	24
3F_Bedroom 9	-	125	-	37
3F_Corridor 1	-	125	-	17
3F_Corridor 2	-	125	-	20
3F_Corridor 3	-	125	-	46
3F_Corridor 4	-	125	-	22
3F_Stairs 1	-	125	-	27
3F_Stairs 2	-	125	-	29
3F_Stairs 3	-	125	-	15
3F_Store 1	125	-	-	6
3F_WC 1	-	125	-	36
-1F_Multifunction Space 1	-	125	-	449
-1F_Multifunction Space 2	-	125	-	389
0F_Community Hub	-	125	-	1278
0F_Kitchen	-	125	-	444
0F_Snug_Cafe	-	125	-	49
0F_Wellbeing Centre	-	125	-	306
1F_Community & Care Spaces 1	-	125	-	571
1F_Community & Care Spaces 2	-	125	-	436
1F_Function Space	-	125	-	747
1F_Kitchen	-	125	-	450
1F_Staff Room	-	125	-	40
2F_Function Room	-	125	-	817
3F_Archive_Library	-	125	-	367
3F_Community Care Space 1	-	125	-	141
3F_Function Room	-	125	-	199
2F_Community Care Space 2	-	125	-	524
2F_Community Care Space 1	-	125	-	378
3F_Community Care Space 2	-	125	-	522
0F_Corridor 1	-	125	-	95
0F_Entrance Lobby	-	125	-	12
1F_Green Room	-	125	-	41
1F_Stage	-	125	-	144
2F_McNamara Hall Balcony	-	125	-	617
1F_McNamara Hall	-	125	-	1271

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?
0F_Meeting Rooms	N/A	N/A
1F_Bedroom 1	NO (-85.1%)	NO
1F_Bedroom 2	NO (-79.4%)	NO
1F_Bedroom 3	NO (-80.4%)	NO
1F_Meeting Rooms	N/A	N/A
2F_Bedroom 4	NO (-88.6%)	NO
2F_Bedroom 5	NO (-88.8%)	NO
2F_Bedroom 6	NO (-85.3%)	NO
3F_Bedroom 7	NO (-91.2%)	NO
3F_Bedroom 8	NO (-91.4%)	NO
3F_Bedroom 9	NO (-88.7%)	NO
-1F_Multifunction Space 1	N/A	N/A
-1F_Multifunction Space 2	N/A	N/A
0F_Community Hub	NO (-59.1%)	NO
0F_Kitchen	N/A	N/A
0F_Snug_Cafe	N/A	N/A
0F_Wellbeing Centre	NO (-67.6%)	NO
1F_Community & Care Spaces 1	NO (-76.4%)	NO
1F_Community & Care Spaces 2	NO (-76.8%)	NO
1F_Function Space	NO (-60.4%)	NO
1F_Kitchen	N/A	N/A
1F_Staff Room	NO (-78.3%)	NO
2F_Function Room	NO (-66.4%)	NO
3F_Archive_Library	NO (-41.9%)	NO
3F_Community Care Space 1	NO (-9.3%)	NO
3F_Function Room	NO (-67.2%)	NO
2F_Community Care Space 2	NO (-86%)	NO
2F_Community Care Space 1	NO (-50.3%)	NO
3F_Community Care Space 2	NO (-89.3%)	NO
1F_Green Room	N/A	N/A
1F_Stage	N/A	N/A
2F_McNamara Hall Balcony	N/A	N/A
1F_McNamara Hall	NO (-73.4%)	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?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	3909.7	3909.7
External area [m²]	5673	5673
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	4	3
Average conductance [W/K]	1254.59	2619.72
Average U-value [W/m²K]	0.22	0.46
Alpha value* [%]	22.67	15

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
4	**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
96	**D2 General Assembly and Leisure, Night Clubs, and Theatres**
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	20.98	25.34
Cooling	4.77	9.11
Auxiliary	8.15	7.52
Lighting	9.28	17.37
Hot water	20.77	20.77
Equipment*	21.26	21.26
TOTAL**	63.95	80.12

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

Energy Production by Technology [kWh/m²]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	166.82	226.26
Primary energy* [kWh/m²]	117.39	158.03
Total emissions [kg/m²]	20.3	27.2

* 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	142.2	44.8	45.7	0	3.8	0.86	0	0.92	0
	Notional	169.2	107.2	57.4	0	4.8	0.82	0	----	----
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	12	142.8	3.7	7.7	9.9	0.9	5.16	0.92	6.9
	Notional	25	175.3	8.5	13.5	5.6	0.82	3.6	----	----
[ST] Other local room heater - fanned, [HS] Room heater, [HFT] Natural Gas, [CFT] Electricity										
	Actual	154.5	57.5	58.3	0	0.6	0.74	0	0.92	0
	Notional	169.1	83.2	57.3	0	0	0.82	0	----	----
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Personnel doors	1.5	1.4	0F000013_W2_O0
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"

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

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

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3.5

Combined Building – Be Green

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

London Irish Centre — As designed

Date: Wed Jul 29 12:22:53 2020

Administrative information

Building Details

Address: London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.a.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.12

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

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name:

Telephone number:

Address: , ,

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

CO_2 emission rate from the notional building, kgCO_2/m².annum	27.5
Target CO_2 emission rate (TER), kgCO_2/m².annum	27.5
Building CO_2 emission rate (BER), kgCO_2/m².annum	20.8
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	0.16	1.79	0F00000C_W4_A0
Floor	0.25	0.2	1.09	0F000009_F_A0
Roof	0.25	0.14	1.09	1F000015_C_A2
Windows***, roof windows, and rooflights	2.2	1.11	1.4	0F000015_W1_O0
Personnel doors	2.2	1.4	1.4	0F000013_W2_O0
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"

$U_{a\text{-}Limit}$ = 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
m³/(h.m²) at 50 Pa	10	3.5

Building services

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

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

1- Radiators - Electric

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

2- MVHR - ASHP

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.3	6.9	-	-	-
Standard value	2.5*	2.6	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

3- Door Curtain - Electric

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

4- AHU - ASHP

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.3	6.9	-	1.3	-
Standard value	2.5*	N/A	N/A	1.6^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

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

1- SYST0005-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	2.4	0.018
Standard value	2*	N/A

* Standard shown is for all types except absorption and gas engine heat pumps.

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
-1F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
0F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
0F_WC 2	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_Female WC	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_Male WC	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
1F_WC 3	-	-	0.3	-	-	-	-	-	-	-	N/A
2F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
2F_WC 2	-	-	0.3	-	-	-	-	-	-	-	N/A
3F_WC 1	-	-	0.3	-	-	-	-	-	-	-	N/A
-1F_Multifunction Space 1	-	-	-	1.4	-	-	-	-	-	0.74	0.5
-1F_Multifunction Space 2	-	-	-	1.4	-	-	-	-	-	0.74	0.5
0F_Community Hub	-	-	-	1.4	-	-	-	-	-	0.78	0.5
0F_Kitchen	-	-	-	1.4	-	-	-	-	-	0.78	0.5
0F_Snug_Cafe	-	-	-	1.4	-	-	-	-	-	0.78	0.5
0F_Wellbeing Centre	-	-	-	1.5	-	-	-	-	-	0.74	0.5
1F_Community & Care Spaces 1	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Community & Care Spaces 2	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Function Space	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Kitchen	-	-	-	1.4	-	-	-	-	-	0.78	0.5
1F_Staff Room	-	-	-	1.4	-	-	-	-	-	0.78	0.5
2F_Function Room	-	-	-	1.4	-	-	-	-	-	0.78	0.5
3F_Archive_Library	-	-	-	1.5	-	-	-	-	-	0.74	0.5
3F_Community Care Space 1	-	-	-	1.5	-	-	-	-	-	0.74	0.5
3F_Function Room	-	-	-	1.5	-	-	-	-	-	0.74	0.5
2F_Community Care Space 2	-	-	-	1.4	-	-	-	-	-	0.78	0.5
2F_Community Care Space 1	-	-	-	1.4	-	-	-	-	-	0.78	0.5
3F_Community Care Space 2	-	-	-	1.5	-	-	-	-	-	0.74	0.5

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
-1F_Cloak Room	125	-	-	17
-1F_Lobby	-	125	-	53
-1F_Plant	125	-	-	62
-1F_Stairs 1	-	125	-	26
-1F_Stairs 2	-	125	-	26
-1F_Store 1	125	-	-	13
-1F_Store 2	125	-	-	17
-1F_Store 3	125	-	-	5
-1F_WC 1	-	125	-	66
0F_Comms Room	125	-	-	57
0F_Corridor 2	-	125	-	30

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
0F_Cycle Store	125	-	-	14
0F_Drinks Store	125	-	-	21
0F_Elec	125	-	-	40
0F_Meeting Rooms	125	-	-	181
0F_Plant	125	-	-	82
0F_Stairs 1	-	125	-	27
0F_Stairs 2	-	125	-	29
0F_Store 1	125	-	-	6
0F_WC 1	-	125	-	78
0F_WC 2	-	125	-	23
1F_Bedroom 1	-	125	-	24
1F_Bedroom 2	-	125	-	24
1F_Bedroom 3	-	125	-	39
1F_Corridor 1	-	125	-	18
1F_Corridor 2	-	125	-	19
1F_Corridor 3	-	125	-	67
1F_Corridor 4	-	125	-	29
1F_Corridor 5	-	125	-	23
1F_Corridor 6	-	125	-	17
1F_Corridor 7	-	125	-	49
1F_Female WC	-	125	-	85
1F_Male WC	-	125	-	64
1F_Meeting Rooms	125	-	-	175
1F_Stairs 1	-	125	-	27
1F_Stairs 2	-	125	-	30
1F_Stairs 3	-	125	-	27
1F_Stairs 4	-	125	-	15
1F_Store 1	125	-	-	4
1F_Store 2	125	-	-	6
1F_Store 3	125	-	-	6
1F_WC 1	-	125	-	34
1F_WC 3	-	125	-	22
2F_Bedroom 4	-	125	-	25
2F_Bedroom 5	-	125	-	24
2F_Bedroom 6	-	125	-	37
2F_Corridor 1	-	125	-	23
2F_Corridor 2	-	125	-	30
2F_Corridor 3	-	125	-	51
2F_Corridor 4	-	125	-	24
2F_Corridor 5	-	125	-	17
2F_Stairs 1	-	125	-	27
2F_Stairs 2	-	125	-	31
2F_Stairs 3	-	125	-	28

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
2F_Stairs 4	-	125	-	15
2F_Store 1	125	-	-	14
2F_Store 2	125	-	-	18
2F_Store 3	125	-	-	6
2F_WC 1	-	125	-	78
2F_WC 2	-	125	-	36
3F_Bedroom 7	-	125	-	25
3F_Bedroom 8	-	125	-	24
3F_Bedroom 9	-	125	-	37
3F_Corridor 1	-	125	-	17
3F_Corridor 2	-	125	-	20
3F_Corridor 3	-	125	-	46
3F_Corridor 4	-	125	-	22
3F_Stairs 1	-	125	-	27
3F_Stairs 2	-	125	-	29
3F_Stairs 3	-	125	-	15
3F_Store 1	125	-	-	6
3F_WC 1	-	125	-	36
-1F_Multifunction Space 1	-	125	-	449
-1F_Multifunction Space 2	-	125	-	389
0F_Community Hub	-	125	-	1278
0F_Kitchen	-	125	-	444
0F_Snug_Cafe	-	125	-	49
0F_Wellbeing Centre	-	125	-	306
1F_Community & Care Spaces 1	-	125	-	571
1F_Community & Care Spaces 2	-	125	-	436
1F_Function Space	-	125	-	747
1F_Kitchen	-	125	-	450
1F_Staff Room	-	125	-	40
2F_Function Room	-	125	-	817
3F_Archive_Library	-	125	-	367
3F_Community Care Space 1	-	125	-	141
3F_Function Room	-	125	-	199
2F_Community Care Space 2	-	125	-	524
2F_Community Care Space 1	-	125	-	378
3F_Community Care Space 2	-	125	-	522
0F_Corridor 1	-	125	-	95
0F_Entrance Lobby	-	125	-	12
1F_Green Room	-	125	-	41
1F_Stage	-	125	-	144
2F_McNamara Hall Balcony	-	125	-	617
1F_McNamara Hall	-	125	-	1271

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?
0F_Meeting Rooms	N/A	N/A
1F_Bedroom 1	NO (-85.1%)	NO
1F_Bedroom 2	NO (-79.4%)	NO
1F_Bedroom 3	NO (-80.4%)	NO
1F_Meeting Rooms	N/A	N/A
2F_Bedroom 4	NO (-88.6%)	NO
2F_Bedroom 5	NO (-88.8%)	NO
2F_Bedroom 6	NO (-85.3%)	NO
3F_Bedroom 7	NO (-91.2%)	NO
3F_Bedroom 8	NO (-91.4%)	NO
3F_Bedroom 9	NO (-88.7%)	NO
-1F_Multifunction Space 1	N/A	N/A
-1F_Multifunction Space 2	N/A	N/A
0F_Community Hub	NO (-59.1%)	NO
0F_Kitchen	N/A	N/A
0F_Snug_Cafe	N/A	N/A
0F_Wellbeing Centre	NO (-67.6%)	NO
1F_Community & Care Spaces 1	NO (-76.4%)	NO
1F_Community & Care Spaces 2	NO (-76.8%)	NO
1F_Function Space	NO (-60.4%)	NO
1F_Kitchen	N/A	N/A
1F_Staff Room	NO (-78.3%)	NO
2F_Function Room	NO (-66.4%)	NO
3F_Archive_Library	NO (-41.9%)	NO
3F_Community Care Space 1	NO (-9.3%)	NO
3F_Function Room	NO (-67.2%)	NO
2F_Community Care Space 2	NO (-86%)	NO
2F_Community Care Space 1	NO (-50.3%)	NO
3F_Community Care Space 2	NO (-89.3%)	NO
1F_Green Room	N/A	N/A
1F_Stage	N/A	N/A
2F_McNamara Hall Balcony	N/A	N/A
1F_McNamara Hall	NO (-73.4%)	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?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	3909.7	3909.7
External area [m²]	5673	5673
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	4	3
Average conductance [W/K]	1254.59	2619.72
Average U-value [W/m²K]	0.22	0.46
Alpha value* [%]	22.67	15

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
4	**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
96	**D2 General Assembly and Leisure, Night Clubs, and Theatres**
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	17.51	20.56
Cooling	4.77	9.11
Auxiliary	7.48	7.02
Lighting	9.28	17.37
Hot water	7.96	7
Equipment*	21.26	21.26
TOTAL**	47.01	61.06

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	5.73	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	168.56	226.26
Primary energy* [kWh/m²]	140.7	148.44
Total emissions [kg/m²]	20.8	27.5

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	146.9	45.8	51	0	1.6	0.8	0	1	0
	Notional	169.2	107.2	57.4	0	3.2	0.82	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	12.1	142.8	0.8	7.7	9.9	4.22	5.16	4.3	6.9
	Notional	25	175.3	2.9	13.5	5.6	2.43	3.6	----	----
[ST] Other local room heater - fanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	154.7	57.4	53.7	0	0.5	0.8	0	1	0
	Notional	169.1	83.2	57.3	0	0	0.82	0	----	----
[ST] Indoor packaged cabinet (VAV), [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	83.4	81.8	6.6	4.2	11.6	3.49	5.43	4.3	6.9
	Notional	54.8	162	6.3	12.5	21.8	2.43	3.6	----	----

Key to terms

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

Key Features

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

Building fabric

Element	$U_{l\text{-}Typ}$	$U_{l\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.01	1F00000C_W4_A2
Floor	0.2	0.01	1F000022_F_A2
Roof	0.15	-	0F000009_C_A0
Windows, roof windows, and rooflights	1.5	1	1F00002C_W1_O0
Personnel doors	1.5	1.4	0F000013_W2_O0
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"

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

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

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3.5