KJ TAIT
ENGINEERS

GREAT ORMOND STREET HOSPITAL

ITALIAN HOSPITAL

LONDON

ENERGY STRATEGY

Issue 04

Document History

ISSUE	DATE	DETAILS	BY	CHKD
01	29th June 2017	First Issue	PM	MW
02	8th August 2017	Second Issue	PM	MW
03	22nd March 2018	Report updated with new gas boilers and comments with regards to the upgrading of thermal elements with insulation.	PM	MW
04	25th April 2018	Comments from Sonnemann Toon Architects incorporated	PM	MW

C O N T E N T S

1.0 EXECUTIVE SUMMARY

KJ Tait Engineers have been instructed to provide the Energy Strategy for a full planning development application for proposals at Great Ormond Street Hospital in London. This site is located in Camden town and the area is part of Camden Borough Council.

The proposed development consists of the refurbishment and remodelling of an existing Grade II listed building which will retain the existing facades. There will also be an extension constructed as part of the refurbishment.

To obtain likely energy demands for the development it has been modelled in IES Virtual Environment 2017. This analysis found the baseline site CO_2 emissions for the building as un-refurbished as 261tCO_2/year.

After a preliminary feasibility assessment, the following energy strategy is proposed to reduce the emissions from the Proposed Development. This follows the structure set out within the Greater London Authority (GLA) guidance with respect to the energy hierarchy.

Be Lean

It is proposed that the re-development will be designed with a high level of energy efficiency. This will include the following passive design measures:

- Maximising effective natural ventilation where feasible with existing façade and clinical requirements.
- Good daylighting levels assisted by narrow plan nature.
- Minimising overheating through modifications to existing façade openings to maximize high level opening with restricted low-level opening and use of free cooling methods, such as using night ventilation to minimise use of mechanical cooling to consulting rooms.
- Existing building facades will be retained.
- Locating service intensive departments at Basement and Ground Floor allowing accommodation with potential for natural ventilation to be located at upper levels.

U-value tables in Part L2B to be followed for refurbishment elements and L1B for new elements. Specific factors will be as follows:

Secondary Glazing

- Single glazing using 4mm toughened Low E glazing - U-Value: 1.94 W/m^{2}K
- Double Glazing using 28mm double glazed sealed unit - U-Value: 1.09 W/m^{2}K

Loft Insulation (to pitched roof)

- Insulation roll 300mm thickness – U-Value: 0.15 W/m^{2}K

Flat Roofs (inverted roof build up)

- Extruded polystyrene board thickness 180mm - U-value = 0.17W/m^{2}K

The efficiency measures suggested are estimated to save 52.2% of non-domestic regulated CO_2 emissions compared to the baseline building.

Be Clean

The ability of the building to connect to an existing heat network has been assessed using the London Heat Map tool. This found that there is no current or potential network in the vicinity for the development to utilise.

The primary heating provision for the hospital will be provided by a new modular boiler installation located in the lower ground floor basement. Current specification for these will be low NOx condensing boilers which have a seasonal efficiency of 95.9%.

Other measures to reduce the demand of the building include:

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- Effective metering and monitoring of building energy use.
- LED lighting throughout the facility including effective controls, zoning and metering.
- Mixed mode ventilation of consulting rooms and support accommodation maximising natural ventilation use to the building.
- Mechanical ventilation equipment will incorporate heat exchangers.
- Use of low flow fittings to minimise water use.
- Use of active chilled beams

Be Green

In providing renewable energy to the building, it has been calculated that a photovoltaic (PV) installation on the roof would provide a good proportion of the buildings energy demand within an acceptable payback of around 12 years. Ideally the panels will be installed facing southwards on a 30˚ incline. Shading on the panels should be minimised as much as possible and where there is a risk of shading throughout the most productive time of the day, micro inverters should be specified over a central inverter.

CO_2 Savings Summary

In line with GLA guidance with respect to the energy hierarchy of refurbishments, the following savings have been derived from modelling the refurbishment within IES VE 2017. The baseline for calculating savings was taken from modelling the existing un-refurbished building. This found that the baseline emissions for the building was estimated to be in the region of 261tCO_2/year. After refurbishing the building with both the passive and active design features within this report, it was found that there would be a saving of 136.5tCO_2/year. This equates to a saving in regulated carbon emissions of 52.2%.

In terms of renewable energy, the building has been modelled with a PV array. The maximum area of PV panels have been installed on central area of roof where unaffected by other services. These provide in the region of 9.4kWp installed. This, although a small installation contributes to a saving of around 4.3tCO_2/year which is a 1.6% saving over the refurbished building.

The total cumulative savings from refurbishing the building and installing a PV array on the roof is expected to be around 140.8tCO_2/year which equates to a significant saving of 53.9%.

	Regulated non-domestic carbon savings	
	Tonnes CO_2 per annum	%
Savings from energy demand reduction	136.5	52.2
Savings from heat network/CHP	0.0	0.0
Savings from renewable energy	4.3	1.6
Total cumulative savings	**140.8**	**53.9**

2.0 INTRODUCTION

This report follows guidance from the GLA with respect to preparing energy assessments for proposed developments within London. The building has been modelled in IES VE 2017 to determine the following parameters:

- The baseline regulated CO_2 emissions which has been taken from the Building Emissions Rate (BER) from the modelling of the existing building
- The buildings regulated CO_2 emissions from the 'Be Lean' analysis after the refurbishment
- The buildings regulated CO_2 emissions from the 'Be Clean' analysis after investigating any connections to existing district heating networks or incorporating combined heat & power (CHP) where applicable
- The buildings regulated CO_2 emissions from the 'Be Green' emissions which involves the installation of renewable energy where applicable

This step-by-step approach will ensure that that the building is sustainable and that any energy provided by any district heating/CHP or renewable installation is not being used for energy that could otherwise have been mitigated earlier in the design process.

2.1 Site Information

The site proposed for redevelopment is located within the London borough of Camden. The building, known as The Italian Hospital, will undergo a major refurbishment and remodelling of the existing Grade II listed building and will retain existing facades. There will also be a (area) of new build elements. In line with GLA and Camden Borough Council guidance, the re-development has been classed as a major development, therefore there has been no splitting of the existing and new build elements within this report.

2.2 Policy Review

Due to the new build aspect of the redevelopment not being greater than 25% of the total useful floor area, it will not be subject to Part L2A of the Building Regulations. However, due to this new extension, the building will have to follow Section 4: Guidance relating to Building Work, Section 5: Guidance on Thermal Elements and Section 6: Consequential Improvements of Part L2B of the Building Regulations. The re-development will also have to conform to aspects contained within the London Plan for refurbishments and the Camden Development policy DP22.

2.2.1 Building Regulations

English Building Regulations Technical Standards Part L2B provides the framework for re-developments of existing buildings. Due to the listed nature of the building, some of the aspects contained within the document may not be feasible.

Section 4

Section 4 contains the guidance on controlled fittings for the re-development. Within this section there are standard U-values are provided for aspects such as windows and doors.

Section 5

Guidance on new and retained thermal elements for the re-development are contained within section 5 of Part L2B of the Building Regulations. This section gives standard U-values to be achieved for new thermal elements that will be important for the extension. In terms of retained thermal elements, there are threshold U-values specified where, if below, reasonable provision to improve on them should be made.

Section 6

As a result of the small extension being proposed for the re-development and the total useful floor area of the existing building exceeding 1,000m^2 Part L2B Section 6 for consequential improvements will need to be adhered too. Within this there are 9No. Improvement measures specified that must be met if it is economically feasible to do so.

2.2.2 Planning Policy

The National Planning Policy Framework (NPPF) was published in March 2012 and states a clear presumption in favour of sustainable development. The NPPF supports the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change, encouraging the reuse of existing resources, and the use of renewable resources.

The NPPF replaces Planning Policy Statement 22 (PPS22) and in Section 10 outlines its energy and climate change policies. To support the move to a low carbon future, local planning authorities should:

- Plan for new development in locations and ways which reduce greenhouse gas emissions
- Actively support energy efficiency improvements to existing buildings
- When setting any local requirement for a building's sustainability, do so in away consistent with the Government's zero carbon buildings policy and adopt nationally described standards.

In determining planning applications, local planning authorities should expect new developments to:

- Comply with adopted Local Plan policies on local requirements for decentralised energy supply unless it can be demonstrated that this is not feasible or viable

- Take account of landform, layout, building orientation, massing, and landscaping to minimise energy consumption
- Have a positive strategy to promote energy from renewable and low carbon sources
- Identify opportunities where development can draw its energy supply from decentralised, renewable, or low carbon energy supply systems and for co-locating potential heat customers and Suppliers.

2.2.3 The London Plan

The London Plan is considered to be the benchmark for local planning regulation. In terms of refurbishments, these should be modelled to reflect the building as is at present to ascertain a benchmark for carbon emissions. The analysis should subsequently follow the energy hierarchy laid out in Policies 5.2 and 5.6 of the London Plan to improve the energy performance of the building.

2.2.4 Local Policy

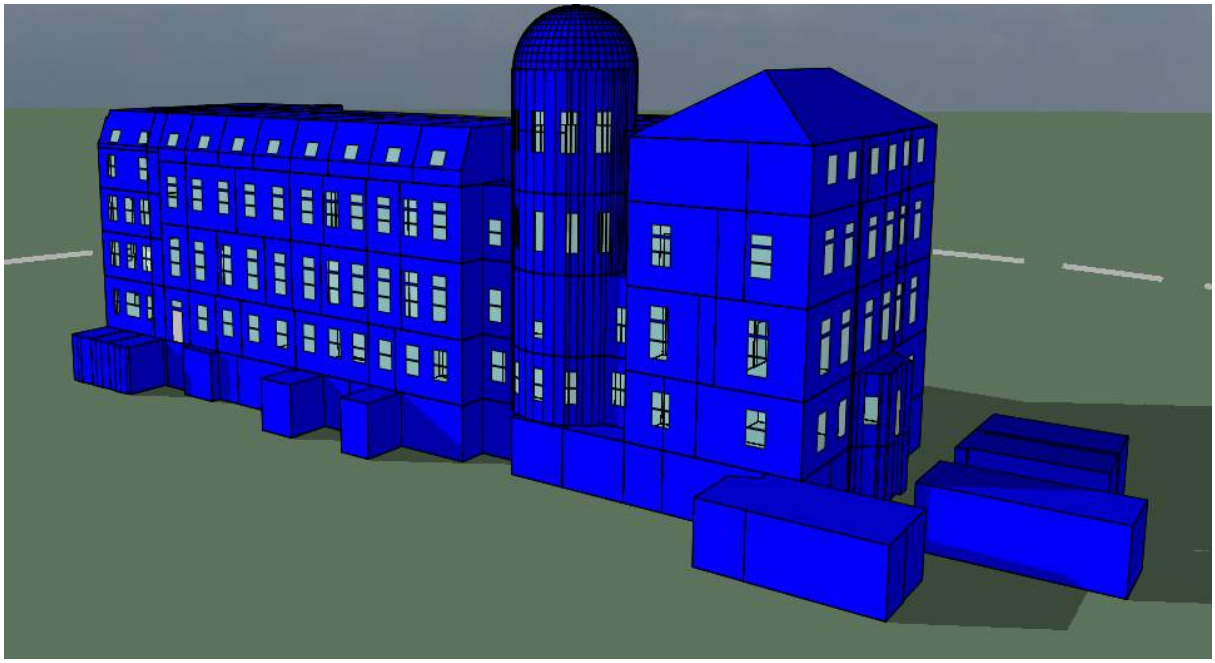
Camden Development policy DP22 stipulate the following requirements:

- For non-domestic developments of 500m^2 or above to achieve a BREEAM "Very Good" rating.
- Consideration of good insulation levels, efficient heating, cooling and lighting and source of energy used.
- Good control and metering of equipment and energy uses.
- Efficient use of water.

Energy use is also a key client consideration with respect to design of building services and completed installations will need to meet requirements of NHS guidance HTM07-EnCO_2de as well as the requirements of the building regulations and local planners.

3.0 BASELINE CARBON EMISSIONS

To ascertain the baseline carbon emissions in line with guidance contained within the London Plan, the existing building has been modelled in IES VE 2017. This has allowed for comparison with proposals set out within the 'be lean' analysis to be calculated. The calculated baseline carbon emissions for the building have been calculated as **67.4 kg/CO_2/m^2.**



4.0 DEMAND REDUCTION (BE LEAN)

In line with London Plan guidance for refurbishments, the building has been modelled with the following passive and active design measure implemented. This has resulted in a Building Emissions Rate of **32.8 kg/CO_2/m^2**. This has resulted in an improvement over the baseline existing building of **34.6 kg/CO_2/m^2**.

Passive Design Measures

In terms of the refurbishment of the building, this will be achieved in the first instance by the introduction of passive measures. The approach to be taken is for the building to be mixed mode, where feasible, maximising the use of natural ventilation with the existing façade. In instances where mechanical ventilation is unavoidable such as for clinical requirements, mechanical ventilation with heat recovery will be used.

There will be good daylighting levels, mitigating the extended use of lighting. This will be achieved due to narrow plan of the building. By modifications to the existing façade openings to maximise high level openings overheating of the building will be minimised. This is expected to lead to free cooling methods such as night ventilation.

In terms of windows, these will be secondary glazed. Lastly, service intensive departments will be located in the basement and ground floors.

Upgrade to Building Fabric

It was proposed that the building fabric be upgraded with insulated wall lining to improve the heat losses from the building. In assessing whether this would be feasible, Degree Day calculations have been carried out in which the improved U-values of the building fabric were used and a yearly saving in the gas consumption worked out which also incorporated heating degree days for the local area. A quote was also provided for carrying out this improvement so that a simple payback period could be calculated.

If carrying out this upgrade, it was found there would be an improvement to the buildings U-values of 0.48W/m^{2}K. When taking degree days into account, it was calculated that this would save around 76,293kWh of gas consumption yearly. This would equate to a saving of circa £2136 at current gas costs of 2.8p/kWh.

The cost of improving the U-values of the fabric by insulating the walls was quoted to be £151,400. On a simple payback calculation, this initiative would take circa 71 years to payback. Therefore, it has been deemed economically unfeasible to carry out this upgrade and thus this work has not been included in the building modelling and subsequent BRUKL analysis.

A secondary check on this using the BRUKL analysis was also carried out and indicated a lower annual energy saving of 37,797kWh and financial saving of £1058. On a simple payback calculation, this initiative would take circa 142 years to payback. The original degree day calculation is considered more accurate for purposes of comparing savings.

Associated outputs from draft BRUKL analysis are as follows.

Current (0.75 U-Value)

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$
Wall**	0.35	0.75	0.75
Floor	0.25	0.49	0.49
Roof	0.25	0.18	0.18
Windows***, roof windows, and rooflights	2.2	1.62	2.1
Personnel doors	2.2	2.2	2.2

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

	Actual	Notional
Heating	22.48	9.6
Cooling	6.31	10.23
Auxiliary	16.07	15.98
Lighting	40.21	34.34
Hot water	3.21	3.38
Equipment*	98.47	98.47
TOTAL**	**88.28**	**73.52**

Insulated Plasterboard (0.27 U-Value)

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$
Wall**	0.35	0.27	0.27
Floor	0.25	0.49	0.49
Roof	0.25	0.18	0.18
Windows***, roof windows, and rooflights	2.2	1.62	2.1
Personnel doors	2.2	2.2	2.2

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

	Actual	Notional
Heating	10.85	9.42
Cooling	8.07	10.2
Auxiliary	12.73	15.81
Lighting	39.8	33.99
Hot water	3.17	3.34
Equipment*	100.34	100.34
TOTAL**	**74.61**	**72.76**

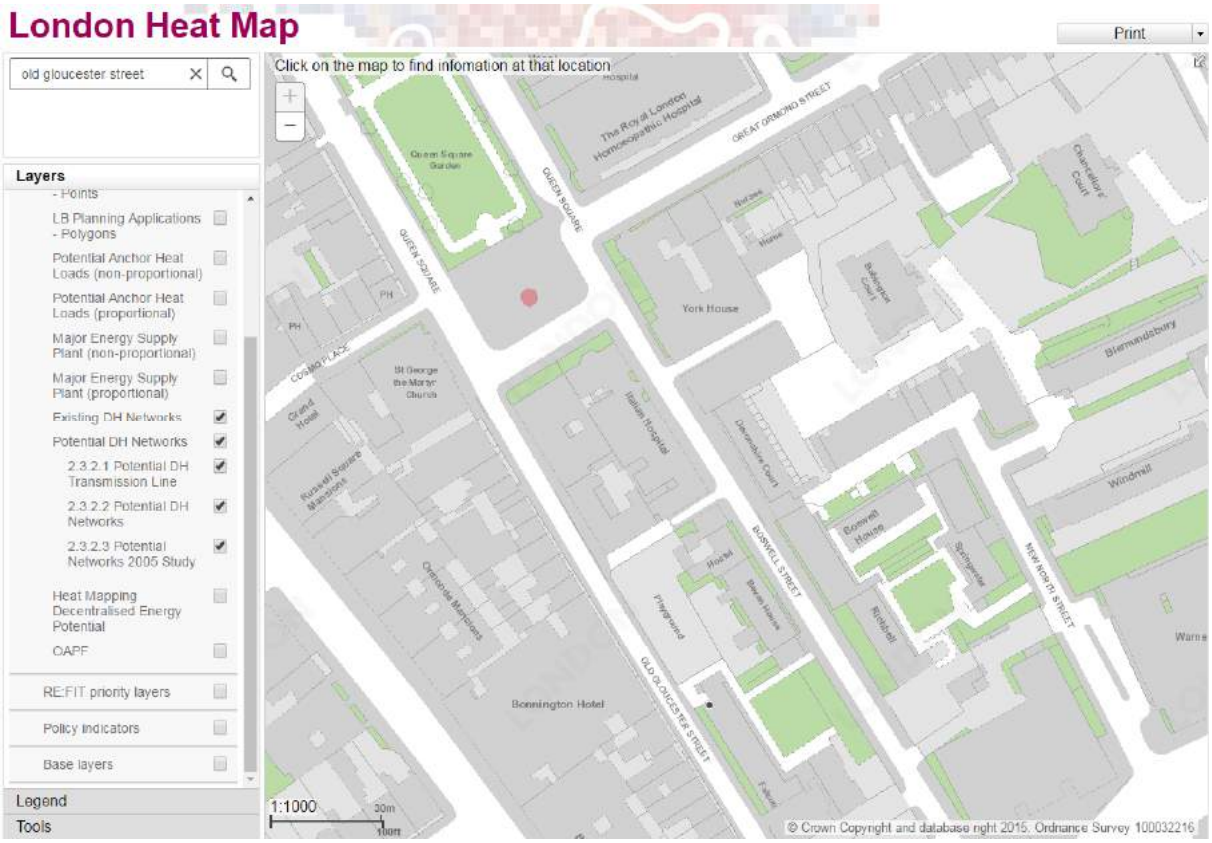
Active Design Measures

In terms of active design measures for the re-development, heating will be supplied by a new modular boiler arrangement located in the lower ground floor basement. These will be low NOx condensing boilers with a seasonal efficiency of 95.9%. There will be effective metering throughout the site so that energy usage can be recorded with a view to reducing if there are rises after occupation of the building. LED lighting will be installed throughout the building with effective controls, zoning and metering.

5.0 HEATING INFRASTRUCTURE INCLUDING CHP (BE CLEAN)

Heat Networks

On investigating potential or current heat networks in the vicinity of the hospital it was found that there are no existing or potential heat networks in operation.



Combined Heat & Power (CHP)

Potential for connecting to the existing hospital CHP plant has been ruled out due to distance between facilities, capacity of plant and also because of proposed redevelopment works on potential service routes.

6.0 RENEWABLE ENERGY (BE GREEN)

It is proposed that a photovoltaic (PV) array is installed on all available flat roof area where not affected by servicing and over shadowing of adjacent plant compounds. This provides a PV array in the region of 9.4kWp be installed on the available roof areas of the building.

Panels will be installed on a 30˚ incline and facing southwest and should provide a good saving in carbon emissions for the building.

The addition of PV on the roof has been modelled in IES VE 2017 after the Be Lean analysis which consisted of modelling the proposed passive and active design upgrades. It was found that by installing PV there would be a **1.1 kg/CO_2/m^2** reduction in carbon emissions from implementing this initiative. It would be expected that the PV panels would produce a payback in the region of 10 years due to a combination of the Feed in Tariff (FiT) and the electricity savings from not using grid electricity.

7.0 MONITORING

In line with BREEAM ambitions and regulatory guidance the redeveloped building will follow the metering strategy contained within CIBSE Guide TM39: Building Energy Metering.

Central monitoring proposed for the building include the following.

- Electrical consumption of major plant including supply and extract AHUs, circulating pumps, booster pumps, chillers, condensers and server room cooling room cooling with ability to display KVA, Amps (in each phase and neutral), Volts (in each phase), Watts, KVAr, KVAh, KVAhr, and Hz.
- Water consumption at main meter (Modbus output).
- Water consumption at Cat 5 Booster Set.
- Energy consumption at hot water generators.
- Energy consumption by building heating.
- Building gas consumption.
- Main building electrical consumption (primary and secondary supplies).
- Energy usage by lift installations.
- Electricity consumption at each floor distribution boards (small power and lighting).

Operation of plant will be controlled and monitored by the installed Building Management System.

8.0 CONCLUSIONS

This report has been completed in accordance with the structure and content set out within the GLA Guidance on Preparing Energy Assessments (March 2016) document. It was found that there would be a saving in regulated carbon emissions of **136.5tCO_2/year** by the refurbishment of the building by both passive and active measures.

In terms of the 'Be Green' part of the modelling, a 9.4kWp PV array was added and a further **4.3tCO_2/year** of savings were evidenced. This installation would produce a payback in the region of 10 years which, although longer than what would be economically feasible within Part L2B building regulations still should be completed due to the significant savings in carbon emissions from not using grid electricity.

	Regulated non-domestic carbon savings	
	Tonnes CO_2 per annum	%
Savings from energy demand reduction	136.5	52.2
Savings from heat network/CHP	0.0	0.0
Savings from renewable energy	4.3	1.6
Total cumulative savings	**140.8**	**53.9**

9.0 APPENDEIX

Before Refurbishment

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

L0217-Italian Hospital — As built

Date: Thu Jun 29 11:00:15 2017

Administrative information

Building Details

Address: 40-41 Queen Square, London, WC1

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.7

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.7

BRUKL compliance check version: v5.3.a.0

Owner Details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

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, $kgCO_2/m^2.annum$	40.6
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	40.6
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	67.4
Are emissions from the building less than or equal to the target?	BER > TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.75	0.75	RM000001:Surf[2]
Floor	0.25	0.49	0.49	RM000001:Surf[0]
Roof	0.25	0.4	0.4	RM000001:Surf[1]
Windows***, roof windows, and rooflights	2.2	5.45	5.59	Q1000003:Surf[0]
Personnel doors	2.2	2.2	2.2	RM00004D:Surf[12]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

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

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

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	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	NO
Whole building electric power factor achieved by power factor correction	>0.95

1- Old Gas Boiler with Natural Ventilation

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.75	-	0.2	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

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

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

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
Q1003 Acc WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q1028 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q1038 Acc WC/Baby Ch	-	-	0.5	-	-	-	-	-	-	-	N/A
Q1042 Acc WC/Baby Ch	-	-	0.5	-	-	-	-	-	-	-	N/A
Q1086 Acc WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q2026 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q2040 Acc WC/Baby Ch	-	-	0.5	-	-	-	-	-	-	-	N/A
Q2086 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q2038 Acc WC/Baby Ch	-	-	0.5	-	-	-	-	-	-	-	N/A
Q2060 WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q2058 WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q2036 Infant Feed	-	-	0.5	-	-	-	-	-	-	-	N/A
Q3030 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q3052 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q4086 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q4026 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q5024 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q4086 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
Q5045 W/C	-	-	0.5	-	-	-	-	-	-	-	N/A
Q3M004 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q3024 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Q1112 Plant	45	-	-	268
Q1047 Store (SLT)	76	-	-	30
Q1049 Store (Audio)	71	-	-	34
Q1092 Shower	-	174	-	13
Q1082 Lobby	-	127	-	22
Q1S-04 Staircase	-	78	-	86
Q1098 Lift Lobby	-	91	-	37
Q1R-08 Elec Riser	-	174	-	20
Q1L-06 Passenger/Goods Lift 3	-	93	-	59
Q1R-10 Mech Riser	-	174	-	14
Q1064 CRA Cochlear Implant Booth	-	69	-	176
Q1076 Control	76	-	-	71
Q1068 VRA Audio Booth	-	75	-	118
Q1066 Sound Treated	-	78	-	98
Q1070 Control	66	-	-	92
Q1089 Change	-	121	-	23
Q1088 Female Stagg Change	-	87	-	58
Q1080 Circulation	-	98	-	77
Q1096 LV Switchroom	50	-	-	143
Q1094 Existing Substation	49	-	-	153
Q1003 Acc WC	-	96	-	78
Q1024 Tea Point	-	84	-	163
Q1044 Audio Booth	-	71	-	142
Q1048 Audio Booth	-	73	-	127
Q1046 Sound Treated	-	78	-	99
Q1028 Staff WC	-	131	-	42
Q1062 Circulation	-	87	-	253
Q1050 Equip Store	120	-	-	30
Q1060 Vestibular Lab	57	-	-	167
Q1056 Caloric Test	-	76	-	149
Q1058 Equip St (Cochlear Implant)	98	-	-	22
Q1030 Lobby	-	109	-	28
Q1038 Acc WC/Baby Ch	-	108	-	61
Q1R-04 Vent/Comms Riser	-	102	-	51
Q1042 Acc WC/Baby Ch	-	91	-	86
Q1040 Lift Lobby	-	73	-	107

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Q1L-02 Passenger Lift-1	-	85	-	74
Q1L-04 Passenger Lift 2	-	88	-	70
Q1R-02 Elec Riser	-	174	-	15
Q1032 Cleaner	76	-	-	36
Q1002 Consult-Iso	48	-	-	308
Q1010 Circulation	-	88	-	106
Q1006 Counsel/Therapy	65	-	-	118
Q1004 Disposal Hold	92	-	-	21
Q1022 Lobby	-	85	-	65
Q1016 Consult	50	-	-	226
Q1018 Office (6)	50	-	-	315
Q1020 Consult	51	-	-	221
Q1110 Plant	47	-	-	216
Q1108 Plant	53	-	-	137
Q1106 Plant	50	-	-	149
Q1102 Plant Vault	73	-	-	42
Q1104 Plant Vault	72	-	-	43
Q1103 Plant Vault	78	-	-	38
Q1101 Plant	120	-	-	11
Q1100 Plant	43	-	-	733
Q1084 Male Staff Change	-	88	-	47
Q1090 Circulation	-	86	-	78
Q1086 Acc WC	-	103	-	61
Q1074 VRA Audio Booth	-	74	-	120
Q1072 VRA Audio Booth	-	72	-	139
Q1052 ABR Booth (RF)	-	78	-	100
Q1054 Cochlear Implant Booth	-	77	-	105
Q1S-02 Staircase	-	98	-	59
Q1026 Circulation	-	68	-	97
Q1012 Hearing Aid Fitting (Sound Treated)	-	104	-	49
Q1014 Consult	49	-	-	287
Q1R-06 Mech/Domestic Water Riser	-	132	-	33
Q1034 Sub-Wait	-	69	15	829
Q1036 Touchdown	-	174	15	20
Q2026 Staff WC	-	155	-	42
Q2R-08 Elec Riser	-	174	-	20
Q2L-06 Passenger/Goods Lift 3	-	105	-	59
Q2R-10 Mech Riser	-	174	-	14
Q2R-04 Vent/Comms Riser	-	117	-	51
Q2L-02 Passenger Lift-1	-	95	-	74
Q2L-04 Passenger Lift 2	-	98	-	70
Q2R-02 Elec Riser	-	174	-	15
Q2R-06 Mech/Domestic Water Riser	-	157	-	33

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Q2040 Acc WC/Baby Ch	-	103	-	86
Q2014 Weigh & Measure Pre-Assess	-	74	-	92
Q2016 Main Wait	-	64	15	871
Q2018 Lobby	-	78	-	76
Q2017 Lobby	-	110	-	49
Q2020 Lobby	-	101	-	46
Q2004 Weigh & Measure	-	83	-	105
Q2086 Staff WC	-	174	-	31
Q2094 Central Disposal	56	-	-	83
Q2092 Med Gas Bottles	120	-	-	13
Q2096 Cleaners Med	98	-	-	26
Q2084 Lift Lobby	-	100	-	44
Q2070 Glasses Repair	60	-	-	174
Q2S-04 Staircase	-	85	-	88
Q2062 Imaging	-	65	-	2527
Q2044 APOA-Consult	52	-	-	249
Q2046 APOA Int	75	-	-	105
Q2048 Dispensing Opticians	50	-	-	307
Q2028 Lobby	-	109	-	37
Q2051 Store	105	-	-	22
Q2038 Acc WC/Baby Ch	-	125	-	61
Q2042 Lift Lobby	-	79	-	107
Q2060 WC	-	161	-	40
Q2058 WC	-	174	-	26
Q2056 Lobby	-	92	-	53
Q2064 Genetic Counsel	69	-	-	120
Q2012 Circulation	-	66	-	191
Q2002 Main Wait	-	64	15	898
Q1024 Tea Point	-	147	-	69
Q2S-02 Staircase	-	111	-	62
Q2024 Circulation	-	86	-	76
Q2V-02 Void	-	138	-	32
Q2030 Cleaner	88	-	-	36
Q2032 Changing Places	-	80	-	84
Q2034 Circulation	-	94	-	52
Q2036 Infant Feed	-	123	-	60
Q2050 Servery	-	95	-	146
Q2066 Interview	64	-	-	190
Q3030 Staff WC	-	174	-	42
Q3R-08 Elec Riser	-	173	-	20
Q3L-06 Passenger/Goods Lift 3	-	93	-	59
Q3R-10 Mech Riser	-	174	-	14
Q3L-02 Passenger Lift-1	-	108	-	74

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Q3L-04 Passenger Lift 2	-	112	-	70
Q3R-02 Elec Riser	-	174	-	15
Q3052 Staff WC	-	159	-	31
Q3S-02 Staircase	-	130	-	62
Q3026 Circulation	-	93	-	76
Q3010 Eye Drops	73	-	-	44
Q3005 Disposal Hold	68	-	-	24
Q3022 Lobby	-	93	-	36
Q3014 IT Server	-	90	15	381
Q3004 Consult	57	-	-	247
Q3002 Consult	53	-	-	321
Q3020 Consult	61	-	-	216
Q3016 Consult	56	-	-	265
Q3018 Consult	61	-	-	237
Q3012 Circulation	-	91	-	135
Q3056 C/E	-	81	-	168
Q3054 C/E	-	90	-	163
Q3052 C/E	-	85	-	157
Q3051 C/E	-	86	-	156
Q3048 C/E	-	88	-	160
Q3046 C/E	-	82	-	178
Q3044 C/E	-	79	-	202
Q3028 Lobby	-	142	-	27
Q3S-04 Staircase	-	96	-	94
Q3067 Circulation	-	149	-	26
Q3070 Seminar/Meeting Room	43	-	-	572
Q3060 Lift Lobby	-	85	-	49
Q3V-02 Void	-	165	-	32
Q4R-08 Elec Riser	-	147	-	20
Q4L-06 Passenger/Goods Lift 3	-	84	-	59
Q4R-10 Mech Riser	-	174	-	14
Q4L-02 Passenger Lift-1	-	106	-	74
Q4L-04 Passenger Lift 2	-	110	-	70
Q4R-02 Elec Riser	-	174	-	15
Q4086 Staff WC	-	136	-	31
Q4014 Contact Lenses Fitting	-	88	-	114
Q4020 Consult	60	-	-	216
Q4016 Consult	55	-	-	265
Q4018 Consult	60	-	-	237
Q4028 Lobby	-	148	-	27
Q4060 Lift Lobby	-	78	-	49
Q4004 Store	120	-	-	11
Q4050 C/E MDT	-	71	-	255

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Q4048 C/E	-	84	-	158
Q4046 C/E	-	84	-	163
Q4042 C/E	-	78	-	201
Q4044 C/E	-	81	-	173
Q4052 Consult	57	-	-	235
Q4054 Lobby	-	174	-	21
Q4S-04 Staircase	-	90	-	87
Q4008 Eye Drops	87	-	-	43
Q4010 Circulation	-	109	-	108
Q4024 Circulation	-	83	-	76
Q4V-02 Void	-	160	-	32
Q4002 Consult	58	-	-	295
Q4S-06 Staircase	-	84	-	96
Q4030 Cleaner	102	-	-	36
Q4058 Circulation	-	99	-	62
Q4006 Disposal Hold	93	-	-	23
Q4026 Staff WC	-	174	-	32
Q4S-02 Staircase	-	97	-	72
Q3032 Cleaner	105	-	-	36
Q5016 C/E	-	69	-	157
Q5018 C/E	-	73	-	141
Q5S-06 Staircase	-	72	-	145
Q5004 Disposal Hold	119	-	-	13
Q5S-08 Plant Access Stair	83	-	-	37
Q5R-02 Slec Riser	-	174	-	12
Q5008 Scope Store	120	-	-	11
Q5010 Circulation	-	73	-	126
Q5013 Sub-Wait	-	65	15	438
Q5L-04 Passeger Lift 2	-	81	-	83
Q5024 Staff WC	-	94	-	41
Q5020 Microscope Suction	-	88	-	87
Q5002 Endoscope C/E	-	69	-	217
Q5052 Cleaner	85	-	-	16
Q4L-06 Passenger/Goods Lift 3	-	80	-	59
Q4R-10 Mech Riser	-	174	-	14
Q4086 Staff WC	-	122	-	31
Q4060 Lift Lobby	-	75	-	49
Q5045 W/C	-	149	-	30
Q5047 Store	120	-	-	6
Q5049 Store	120	-	-	6
Q5L-02 Passenger Lift 1	-	93	-	58
Q5006 Lobby	-	97	-	36
Q4022 Lobby	-	109	-	66

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General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Q5062 Circulation	-	104	-	29
Q4068 Circulation	-	77	-	155
Q3MR-08 Elec Riser	-	162	-	20
Q3ML-06 Passenger/Goods Lift 3	-	89	-	59
Q3MR-10 Mech Riser	-	174	-	14
Q3M004 Staff WC	-	150	-	31
Q3012 Open Plan Office	43	-	-	572
Q3M002 Lift Lobby	-	82	-	49
Q3M008 Quiet Space/Video Conference	59	-	-	141
Q3066 Quiet Space/Video Conference	61	-	-	141
Q3068 Circulation	-	84	-	94
Q2090 Circulation	-	89	-	207
Q2054 Circulation	-	79	-	158
Q3056 Circulation	-	87	-	271
Q4056 Circulation	-	82	-	278
Q5050 Circulation	-	75	-	228
Q3024 Staff WC	-	174	-	46
Q5S-04 Staircase	-	68	-	83
Q5048 Consult	47	-	-	277
Q5046 Consult	47	-	-	279
Q5044 C/E	-	68	-	166
Q5042 Iso C/E	-	69	-	157
Q5040 C/E	-	66	-	175
Q5038 C/E	-	66	-	175
Q5036 C/E	-	67	-	177
Q4R-08 Elec Riser	-	97	-	20
Q5062 Circulation	-	69	-	155
Q4070 Open Plan Office	42	-	-	572
Q3M010 Circulation	-	85	-	94
Q5066 C/E-MDT/Group	49	-	-	171
Q5064 Consult	43	-	-	221
Q5066 C/E-MDT/Group	45	-	-	179
Q5022 Staff Lounge/Meeting	48	-	-	740
ROOM	-	81	-	190
Q4034 Touchdown	-	73	15	830
Q4040 Lift Lobby	-	82	-	114
Q3034 Sub Wait	-	74	15	827
Q3042 Lift Lobby	-	83	-	114
Q5026 Sub Wait	-	67	15	629
Q5034 Lift Lobby	-	70	-	114
Lobby	-	85	-	96

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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?
Q1R-08 Elec Riser	N/A	N/A
Q1L-06 Passenger/Goods Lift 3	N/A	N/A
Q1R-10 Mech Riser	N/A	N/A
Q1064 CRA Cochlear Implant Booth	N/A	N/A
Q1076 Control	N/A	N/A
Q1068 VRA Audio Booth	N/A	N/A
Q1066 Sound Treated	N/A	N/A
Q1070 Control	N/A	N/A
Q1044 Audio Booth	N/A	N/A
Q1048 Audio Booth	N/A	N/A
Q1046 Sound Treated	N/A	N/A
Q1060 Vestibular Lab	N/A	N/A
Q1056 Caloric Test	N/A	N/A
Q1R-04 Vent/Comms Riser	N/A	N/A
Q1L-02 Passenger Lift-1	N/A	N/A
Q1L-04 Passenger Lift 2	N/A	N/A
Q1R-02 Elec Riser	NO (-100%)	NO
Q1002 Consult-Iso	N/A	N/A
Q1006 Counsel/Therapy	N/A	N/A
Q1016 Consult	N/A	N/A
Q1018 Office (6)	N/A	N/A
Q1020 Consult	N/A	N/A
Q1074 VRA Audio Booth	N/A	N/A
Q1072 VRA Audio Booth	N/A	N/A
Q1052 ABR Booth (RF)	N/A	N/A
Q1054 Cochlear Implant Booth	N/A	N/A
Q1012 Hearing Aid Fitting (Sound Treated)	N/A	N/A
Q1014 Consult	N/A	N/A
Q1R-06 Mech/Domestic Water Riser	N/A	N/A
Q1034 Sub-Wait	NO (-99.9%)	NO
Q1036 Touchdown	N/A	N/A
Q2R-08 Elec Riser	N/A	N/A
Q2L-06 Passenger/Goods Lift 3	N/A	N/A
Q2R-10 Mech Riser	N/A	N/A
Q2R-04 Vent/Comms Riser	N/A	N/A
Q2L-02 Passenger Lift-1	N/A	N/A
Q2L-04 Passenger Lift 2	N/A	N/A
Q2R-02 Elec Riser	N/A	N/A
Q2R-06 Mech/Domestic Water Riser	N/A	N/A
Q2014 Weigh & Measure Pre-Assess	NO (-72.7%)	NO
Q2016 Main Wait	NO (-43.6%)	NO
Q2004 Weigh & Measure	NO (-74.9%)	NO
Q2070 Glasses Repair	N/A	N/A
Q2062 Imaging	NO (-73.4%)	NO

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Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Q2044 APOA-Consult	NO (-56.8%)	NO
Q2046 APOA Int	NO (-29.5%)	NO
Q2048 Dispensing Opticians	NO (-28.7%)	NO
Q2064 Genetic Counsel	NO (-39.9%)	NO
Q2002 Main Wait	NO (-59%)	NO
Q2V-02 Void	NO (-99.9%)	NO
Q2066 Interview	NO (-44.8%)	NO
Q3R-08 Elec Riser	N/A	N/A
Q3L-06 Passenger/Goods Lift 3	N/A	N/A
Q3R-10 Mech Riser	N/A	N/A
Q3L-02 Passenger Lift-1	N/A	N/A
Q3L-04 Passenger Lift 2	N/A	N/A
Q3R-02 Elec Riser	N/A	N/A
Q3014 IT Server	N/A	N/A
Q3004 Consult	NO (-68.3%)	NO
Q3002 Consult	NO (-29.5%)	NO
Q3020 Consult	NO (-57.8%)	NO
Q3016 Consult	NO (-34%)	NO
Q3018 Consult	NO (-21.6%)	NO
Q3056 C/E	NO (-25.9%)	NO
Q3054 C/E	NO (-6.8%)	NO
Q3052 C/E	NO (-10.5%)	NO
Q3051 C/E	NO (-15.9%)	NO
Q3048 C/E	YES (+10%)	NO
Q3046 C/E	NO (-18.2%)	NO
Q3044 C/E	NO (-33.3%)	NO
Q3070 Seminar/Meeting Room	NO (-83.8%)	NO
Q3V-02 Void	NO (-100%)	NO
Q4R-08 Elec Riser	N/A	N/A
Q4L-06 Passenger/Goods Lift 3	N/A	N/A
Q4R-10 Mech Riser	N/A	N/A
Q4L-02 Passenger Lift-1	N/A	N/A
Q4L-04 Passenger Lift 2	N/A	N/A
Q4R-02 Elec Riser	N/A	N/A
Q4014 Contact Lenses Fitting	N/A	N/A
Q4020 Consult	NO (-33%)	NO
Q4016 Consult	NO (-47.5%)	NO
Q4018 Consult	NO (-1.7%)	NO
Q4050 C/E MDT	NO (-32.2%)	NO
Q4048 C/E	NO (-41.6%)	NO
Q4046 C/E	NO (-4.8%)	NO
Q4042 C/E	NO (-47.4%)	NO
Q4044 C/E	NO (-35.6%)	NO
Q4052 Consult	NO (-31.6%)	NO
Q4V-02 Void	NO (-99.9%)	NO
Q4002 Consult	NO (-35%)	NO
Q5016 C/E	NO (-63.7%)	NO
Q5018 C/E	NO (-32.4%)	NO
Q5S-06 Staircase	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Q5R-02 Slec Riser	N/A	N/A
Q5013 Sub-Wait	N/A	N/A
Q5L-04 Passeger Lift 2	N/A	N/A
Q5020 Microscope Suction	NO (-41.5%)	NO
Q5002 Endoscope C/E	NO (-68.9%)	NO
Q4L-06 Passenger/Goods Lift 3	N/A	N/A
Q4R-10 Mech Riser	N/A	N/A
Q5L-02 Passenger Lift 1	N/A	N/A
Q3MR-08 Elec Riser	N/A	N/A
Q3ML-06 Passenger/Goods Lift 3	N/A	N/A
Q3MR-10 Mech Riser	N/A	N/A
Q3012 Open Plan Office	NO (-87.4%)	NO
Q3M008 Quiet Space/Video Conference	NO (-46.2%)	NO
Q3066 Quiet Space/Video Conference	NO (-31.6%)	NO
Q5048 Consult	NO (-83%)	NO
Q5046 Consult	NO (-83.1%)	NO
Q5044 C/E	NO (-83.1%)	NO
Q5042 Iso C/E	NO (-82.7%)	NO
Q5040 C/E	NO (-83.2%)	NO
Q5038 C/E	NO (-82.2%)	NO
Q5036 C/E	NO (-92.3%)	NO
Q4R-08 Elec Riser	N/A	N/A
Q4070 Open Plan Office	NO (-81.5%)	NO
Q5066 C/E-MDT/Group	NO (-93.5%)	NO
Q5064 Consult	NO (-90.9%)	NO
Q5066 C/E-MDT/Group	NO (-57.9%)	NO
Q5022 Staff Lounge/Meeting	NO (-61.4%)	NO
ROOM	N/A	N/A
Q4034 Touchdown	NO (-34.7%)	NO
Q3034 Sub Wait	NO (-38.9%)	NO
Q5026 Sub Wait	NO (-83.8%)	NO
Lobby	N/A	N/A

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?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

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Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	3500.8	3500.8
External area [m²]	4911.1	4911.1
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	10	3
Average conductance [W/K]	4231.43	2398.14
Average U-value [W/m²K]	0.86	0.49
Alpha value* [%]	10.26	10

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

Building Use

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	155.69	88.83
Cooling	0	0
Auxiliary	4.77	2.7
Lighting	51.99	29.69
Hot water	23.33	23.33
Equipment*	97.33	97.33
TOTAL**	**235.78**	**144.55**

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

Energy Production by Technology [kWh/m²]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	375.07	275.7
Primary energy* [kWh/m²]	388.31	233.77
Total emissions [kg/m²]	67.4	40.6

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

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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	405.5	0	168.3	0	5.2	0.67	0	0.75	0
	Notional	298.1	0	96	0	2.9	0.86	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

Key Features

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

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.75	RM000001:Surf[2]
Floor	0.2	0.49	RM000001:Surf[0]
Roof	0.15	0.4	RM000001:Surf[1]
Windows, roof windows, and rooflights	1.5	2.1	Q5000000:Surf[0]
Personnel doors	1.5	2.2	RM00004D:Surf[12]
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

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

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

Air Permeability	Typical value	This building
$m^3/(h.m^2)$ at 50 Pa	5	10

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After Refurbishment with No PV

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

L0217-Italian Hospital — As built

Date: Thu Mar 22 12:21:52 2018

Administrative information

Building Details

Address: 40-41 Queen Square, London, WC1

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.8

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.8

BRUKL compliance check version: v5.3.a.0

Owner Details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	32.8
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	32.8
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	32.2
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	$U_{i\text{-Limit}}$	$U_{i\text{-Calc}}$	$U_{i\text{-Calc}}$	Surface where the maximum value occurs*
Wall**	0.35	0.75	0.75	RM000001:Surf[2]
Floor	0.25	0.49	0.49	RM000001:Surf[0]
Roof	0.25	0.18	0.18	RM000001:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.62	2.1	Q5000000:Surf[0]
Personnel doors	2.2	2.2	2.2	RM00004D:Surf[12]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

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

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

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

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Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	>0.95

1- New Gas Boiler with Natural Ventilation

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	-	0.2	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					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- New Gas Boiler with Mechanical Ventilation

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.95	-	0.2	0	0.68
Standard value	0.91*	N/A	N/A	N/A	0.45
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- Chilled Beams

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	2.9	0	1.6	0.68
Standard value	0.91*	2.55	N/A	1.6^	0.45
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.

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

4- Warm Air System

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	2.9	0	1.6	0.68
Standard value	0.91*	2.55	N/A	1.6^	0.45
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

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

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

5- Hub Room

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.81	2.5	0	0	0.68
Standard value	0.91*	3.2	N/A	N/A	0.45
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

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

6- Fan Coil Unit

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	2.9	0	1.6	0.68
Standard value	0.91*	2.55	N/A	1.6^	0.45
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

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

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

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

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
Q1092 Shower	-	-	0.5	-	-	-	-	-	-	-	N/A
Q1003 Acc WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q1024 Tea Point	-	-	0.5	-	-	-	-	-	-	-	N/A
Q1028 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q1084 Male Staff Change	-	-	0.5	-	-	-	-	-	-	-	N/A
Q1086 Acc WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q2026 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q2086 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q1024 Tea Point	-	-	0.5	-	-	-	-	-	-	-	N/A
Q2071 Glasses Repair Store	-	-	0.5	-	-	-	-	-	-	-	N/A
Q3030 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q3052 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q3005 Disposal Hold	-	-	0.5	-	-	-	-	-	-	-	N/A
Q4086 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q4006 Disposal Hold	-	-	0.5	-	-	-	-	-	-	-	N/A
Q4026 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q4086 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q3M004 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q3024 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Changing Places	-	-	0.5	-	-	-	-	-	-	-	N/A
Q2012 Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
Q2R-04 Vent/Comms Riser	-	-	0.5	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
Q2038 Acc WC/Baby Ch	-	-	0.5	-	-	-	-	-	-	-	N/A
Acc WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Infant Feed	-	-	0.5	-	-	-	-	-	-	-	N/A
Q2032 Changing Places	-	-	0.5	-	-	-	-	-	-	-	N/A
Q2060 WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q3038 Acc WC/Baby Ch	-	-	0.5	-	-	-	-	-	-	-	N/A
Q3034 Acc EC/Baby Ch-1	-	-	0.5	-	-	-	-	-	-	-	N/A
Acc WC/Changing	-	-	0.5	-	-	-	-	-	-	-	N/A
WC	-	-	0.5	-	-	-	-	-	-	-	N/A
WC	-	-	0.5	-	-	-	-	-	-	-	N/A
WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q1088 Female Stagg Change	-	-	0.5	-	-	-	-	-	-	-	N/A
Store	-	-	0.5	-	-	-	-	-	-	-	N/A
Q2094 Central Disposal	-	-	0.5	-	-	-	-	-	-	-	N/A
Acc Wc	-	-	0.5	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Q1112 Plant	45	-	-	286
Q1047 Store (SLT)	76	-	-	43
Q1049 Store (Audio)	71	-	-	49
Q1092 Shower	-	174	-	16
Q1082 Lobby	-	127	-	35
Q1S-04 Staircase	-	78	-	133
Q1064 CRA Cochlear Implant Booth	48	-	-	181
Q1076 Control	76	-	-	43
Q1068 VRA Audio Booth	52	-	-	121
Q1066 Sound Treated	54	-	-	101
Q1078 Lobby	-	85	-	98
Q1070 Control	66	-	-	56
Q1080 Circulation	-	98	-	119
Q1096 LV Switchroom	50	-	-	153
Q1094 Existing Substation	49	-	-	163
Q1003 Acc WC	-	96	-	60
Q1024 Tea Point	-	84	-	84
Q1044 Audio Booth	49	-	-	146
Q1048 Audio Booth	51	-	-	130
Q1046 Sound Treated	54	-	-	102
Q1028 Staff WC	-	131	-	32
Q1062 Circulation	-	87	-	390
Q1050 Equip Store	120	-	-	43

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Q1060 Vestibular Lab	57	-	-	89
Q1056 Caloric Test	53	-	-	152
Q1058 Equip St (Cochlear Implant)	98	-	-	31
Q1030 Lobby	-	109	-	43
Q1002 Consult-Iso	48	-	-	188
Q1010 Circulation	-	88	-	163
Q1022 Lobby	-	85	-	101
Q1016 Consult	50	-	-	137
Q1018 Office (6)	50	-	-	192
Q1020 Consult	51	-	-	135
Q1110 Plant	47	-	-	231
Q1108 Plant	53	-	-	146
Q1106 Plant	50	-	-	159
Q1102 Plant Vault	73	-	-	45
Q1104 Plant Vault	72	-	-	46
Q1103 Plant Vault	78	-	-	40
Q1101 Plant	120	-	-	12
Q1100 Plant	43	-	-	782
Q1084 Male Staff Change	-	88	-	73
Q1090 Circulation	-	86	-	120
Q1086 Acc WC	-	103	-	47
Q1074 VRA Audio Booth	52	-	-	123
Q1072 VRA Audio Booth	50	-	-	143
Q1052 ABR Booth (RF)	54	-	-	103
Q1054 Cochlear Implant Booth	53	-	-	108
Q1S-02 Staircase	-	98	-	90
Q1026 Circulation	-	68	-	150
Q1012 Hearing Aid Fitting (Sound Treated)	-	104	-	50
Q1014 Consult	49	-	-	175
Q2026 Staff WC	-	155	-	32
Q2016 Main Wait	-	67	15	268
Q2018 Lobby	-	78	-	117
Q2017 Lobby	-	110	-	75
Q2020 Lobby	-	101	-	70
Q2004 Weigh & Measure	58	-	-	108
Q2086 Staff WC	-	174	-	24
Q2070 Glasses Repair	60	-	-	106
Q2072 Disp Hold	120	-	-	22
Q2080 EDT Lab	51	-	-	172
Q2074 Eye Movement	-	74	-	173
Q2076 EDT Lab	51	-	-	174
Q2078 EDT Lab	51	-	-	174
Q2S-04 Staircase	-	85	-	135

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Q2062 Imaging	45	-	-	389
Q2044 APOA-Consult	52	-	-	152
Q2046 APOA Int	75	-	-	64
Q2048 Dispensing Opticians	50	-	-	187
Q2028 Lobby	-	109	-	58
Q2051 Store	105	-	-	31
Q2056 Lobby	-	92	-	82
Q2064 Genetic Counsel	69	-	-	73
Q2002 Main Wait	-	64	15	276
Q1024 Tea Point	-	147	-	36
Q2S-02 Staircase	-	111	-	96
Q2024 Circulation	-	86	-	117
Q2050 Servery	-	72	-	75
Q2071 Glasses Repair Store	95	-	-	47
Q2066 Interview	64	-	-	116
Q3030 Staff WC	-	174	-	32
Q3052 Staff WC	-	159	-	24
Q3S-02 Staircase	-	130	-	96
Q3026 Circulation	-	95	-	117
Q3010 Eye Drops	73	-	-	63
Q3005 Disposal Hold	68	-	-	34
Q3022 Lobby	-	93	-	55
Q3014 IT Server	62	-	-	117
Q3004 Consult	57	-	-	151
Q3002 Consult	53	-	-	195
Q3020 Consult	61	-	-	132
Q3016 Consult	56	-	-	161
Q3018 Consult	61	-	-	144
Q3012 Circulation	-	91	-	207
Q3056 C/E	56	-	-	172
Q3054 C/E	62	-	-	167
Q3052 C/E	59	-	-	161
Q3051 C/E	59	-	-	160
Q3048 C/E	61	-	-	164
Q3046 C/E	57	-	-	182
Q3044 C/E	55	-	-	207
Q3028 Lobby	-	153	-	41
Q3S-04 Staircase	-	96	-	144
Q3067 Circulation	-	149	-	39
Q3070 Seminar/Meeting Room	43	-	-	348
Q3060 Lift Lobby	-	85	-	76
Q4086 Staff WC	-	136	-	24
Q4014 Contact Lenses Fitting	61	-	-	117

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Q4020 Consult	60	-	-	132
Q4016 Consult	55	-	-	161
Q4018 Consult	60	-	-	144
Q4028 Lobby	-	148	-	41
Q4004 Store	120	-	-	15
Q4S-04 Staircase	-	90	-	134
Q4008 Eye Drops	87	-	-	62
Q4010 Circulation	-	109	-	166
Q4024 Circulation	-	83	-	117
Q4002 Consult	58	-	-	180
Q4S-06 Staircase	-	84	-	148
Q4058 Circulation	-	99	-	95
Q4006 Disposal Hold	93	-	-	33
Q4026 Staff WC	-	174	-	24
Q4S-02 Staircase	-	97	-	111
Q5016 C/E	48	-	-	161
Q5S-06 Staircase	-	72	-	148
Q5052 Cleaner	85	-	-	22
Q4086 Staff WC	-	122	-	24
Q4060 Lift Lobby	-	75	-	76
Q5045 W/C	-	149	-	23
Q5062 Circulation	-	93	-	45
Q3M004 Staff WC	-	150	-	24
Q3012 Open Plan Office	43	-	-	348
Q3M002 Lift Lobby	-	82	-	76
Q3M008 Quiet Space/Video Conference	59	-	-	86
Q3066 Quiet Space/Video Conference	61	-	-	86
Q3068 Circulation	-	84	-	145
Q2054 Circulation	-	73	-	243
Q3056 Circulation	-	87	-	418
Q3024 Staff WC	-	174	-	36
Q5S-04 Staircase	-	68	-	128
Q4070 Open Plan Office	42	-	-	348
Q3M010 Circulation	-	85	-	145
Q5064 Consult	43	-	-	135
Q1034 Sub-Wait	46	-	-	278
Cupboard	120	-	-	25
Q1034 Sub-Wait	-	88	15	111
Q1040 Lift Lobby	-	80	-	145
Q1038 Acc WC	-	91	-	70
Q1006 Counsel/Therapy	67	-	-	64
Q1004 Disposal Hold	81	-	-	38
Changing Places	-	80	-	127

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Q2012 Circulation	-	66	-	287
Q2014 Assessment - Children	59	-	-	102
Q2R-04 Vent/Comms Riser	-	107	-	63
Q2038 Acc WC/Baby Ch	-	174	-	26
Acc WC	-	118	-	51
Q2042 Lift Lobby	-	93	-	129
Q2034 Circulation	-	108	-	62
Infant Feed	-	115	-	55
Q2032 Changing Places	-	94	-	110
Q2060 WC	-	122	-	50
Q3038 Acc WC/Baby Ch	-	174	-	31
Q3034 Sub Wait	-	92	15	231
Cupboard	120	-	-	27
Q3034 Acc EC/Baby Ch-1	-	118	-	70
Q3034 Sub Wait	-	118	15	107
Q3042 Lift Lobby	-	100	-	162
Sub Wait	-	90	15	231
Acc WC/Changing	-	115	-	70
Q4034 Touchdown	-	174	15	27
Q4034 Circulation	-	114	-	108
Q4040 Lift Lobby	-	98	-	162
Q4022 Lobby	-	109	-	101
Q4042 C/E	55	-	-	191
Q4044 C/E	57	-	-	163
Q4046 C/E	59	-	-	155
Q4048 C/E	59	-	-	150
Q4050 C/E MDT	62	-	-	139
Q4050 C/E Segregation	59	-	-	182
Q4054 Lobby	-	174	-	23
WC	-	130	-	63
Q4056 Circulation	-	115	-	71
Q4056 Circulation	-	76	-	439
Q4068 Circulation	-	81	-	86
Q4068 Circulation	-	83	-	121
Q4060 Lift Lobby	-	73	-	108
Q5036 C/E	46	-	-	168
Q5038 C/E	46	-	-	167
Q5042 Iso C/E	48	-	-	153
Q5048 Consult	47	-	-	171
Q5050 Circulation	-	70	-	429
Q5040 C/E	47	-	-	156
Cupboard	120	-	-	10
Q5044 C/E	48	-	-	154

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Cupboard	120	-	-	6
Cupboard	120	-	-	10
Q5046 Consult	47	-	-	156
Q5062 Circulation	-	64	-	86
Q5062 Circulation	-	75	-	153
WC	-	174	-	17
WC	-	159	-	21
Q5026 Sub Wait	-	77	15	162
Q5018 C/E	48	-	-	165
Q5002 Endoscope C/E	50	-	-	180
Q5020 Microscope Suction	51	-	-	132
Q5026 Sub Wait	-	81	-	101
Cupboard	120	-	-	19
Staff WC	-	114	-	38
Q1088 Female Stagg Change	-	88	-	87
Store	120	-	-	9
Q2094 Central Disposal	55	-	-	148
Q2082 Circulation	-	84	-	335
Q2084 Lift Lobby	-	81	-	150
FM/Security Office	64	-	-	127
Q2090 Circulation	-	89	-	173
Q5022 Staff Lounge/Meeting	48	-	-	454
Acc Wc	-	106	-	44
Q5006 Lobby	-	91	-	67
Q5004 Disposal Hold	120	-	-	14
Q5010 Circulation	-	69	15	320
Q5066 C/E-MDT/Group	120	-	-	13
Q5066 C/E-MDT/Group	43	-	-	201

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?
Q1064 CRA Cochlear Implant Booth	N/A	N/A
Q1076 Control	N/A	N/A
Q1068 VRA Audio Booth	N/A	N/A
Q1066 Sound Treated	N/A	N/A
Q1070 Control	N/A	N/A
Q1044 Audio Booth	N/A	N/A
Q1048 Audio Booth	N/A	N/A
Q1046 Sound Treated	N/A	N/A
Q1060 Vestibular Lab	N/A	N/A
Q1056 Caloric Test	N/A	N/A
Q1002 Consult-Iso	N/A	N/A
Q1016 Consult	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Q1018 Office (6)	N/A	N/A
Q1020 Consult	N/A	N/A
Q1074 VRA Audio Booth	N/A	N/A
Q1072 VRA Audio Booth	N/A	N/A
Q1052 ABR Booth (RF)	N/A	N/A
Q1054 Cochlear Implant Booth	N/A	N/A
Q1012 Hearing Aid Fitting (Sound Treated)	N/A	N/A
Q1014 Consult	N/A	N/A
Q2016 Main Wait	NO (-72.4%)	NO
Q2004 Weigh & Measure	NO (-89%)	NO
Q2070 Glasses Repair	N/A	N/A
Q2080 EDT Lab	N/A	N/A
Q2074 Eye Movement	N/A	N/A
Q2076 EDT Lab	N/A	N/A
Q2078 EDT Lab	N/A	N/A
Q2062 Imaging	NO (-74%)	NO
Q2044 APOA-Consult	NO (-81%)	NO
Q2046 APOA Int	NO (-69%)	NO
Q2048 Dispensing Opticians	NO (-68.5%)	NO
Q2064 Genetic Counsel	NO (-73.6%)	NO
Q2002 Main Wait	NO (-81.6%)	NO
Q2066 Interview	NO (-75.8%)	NO
Q3010 Eye Drops	N/A	N/A
Q3014 IT Server	N/A	N/A
Q3004 Consult	NO (-86.1%)	NO
Q3002 Consult	NO (-68.1%)	NO
Q3020 Consult	NO (-81.4%)	NO
Q3016 Consult	NO (-70.8%)	NO
Q3018 Consult	NO (-65.3%)	NO
Q3056 C/E	NO (-67.5%)	NO
Q3054 C/E	NO (-58.9%)	NO
Q3052 C/E	NO (-60.7%)	NO
Q3051 C/E	NO (-63.1%)	NO
Q3048 C/E	NO (-51.5%)	NO
Q3046 C/E	NO (-64.1%)	NO
Q3044 C/E	NO (-70.6%)	NO
Q3070 Seminar/Meeting Room	NO (-95.8%)	NO
Q4014 Contact Lenses Fitting	N/A	N/A
Q4020 Consult	NO (-70.4%)	NO
Q4016 Consult	NO (-76.9%)	NO
Q4018 Consult	NO (-56.6%)	NO
Q4008 Eye Drops	N/A	N/A
Q4002 Consult	NO (-70.8%)	NO
Q5016 C/E	NO (-84%)	NO
Q3012 Open Plan Office	NO (-95.9%)	NO
Q3M008 Quiet Space/Video Conference	NO (-76%)	NO
Q3066 Quiet Space/Video Conference	NO (-71.1%)	NO
Q4070 Open Plan Office	NO (-91.7%)	NO
Q5064 Consult	NO (-90.9%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Q1034 Sub-Wait	N/A	N/A
Q1034 Sub-Wait	N/A	N/A
Q1006 Counsel/Therapy	N/A	N/A
Q2012 Circulation	NO (-95.4%)	NO
Q2014 Assessment - Children	N/A	N/A
Infant Feed	NO (-99.8%)	NO
Q3034 Sub Wait	NO (-99.4%)	NO
Q3034 Sub Wait	NO (-61.2%)	NO
Sub Wait	NO (-99.3%)	NO
Q4034 Touchdown	N/A	N/A
Q4042 C/E	NO (-76.9%)	NO
Q4044 C/E	NO (-71.8%)	NO
Q4046 C/E	NO (-58.1%)	NO
Q4048 C/E	NO (-74.4%)	NO
Q4050 C/E MDT	NO (-74.1%)	NO
Q4050 C/E Segregation	NO (-68.5%)	NO
Q5036 C/E	NO (-92.4%)	NO
Q5038 C/E	NO (-83.2%)	NO
Q5042 Iso C/E	NO (-82.8%)	NO
Q5048 Consult	NO (-83%)	NO
Q5040 C/E	NO (-83.2%)	NO
Q5044 C/E	NO (-83.1%)	NO
Q5046 Consult	NO (-83.2%)	NO
Q5026 Sub Wait	N/A	N/A
Q5018 C/E	NO (-70.1%)	NO
Q5002 Endoscope C/E	NO (-85.2%)	NO
Q5020 Microscope Suction	NO (-79.8%)	NO
FM/Security Office	NO (-81.3%)	NO
Q5022 Staff Lounge/Meeting	NO (-83.1%)	NO
Q5010 Circulation	N/A	N/A
Q5066 C/E-MDT/Group	N/A	N/A
Q5066 C/E-MDT/Group	NO (-87.8%)	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?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	3439.5	3439.5
External area [m²]	4856.7	4856.7
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	10	3
Average conductance [W/K]	3030.61	2290.84
Average U-value [W/m²K]	0.62	0.47
Alpha value* [%]	10.42	10

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

Building Use

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	23.26	9.51
Cooling	5.42	10.19
Auxiliary	12.65	15.75
Lighting	34.27	33.41
Hot water	3.13	3.3
Equipment*	100.13	100.13
TOTAL**	**78.73**	**72.16**

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

Energy Production by Technology [kWh/m²]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	115.51	135.82
Primary energy* [kWh/m²]	188.86	193.28
Total emissions [kg/m²]	32.2	32.8

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	167.7	0	52	0	12.8	0.9	0	0.95	0
	Notional	0	0	0	0	0	0	0	---	---
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	314.2	0	96.9	0	5.8	0.9	0	0.96	0
	Notional	85.2	0	27.5	0	11.9	0.86	0	---	---
[ST] Active chilled beams, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	52.6	88.2	17.3	10.4	19.7	0.84	2.36	0.96	2.9
	Notional	155.7	0	50.2	0	3.4	0.86	0	---	---
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	29	330.9	1.9	19	0	4.2	4.83	0.81	6.8
	Notional	13.1	231.7	4.2	22.6	28.8	0.86	2.84	---	---
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	87.6	293.4	29.7	37.7	29.4	0.82	2.16	0.96	2.9
	Notional	2.3	511.8	0.8	37.5	0	0.86	3.79	---	---
[ST] Terminal reheat (constant volume), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	93.8	61.8	49.6	21.8	71.2	0.53	0.79	0.96	2.9
	Notional	25.8	361.4	8.3	26.5	29.3	0.86	3.79	---	---
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	16.7	90	5.4	6.6	52.2	0.86	3.79	---	---

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	0.75	RM000001:Surf[2]
Floor	0.2	0.49	RM000001:Surf[0]
Roof	0.15	0.18	RM000001:Surf[1]
Windows, roof windows, and rooflights	1.5	1.6	Q1000003:Surf[0]
Personnel doors	1.5	2.2	RM00004D:Surf[12]
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

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

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

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

After Refurbishment With PV

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

L0217-Italian Hospital — As built

Date: Thu Mar 22 11:39:08 2018

Administrative information

Building Details

Address: 40-41 Queen Square, London, WC1

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.8

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.8

BRUKL compliance check version: v5.3.a.0

Owner Details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	32.8
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	32.8
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	31.1
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	0.75	0.75	RM000001:Surf[2]
Floor	0.25	0.49	0.49	RM000001:Surf[0]
Roof	0.25	0.18	0.18	RM000001:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.62	2.1	Q5000000:Surf[0]
Personnel doors	2.2	2.2	2.2	RM00004D:Surf[12]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

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

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

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

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Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	>0.95

1- New Gas Boiler with Natural Ventilation

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	-	0.2	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					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- New Gas Boiler with Mechanical Ventilation

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.95	-	0.2	0	0.68
Standard value	0.91*	N/A	N/A	N/A	0.45
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- Chilled Beams

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	2.9	0	1.6	0.68
Standard value	0.91*	2.55	N/A	1.6^	0.45
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.

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

4- Warm Air System

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	2.9	0	1.6	0.68
Standard value	0.91*	2.55	N/A	1.6^	0.45
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

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

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

5- Hub Room

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.81	2.5	0	0	0.68
Standard value	0.91*	3.2	N/A	N/A	0.45
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

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

6- Fan Coil Unit

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	2.9	0	1.6	0.68
Standard value	0.91*	2.55	N/A	1.6^	0.45
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

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

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

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

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
Q1092 Shower	-	-	0.5	-	-	-	-	-	-	-	N/A
Q1003 Acc WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q1024 Tea Point	-	-	0.5	-	-	-	-	-	-	-	N/A
Q1028 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q1084 Male Staff Change	-	-	0.5	-	-	-	-	-	-	-	N/A
Q1086 Acc WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q2026 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q2086 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q1024 Tea Point	-	-	0.5	-	-	-	-	-	-	-	N/A
Q2071 Glasses Repair Store	-	-	0.5	-	-	-	-	-	-	-	N/A
Q3030 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q3052 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q3005 Disposal Hold	-	-	0.5	-	-	-	-	-	-	-	N/A
Q4086 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q4006 Disposal Hold	-	-	0.5	-	-	-	-	-	-	-	N/A
Q4026 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q4086 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q3M004 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q3024 Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Changing Places	-	-	0.5	-	-	-	-	-	-	-	N/A
Q2012 Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
Q2R-04 Vent/Comms Riser	-	-	0.5	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
Q2038 Acc WC/Baby Ch	-	-	0.5	-	-	-	-	-	-	-	N/A
Acc WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Infant Feed	-	-	0.5	-	-	-	-	-	-	-	N/A
Q2032 Changing Places	-	-	0.5	-	-	-	-	-	-	-	N/A
Q2060 WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q3038 Acc WC/Baby Ch	-	-	0.5	-	-	-	-	-	-	-	N/A
Q3034 Acc EC/Baby Ch-1	-	-	0.5	-	-	-	-	-	-	-	N/A
Acc WC/Changing	-	-	0.5	-	-	-	-	-	-	-	N/A
WC	-	-	0.5	-	-	-	-	-	-	-	N/A
WC	-	-	0.5	-	-	-	-	-	-	-	N/A
WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Staff WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Q1088 Female Stagg Change	-	-	0.5	-	-	-	-	-	-	-	N/A
Store	-	-	0.5	-	-	-	-	-	-	-	N/A
Q2094 Central Disposal	-	-	0.5	-	-	-	-	-	-	-	N/A
Acc Wc	-	-	0.5	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Q1112 Plant	45	-	-	286
Q1047 Store (SLT)	76	-	-	43
Q1049 Store (Audio)	71	-	-	49
Q1092 Shower	-	174	-	16
Q1082 Lobby	-	127	-	35
Q1S-04 Staircase	-	78	-	133
Q1064 CRA Cochlear Implant Booth	48	-	-	181
Q1076 Control	76	-	-	43
Q1068 VRA Audio Booth	52	-	-	121
Q1066 Sound Treated	54	-	-	101
Q1078 Lobby	-	85	-	98
Q1070 Control	66	-	-	56
Q1080 Circulation	-	98	-	119
Q1096 LV Switchroom	50	-	-	153
Q1094 Existing Substation	49	-	-	163
Q1003 Acc WC	-	96	-	60
Q1024 Tea Point	-	84	-	84
Q1044 Audio Booth	49	-	-	146
Q1048 Audio Booth	51	-	-	130
Q1046 Sound Treated	54	-	-	102
Q1028 Staff WC	-	131	-	32
Q1062 Circulation	-	87	-	390
Q1050 Equip Store	120	-	-	43

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Q1060 Vestibular Lab	57	-	-	89
Q1056 Caloric Test	53	-	-	152
Q1058 Equip St (Cochlear Implant)	98	-	-	31
Q1030 Lobby	-	109	-	43
Q1002 Consult-Iso	48	-	-	188
Q1010 Circulation	-	88	-	163
Q1022 Lobby	-	85	-	101
Q1016 Consult	50	-	-	137
Q1018 Office (6)	50	-	-	192
Q1020 Consult	51	-	-	135
Q1110 Plant	47	-	-	231
Q1108 Plant	53	-	-	146
Q1106 Plant	50	-	-	159
Q1102 Plant Vault	73	-	-	45
Q1104 Plant Vault	72	-	-	46
Q1103 Plant Vault	78	-	-	40
Q1101 Plant	120	-	-	12
Q1100 Plant	43	-	-	782
Q1084 Male Staff Change	-	88	-	73
Q1090 Circulation	-	86	-	120
Q1086 Acc WC	-	103	-	47
Q1074 VRA Audio Booth	52	-	-	123
Q1072 VRA Audio Booth	50	-	-	143
Q1052 ABR Booth (RF)	54	-	-	103
Q1054 Cochlear Implant Booth	53	-	-	108
Q1S-02 Staircase	-	98	-	90
Q1026 Circulation	-	68	-	150
Q1012 Hearing Aid Fitting (Sound Treated)	-	104	-	50
Q1014 Consult	49	-	-	175
Q2026 Staff WC	-	155	-	32
Q2016 Main Wait	-	67	15	268
Q2018 Lobby	-	78	-	117
Q2017 Lobby	-	110	-	75
Q2020 Lobby	-	101	-	70
Q2004 Weigh & Measure	58	-	-	108
Q2086 Staff WC	-	174	-	24
Q2070 Glasses Repair	60	-	-	106
Q2072 Disp Hold	120	-	-	22
Q2080 EDT Lab	51	-	-	172
Q2074 Eye Movement	-	74	-	173
Q2076 EDT Lab	51	-	-	174
Q2078 EDT Lab	51	-	-	174
Q2S-04 Staircase	-	85	-	135

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Q2062 Imaging	45	-	-	389
Q2044 APOA-Consult	52	-	-	152
Q2046 APOA Int	75	-	-	64
Q2048 Dispensing Opticians	50	-	-	187
Q2028 Lobby	-	109	-	58
Q2051 Store	105	-	-	31
Q2056 Lobby	-	92	-	82
Q2064 Genetic Counsel	69	-	-	73
Q2002 Main Wait	-	64	15	276
Q1024 Tea Point	-	147	-	36
Q2S-02 Staircase	-	111	-	96
Q2024 Circulation	-	86	-	117
Q2050 Servery	-	72	-	75
Q2071 Glasses Repair Store	95	-	-	47
Q2066 Interview	64	-	-	116
Q3030 Staff WC	-	174	-	32
Q3052 Staff WC	-	159	-	24
Q3S-02 Staircase	-	130	-	96
Q3026 Circulation	-	95	-	117
Q3010 Eye Drops	73	-	-	63
Q3005 Disposal Hold	68	-	-	34
Q3022 Lobby	-	93	-	55
Q3014 IT Server	62	-	-	117
Q3004 Consult	57	-	-	151
Q3002 Consult	53	-	-	195
Q3020 Consult	61	-	-	132
Q3016 Consult	56	-	-	161
Q3018 Consult	61	-	-	144
Q3012 Circulation	-	91	-	207
Q3056 C/E	56	-	-	172
Q3054 C/E	62	-	-	167
Q3052 C/E	59	-	-	161
Q3051 C/E	59	-	-	160
Q3048 C/E	61	-	-	164
Q3046 C/E	57	-	-	182
Q3044 C/E	55	-	-	207
Q3028 Lobby	-	153	-	41
Q3S-04 Staircase	-	96	-	144
Q3067 Circulation	-	149	-	39
Q3070 Seminar/Meeting Room	43	-	-	348
Q3060 Lift Lobby	-	85	-	76
Q4086 Staff WC	-	136	-	24
Q4014 Contact Lenses Fitting	61	-	-	117

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Q4020 Consult	60	-	-	132
Q4016 Consult	55	-	-	161
Q4018 Consult	60	-	-	144
Q4028 Lobby	-	148	-	41
Q4004 Store	120	-	-	15
Q4S-04 Staircase	-	90	-	134
Q4008 Eye Drops	87	-	-	62
Q4010 Circulation	-	109	-	166
Q4024 Circulation	-	83	-	117
Q4002 Consult	58	-	-	180
Q4S-06 Staircase	-	84	-	148
Q4058 Circulation	-	99	-	95
Q4006 Disposal Hold	93	-	-	33
Q4026 Staff WC	-	174	-	24
Q4S-02 Staircase	-	97	-	111
Q5016 C/E	48	-	-	161
Q5S-06 Staircase	-	72	-	148
Q5052 Cleaner	85	-	-	22
Q4086 Staff WC	-	122	-	24
Q4060 Lift Lobby	-	75	-	76
Q5045 W/C	-	149	-	23
Q5062 Circulation	-	93	-	45
Q3M004 Staff WC	-	150	-	24
Q3012 Open Plan Office	43	-	-	348
Q3M002 Lift Lobby	-	82	-	76
Q3M008 Quiet Space/Video Conference	59	-	-	86
Q3066 Quiet Space/Video Conference	61	-	-	86
Q3068 Circulation	-	84	-	145
Q2054 Circulation	-	73	-	243
Q3056 Circulation	-	87	-	418
Q3024 Staff WC	-	174	-	36
Q5S-04 Staircase	-	68	-	128
Q4070 Open Plan Office	42	-	-	348
Q3M010 Circulation	-	85	-	145
Q5064 Consult	43	-	-	135
Q1034 Sub-Wait	46	-	-	278
Cupboard	120	-	-	25
Q1034 Sub-Wait	-	88	15	111
Q1040 Lift Lobby	-	80	-	145
Q1038 Acc WC	-	91	-	70
Q1006 Counsel/Therapy	67	-	-	64
Q1004 Disposal Hold	81	-	-	38
Changing Places	-	80	-	127

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Q2012 Circulation	-	66	-	287
Q2014 Assessment - Children	59	-	-	102
Q2R-04 Vent/Comms Riser	-	107	-	63
Q2038 Acc WC/Baby Ch	-	174	-	26
Acc WC	-	118	-	51
Q2042 Lift Lobby	-	93	-	129
Q2034 Circulation	-	108	-	62
Infant Feed	-	115	-	55
Q2032 Changing Places	-	94	-	110
Q2060 WC	-	122	-	50
Q3038 Acc WC/Baby Ch	-	174	-	31
Q3034 Sub Wait	-	92	15	231
Cupboard	120	-	-	27
Q3034 Acc EC/Baby Ch-1	-	118	-	70
Q3034 Sub Wait	-	118	15	107
Q3042 Lift Lobby	-	100	-	162
Sub Wait	-	90	15	231
Acc WC/Changing	-	115	-	70
Q4034 Touchdown	-	174	15	27
Q4034 Circulation	-	114	-	108
Q4040 Lift Lobby	-	98	-	162
Q4022 Lobby	-	109	-	101
Q4042 C/E	55	-	-	191
Q4044 C/E	57	-	-	163
Q4046 C/E	59	-	-	155
Q4048 C/E	59	-	-	150
Q4050 C/E MDT	62	-	-	139
Q4050 C/E Segregation	59	-	-	182
Q4054 Lobby	-	174	-	23
WC	-	130	-	63
Q4056 Circulation	-	115	-	71
Q4056 Circulation	-	76	-	439
Q4068 Circulation	-	81	-	86
Q4068 Circulation	-	83	-	121
Q4060 Lift Lobby	-	73	-	108
Q5036 C/E	46	-	-	168
Q5038 C/E	46	-	-	167
Q5042 Iso C/E	48	-	-	153
Q5048 Consult	47	-	-	171
Q5050 Circulation	-	70	-	429
Q5040 C/E	47	-	-	156
Cupboard	120	-	-	10
Q5044 C/E	48	-	-	154

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Cupboard	120	-	-	6
Cupboard	120	-	-	10
Q5046 Consult	47	-	-	156
Q5062 Circulation	-	64	-	86
Q5062 Circulation	-	75	-	153
WC	-	174	-	17
WC	-	159	-	21
Q5026 Sub Wait	-	77	15	162
Q5018 C/E	48	-	-	165
Q5002 Endoscope C/E	50	-	-	180
Q5020 Microscope Suction	51	-	-	132
Q5026 Sub Wait	-	81	-	101
Cupboard	120	-	-	19
Staff WC	-	114	-	38
Q1088 Female Stagg Change	-	88	-	87
Store	120	-	-	9
Q2094 Central Disposal	55	-	-	148
Q2082 Circulation	-	84	-	335
Q2084 Lift Lobby	-	81	-	150
FM/Security Office	64	-	-	127
Q2090 Circulation	-	89	-	173
Q5022 Staff Lounge/Meeting	48	-	-	454
Acc Wc	-	106	-	44
Q5006 Lobby	-	91	-	67
Q5004 Disposal Hold	120	-	-	14
Q5010 Circulation	-	69	15	320
Q5066 C/E-MDT/Group	120	-	-	13
Q5066 C/E-MDT/Group	43	-	-	201

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?
Q1064 CRA Cochlear Implant Booth	N/A	N/A
Q1076 Control	N/A	N/A
Q1068 VRA Audio Booth	N/A	N/A
Q1066 Sound Treated	N/A	N/A
Q1070 Control	N/A	N/A
Q1044 Audio Booth	N/A	N/A
Q1048 Audio Booth	N/A	N/A
Q1046 Sound Treated	N/A	N/A
Q1060 Vestibular Lab	N/A	N/A
Q1056 Caloric Test	N/A	N/A
Q1002 Consult-Iso	N/A	N/A
Q1016 Consult	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Q1018 Office (6)	N/A	N/A
Q1020 Consult	N/A	N/A
Q1074 VRA Audio Booth	N/A	N/A
Q1072 VRA Audio Booth	N/A	N/A
Q1052 ABR Booth (RF)	N/A	N/A
Q1054 Cochlear Implant Booth	N/A	N/A
Q1012 Hearing Aid Fitting (Sound Treated)	N/A	N/A
Q1014 Consult	N/A	N/A
Q2016 Main Wait	NO (-72.4%)	NO
Q2004 Weigh & Measure	NO (-89%)	NO
Q2070 Glasses Repair	N/A	N/A
Q2080 EDT Lab	N/A	N/A
Q2074 Eye Movement	N/A	N/A
Q2076 EDT Lab	N/A	N/A
Q2078 EDT Lab	N/A	N/A
Q2062 Imaging	NO (-74%)	NO
Q2044 APOA-Consult	NO (-81%)	NO
Q2046 APOA Int	NO (-69%)	NO
Q2048 Dispensing Opticians	NO (-68.5%)	NO
Q2064 Genetic Counsel	NO (-73.6%)	NO
Q2002 Main Wait	NO (-81.6%)	NO
Q2066 Interview	NO (-75.8%)	NO
Q3010 Eye Drops	N/A	N/A
Q3014 IT Server	N/A	N/A
Q3004 Consult	NO (-86.1%)	NO
Q3002 Consult	NO (-68.1%)	NO
Q3020 Consult	NO (-81.4%)	NO
Q3016 Consult	NO (-70.8%)	NO
Q3018 Consult	NO (-65.3%)	NO
Q3056 C/E	NO (-67.5%)	NO
Q3054 C/E	NO (-58.9%)	NO
Q3052 C/E	NO (-60.7%)	NO
Q3051 C/E	NO (-63.1%)	NO
Q3048 C/E	NO (-51.5%)	NO
Q3046 C/E	NO (-64.1%)	NO
Q3044 C/E	NO (-70.6%)	NO
Q3070 Seminar/Meeting Room	NO (-95.8%)	NO
Q4014 Contact Lenses Fitting	N/A	N/A
Q4020 Consult	NO (-70.4%)	NO
Q4016 Consult	NO (-76.9%)	NO
Q4018 Consult	NO (-56.6%)	NO
Q4008 Eye Drops	N/A	N/A
Q4002 Consult	NO (-70.8%)	NO
Q5016 C/E	NO (-84%)	NO
Q3012 Open Plan Office	NO (-95.9%)	NO
Q3M008 Quiet Space/Video Conference	NO (-76%)	NO
Q3066 Quiet Space/Video Conference	NO (-71.1%)	NO
Q4070 Open Plan Office	NO (-91.7%)	NO
Q5064 Consult	NO (-90.9%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Q1034 Sub-Wait	N/A	N/A
Q1034 Sub-Wait	N/A	N/A
Q1006 Counsel/Therapy	N/A	N/A
Q2012 Circulation	NO (-95.4%)	NO
Q2014 Assessment - Children	N/A	N/A
Infant Feed	NO (-99.8%)	NO
Q3034 Sub Wait	NO (-99.4%)	NO
Q3034 Sub Wait	NO (-61.2%)	NO
Sub Wait	NO (-99.3%)	NO
Q4034 Touchdown	N/A	N/A
Q4042 C/E	NO (-76.9%)	NO
Q4044 C/E	NO (-71.8%)	NO
Q4046 C/E	NO (-58.1%)	NO
Q4048 C/E	NO (-74.4%)	NO
Q4050 C/E MDT	NO (-74.1%)	NO
Q4050 C/E Segregation	NO (-68.5%)	NO
Q5036 C/E	NO (-92.4%)	NO
Q5038 C/E	NO (-83.2%)	NO
Q5042 Iso C/E	NO (-82.8%)	NO
Q5048 Consult	NO (-83%)	NO
Q5040 C/E	NO (-83.2%)	NO
Q5044 C/E	NO (-83.1%)	NO
Q5046 Consult	NO (-83.2%)	NO
Q5026 Sub Wait	N/A	N/A
Q5018 C/E	NO (-70.1%)	NO
Q5002 Endoscope C/E	NO (-85.2%)	NO
Q5020 Microscope Suction	NO (-79.8%)	NO
FM/Security Office	NO (-81.3%)	NO
Q5022 Staff Lounge/Meeting	NO (-83.1%)	NO
Q5010 Circulation	N/A	N/A
Q5066 C/E-MDT/Group	N/A	N/A
Q5066 C/E-MDT/Group	NO (-87.8%)	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?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	3439.5	3439.5
External area [m²]	4856.7	4856.7
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	10	3
Average conductance [W/K]	3030.61	2290.84
Average U-value [W/m²K]	0.62	0.47
Alpha value* [%]	10.42	10

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

Building Use

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	23.26	9.51
Cooling	5.42	10.19
Auxiliary	12.65	15.75
Lighting	34.27	33.41
Hot water	3.13	3.3
Equipment*	100.13	100.13
TOTAL**	**78.73**	**72.16**

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	2.09	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]	115.51	135.82
Primary energy* [kWh/m²]	188.86	193.28
Total emissions [kg/m²]	31.1	32.8

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	167.7	0	52	0	12.8	0.9	0	0.95	0
	Notional	0	0	0	0	0	0	0	—	—
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	314.2	0	96.9	0	5.8	0.9	0	0.96	0
	Notional	85.2	0	27.5	0	11.9	0.86	0	—	—
[ST] Active chilled beams, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	52.6	88.2	17.3	10.4	19.7	0.84	2.36	0.96	2.9
	Notional	155.7	0	50.2	0	3.4	0.86	0	—	—
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	29	330.9	1.9	19	0	4.2	4.83	0.81	6.8
	Notional	13.1	231.7	4.2	22.6	28.8	0.86	2.84	—	—
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	87.6	293.4	29.7	37.7	29.4	0.82	2.16	0.96	2.9
	Notional	2.3	511.8	0.8	37.5	0	0.86	3.79	—	—
[ST] Terminal reheat (constant volume), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	93.8	61.8	49.6	21.8	71.2	0.53	0.79	0.96	2.9
	Notional	25.8	361.4	8.3	26.5	29.3	0.86	3.79	—	—
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	16.7	90	5.4	6.6	52.2	0.86	3.79	—	—

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	0.75	RM000001:Surf[2]
Floor	0.2	0.49	RM000001:Surf[0]
Roof	0.15	0.18	RM000001:Surf[1]
Windows, roof windows, and rooflights	1.5	1.6	Q1000003:Surf[0]
Personnel doors	1.5	2.2	RM00004D:Surf[12]
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building
$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)]			$U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]
* There might be more than one surface where the minimum U-value occurs.			

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

PV Payback Calculation

PV

Solar Irradiance	977
Area (sqm)	63
Panel Size (W)	250
Length (m)	1.64
Width (m)	0.99
One Panel (sqm)	1.62
Number of Panels	38
Array Size (kWp)	9.6
Yearly Degradation	0.85%
Shade Factor	1.00
Per Panel Cost (£)	£346
Total Panel Cost	£13,321
Maintenance	£139
Total Cost	£13,321
Supply (kWh)	9,402
CO2 Saving	4,880
FiT	4.14
Export	4.91
% Exported	50%
Payback (years)	10

Year	Supply kWh	FiT p/kWh	FiT Income £	Electricity Cost p/kWh	Electricity Saving £	Total Savings £	Payback Years
1	9,402	4.14	£620	10.39	£977	£1,458	9.14
2	9,322	4.26	£626	10.68	£996	£2,940	7.32
3	9,243	4.37	£631	10.98	£1,015	£4,447	6.31
4	9,165	4.50	£637	11.28	£1,034	£5,979	5.31
5	9,087	4.62	£643	11.60	£1,054	£7,537	4.33
6	9,009	4.75	£649	11.92	£1,074	£9,121	3.36
7	8,933	4.88	£656	12.26	£1,095	£10,732	2.40
8	8,857	5.02	£662	12.60	£1,116	£12,371	1.46
9	8,782	5.16	£669	12.95	£1,137	£14,037	0.53
10	8,707	5.30	£676	13.31	£1,159	£15,733	Achieved
11	8,633	5.45	£683	13.68	£1,181	£17,457	Achieved
12	8,560	5.60	£690	14.06	£1,204	£19,212	Achieved
13	8,487	5.76	£697	14.46	£1,227	£20,996	Achieved
14	8,415	5.92	£705	14.86	£1,250	£22,812	Achieved
15	8,343	6.09	£713	15.27	£1,274	£24,660	Achieved
16	8,272	6.26	£721	15.70	£1,299	£26,540	Achieved
17	8,202	6.43	£729	16.14	£1,324	£28,454	Achieved
18	8,132	6.61	£737	16.59	£1,349	£30,400	Achieved
19	8,063	6.79	£746	17.05	£1,375	£32,382	Achieved
20	7,995	6.98	£755	17.53	£1,401	£34,398	Achieved