

STATION HILL NORTH

READING

ENERGY STRATEGY

DECEMBER 2019

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Executive Summary.

This report has been produced by Hoare Lea LLP to outline the Energy Strategy for the Station Hill North development in Reading.

The Station Hill North development comprises of two phases; Phase 2 and Phase 3. This report covers the energy strategy for the detailed planning application for Phase 2 which includes Plot G, and the outline planning application for Phase 3 which includes Plot AB, Plot C and Plot D.

Figure 1 shows the proposed location of the site.

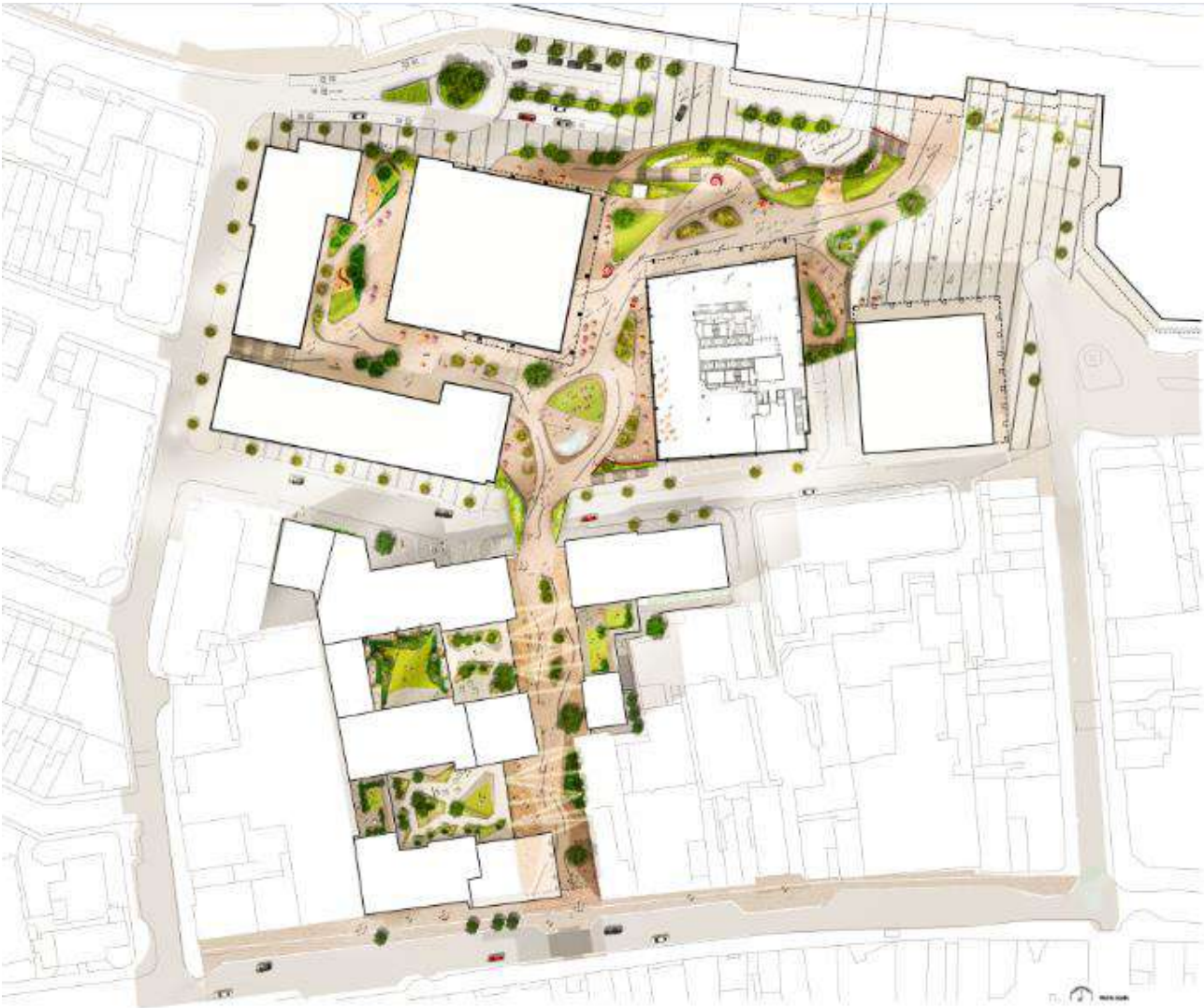


Figure 1 Masterplan site layout (Credit: LDA)

A range of passive and active energy efficiency measures will be employed on the Proposed Development.

A detailed façade study into the most appropriate passive measures has been conducted for Plot G. This study looked at a plethora of façade options with the aim of limiting the amount of solar gain in summer and achieving the required number of BREEAM ENE 01 credits.

A decentralised Air Source Heat Pump (ASHP) network would be the optimum solution for Phase 2 due to the unbalanced heating and cooling load with the option of exploring both ASHP or Ground Source Heat Pump (GSHP) for Phase 3 to plug into the decentralised network.

When Phase 3 comes forward the scheme will be designed for the peak loads across the entire site and therefore when the system isn't running at peak capacity then there would be an opportunity to export or share on a wider network in line with Reading's aspirations. This would depend on how a wider heat pump network is designed and being able to make suitable commercial agreements across sites. A provision will be provided for connecting the Phase 2 Air Source Heat Pump network with the Phase 3 Energy network in the future.

In line with the context of the report, detailed modelling has taken place for Phase 2, with target modelling for Phase 3. This detailed modelling shows that the non-domestic regulated carbon emissions for Phase 2 are approximately 12% below the Part L 2013 baseline scheme. Alongside this the Applicant is committed to targeting Zero Carbon for the domestic elements of Phase 3, with a minimum 45% onsite reduction over Part L 2013 which exceeds the minimum 35% target set in the emerging policy

Table 1 below shows how the Energy Strategy for Phase 2 and 3 of the Station Hill North Development complies with the emerging policy requirements set out at the beginning of this document.

Table 1: Policy Compliance

Policy		Notes
BREEAM Excellent	✓	For both Block G and C
Zero Carbon for domestic elements with a minimum 35% onsite reduction	✓	Minimum target set at 45%
Decentralised energy	✓	Provision for ASHP network (with potential to link to ASHP or GSHP)
Part L 2013	✓	Targets achieved using current carbon factors

SAP 10 Carbon Factors

In July 2018 the Government published updated carbon emission factors (SAP 10), demonstrating how the grid is decarbonising.

Assessing the modelling results for Phase 2 using the SAP 10 Carbon Factors gives the same carbon reduction over Part L 2013, however there are considerably lower site wide CO₂ emissions, due to the reduction in the carbon factor for electricity.

1. Introduction.

This Energy Strategy has been prepared to consider the most appropriate approach to energy for the Station Hill North development in Reading. The Station Hill North development comprises of two phases; Phase 2 and Phase 3. This report covers the energy strategy for the detailed planning application for Phase 2 which includes Plot G, and the outline planning application for Phase 3 which includes Plot AB, Plot C and Plot D.

1.1 Site Location

The Station Hill North development, hereafter referred to as the Proposed Development, is situated in the town of Reading, just to the South of Reading train station. The Proposed Development is part of wider aspirational Masterplan proposals for the site that includes Station Hill South. The hybrid planning application comprises a detailed element (Plot G and landscaped podiums), and outline element (Plots AB, C & D).

1.2 Adopted Policy Requirements

The policies, emerging policies and regulations that are required to be satisfied are summarised as follows. Full information can be found in Appendix A.

- Reading Borough Core Strategy - Policy CS1 “Sustainable Construction and Design” states that all new developments must maximise the use of energy efficiency and energy conservation measures in their design, layout and orientation to reduce overall energy demand.
- Reading Borough Local Plan - Policy H5 “Standards for New Housing” states that all major new-build residential development should be designed to achieve zero carbon homes.
- Reading Borough Draft Sustainable Design and Construction SPD - All new build residential developments of 10 or more dwellings are required to be zero carbon (or if unachievable, a minimum 35% improvement in the dwelling emission rate over the target emission rate).
- Reading Borough Local Plan - Policy CC4 “Decentralised Energy” states that any development of more than 20 dwellings shall consider the inclusion of a CHP plant, or other form of decentralised energy provision, within the site, unless it can be demonstrated that the scheme is not suitable, feasible or viable for this form of energy provision. Further to this, where there is existing decentralised energy provision, developments of over 10 dwellings will be expected to link into this energy network or demonstrate why this is not feasible.
- Reading Borough Local Plan - Policy CC2 “Sustainable Design and Construction” states that all major non-residential developments are required to meet the most up-to-date BREEAM ‘Excellent’ standards where possible.
- Reading Borough Draft Sustainable Design and Construction SPD – All new build non-residential development of 1,000 sqm or more should achieve BREEAM ‘Excellent’ as a minimum or BREEAM ‘Very Good’ for smaller developments.

1.3 Grid Decarbonisation

Grid electricity has significantly decarbonised since the last update of Part L in April 2014. The UK government announced that it will implement the closure of all coal-fired power stations by 2025. This is in line with the increase in renewable power generation.

2017 saw times where low-carbon generation, such as wind, solar and nuclear, generated more energy than coal and gas combined; showing very real progress towards a low-carbon future. In April 2018, Britain went for more than 3 days without the need for coal power and in May 2019 passed a week without the need for this fossil fuel; the first time since 1882.

It is clear that the grid in 2019 is much cleaner than in past years and so it is therefore a hindrance that our new buildings still utilise the emissions rates of 2014 that give a false position of gas being less green than electricity.

1.3.1 What is a Carbon Factor?

A carbon emission factor (carbon factor) is the average emission rate of a given greenhouse gas for a given source, relative to units of activity.

1.3.2 SAP 10 Carbon Factors

In July 2018 the Government published updated carbon emission factors (SAP 10), demonstrating how the grid is decarbonising.

The table below details the carbon factors for electricity under SAP 2012, SAP 10, Actual (last 3 months), Actual (last year) and a source of green energy.

They reflect the general decarbonisation of the grid.

Table 2: Carbon Factors for Electricity

	Emissions kg CO ₂ e per kWh				
	SAP 2012 (2014)	SAP 10 (July 2018)	Actual (last 3 months)	Actual Last Year (2018)	Green Energy (Bulb)
Electricity	0.519 ¹	0.233 ²	0.191 ³	0.225 ⁴	0 ⁵

1: SAP 2012: <https://www.bregroup.com/sap/standard-assessment-procedure-sap-2012/>
2: SAP 10 (please note this is just the carbon factors not the SAP 10 methodology itself): <https://www.bregroup.com/sap/sap10/>
3: Britain's Electricity Demand: <https://electricinsights.co.uk/#/dashboard?period=3-months&start=2019-04-09&k=nk712c>
4: Attached SSE's fuel mix for last year that confirms the national average of 0.225 for 2017-2018
5: Bulb's Fuel Mix: <https://bulb.co.uk/fuelmix/>

All future indications are that electrical energy carbon factors will continue to drop over time. In parallel with this, energy figures associated with gas generated energy have remained similar. Typically gas fired energy centres also create a negative impact on air quality through the NO_x gases generated and discharged via flue systems.

1.4 Energy Strategy Approach

The energy strategy for the detailed application of Phase 2 (Plot G) and the outline application of Phase 3 (Plot AB, Plot C and Plot D) will be assessed against the emerging policy (SAP 2012), this is compliant with RBC Policy requirements.

The proposals for the scheme will also meet compliance using the SAP 10 carbon factors.

2. Energy Efficiency Measures.

A key principle of the design of this development is to provide environments that need minimal intervention of engineering systems to create comfortable spaces. In addition to this, Reading are calling for all buildings to maximise the use of energy efficiently and to adopt energy conservation measures in the design, layout and orientation to reduce the overall energy demand. To comply with the above, this energy strategy has considered passive design and energy efficient solutions at the forefront of the design. The Proposed Development is seeking to maximise the potential of the measures by the strategy outlined in the following sections.

2.1 Passive Measures

A detailed façade study into the most appropriate passive measures has been conducted for Plot G. This study looked at a plethora of façade options with the aim of limiting the amount of solar gain in summer and achieving the required number of BREEAM ENE 01 credits.

These studies included looking at the solid to glass ratio on all façades, a canopy to the south facing terraces, external shading devices (including horizontal and vertical shading fins) and solar control glass. These measures feature within the design and will be used to limit the energy demands and CO₂ emissions for the Proposed Development. The following typical envelope performance characteristics and passive design measures are proposed for the scheme design to limit the building's energy consumption (see Table 3). A screenshot of the energy model can be seen below in Figure 3.

Similar investigations in passive design measures for Phase 3 will take place in the future once the use class has been confirmed



Figure 3 - Model Screenshot with Passive Design

Table 3: Façade Design Criteria

Parameter		Domestic	Non- Domestic
Floor U - Value (W/m²K)		0.10	0.13
Roof U - Value (W/m²K)		0.10	0.13
External Walls U - Value (W/m²K)		0.18	Lower Floors – 0.18 Office Curtain Walling – 1.15
Walls between heated spaces (W/m²K)		Fully filled cavity with sealed edges	-
Walls between stairs/lifts/risers (W/m²K)		Fully filled cavity with sealed edges	-
Walls to unheated spaces (W/m²K)		0.18	0.18
Glazing and Glazed doors	U-value (W/m²K)	1.30 & 1.40	Retail and Lower Floors – 1.60 Atrium – 1.60 Office Curtain Walling – 1.15
	G-value	0.42	Retail and Lower Floors – 0.23 Atrium – 0.45 Office Curtain Walling – 0.23
	Light transmittance	0.65	Retail and Lower Floors – 0.40 Atrium – 0.70 Office Curtain Walling – 0.40
	Frame Factor	0.23 & 0.30	0.10
Air permeability (m³/hm² @ 50Pa)		3.00	3.00

2.2 Active Measures

The energy consumption of the development could be further reduced by the incorporation of active energy efficiency measures in the design of the mechanical and electrical engineering systems. The following energy efficiency measures will be used for this development:

- Efficient mechanical ventilation systems with heat recovery for domestic and commercial units;
- Enhanced levels of pipework insulation;
- Variable speed pumping;
- Low energy lighting throughout;
- DC fan coil units for the commercial spaces; and
- Sensible zoning of systems in the commercial buildings.

2.3 Overheating and Cooling

The façade study detailed above ensured that all spaces of Plot G passed Criterion 3 of Part L2A: limiting the effects of heat gains in summer. This is due to a combination of solid spandrel panels, vertical shading fins and a low g-value.

A CIBSE TM59 assessment will be undertaken for the residential element of Phase 3 when a detailed application is submitted to confirm that measures to mitigate the effects of overheating were in place. A number of passive measures will be investigated as part of the assessment, some of those are listed below:

- High building thermal mass;
- Reduced (<35%) glazing ratio (as a proportion of the façade) and maximise openable window/door areas;
- Low glazing G-value (0.30-0.35); and
- Recessed balconies (preferred option for overheating mitigation) or balconies with opaque balustrades.

3. Heating Infrastructure.

3.1 Energy Networks and Heating Infrastructure.

There is considerable focus on trying to improve air quality and avoid generating further pollutants that contaminate the atmosphere and the ‘fresh air’ we all enjoy. With this in mind, supplying energy efficiently would be a way to reduce the amount of pollutants contaminating the atmosphere. Heating infrastructure measures are those which demonstrate how their energy systems will supply energy efficiently and reduce CO₂ emissions. The requirements of Reading Borough Council’s Local Plan, policy CC4 “Decentralised Energy” has been considered and is outlined in the sections below.

3.2 Connection to Nearby District Heating Networks

During the pre-application process, research was undertaken to investigate the possibility of connecting to a nearby district heating network (DHN). Consulting the District Heating Installation maps from The Association for Decentralised Energy (ADE) showed that there are no nearby DHN’s in close proximity and therefore there is no possibility for a connection, particularly as this site forms a major development site in the area. We understand that Reading are keen to create a decentralised energy network for Reading and this site has been identified with potential to connect into this network. A separate study has been commissioned and we await a copy to review.

3.3 Site Wide Heat Network

With the strategy to connect to a nearby DHN deemed not possible, the next strategy to consider is a site-wide heat network served by a single energy centre. There are two options for this heat network: decentralised, where each phase has one single energy centre, or localised, where each building has an energy centre.

A decentralised energy solution is less reliant on utility supplies and provides energy (heating and cooling) centrally for a cluster of buildings.

In a localised energy solution, each building is provided with standalone energy centres serving that building only.

Following the guidance provided within the Reading Local Plan stating that decentralised energy should be considered unless proven unfeasible, this energy strategy will embrace this requirement and look to provide a decentralised solution, future proofed for easy connection to a wider heat network should one materialise. Table 4 below shows the appraisal of four different options for a decentralised scheme. Further information, providing more detail can be found within the following sections.

Table 4: Decentralised Solution Appraisal

Energy Generator	Appropriate	Notes
Ground Source Heat Pumps (heating and cooling)	✓	To be further analysed
Biomass Boilers (heating only)	✗	Fuel storage requirements and poor air quality
Air Source Heat Pumps (heating and cooling)	✓	To be further analysed
Combined Heat and Power (heating only)	✓	To be further analysed

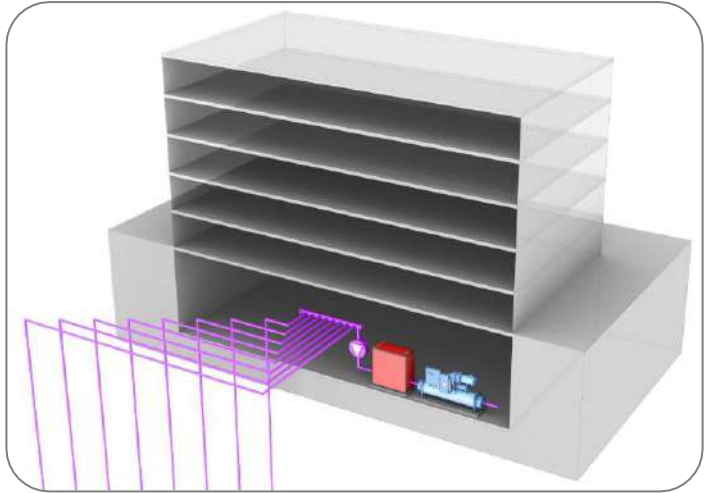
3.4 Review of Potential Decentralised Heat Sources

3.4.1 Ground Source Heat Pumps

Ground source heat pumps (GSHP) utilise either water extracted from an aquifer (open loop) or water circulated within underground pipework (closed loop) as the heat source in a refrigeration process. This enables

them to produce hot water, typically at around 45°C that can be used as means of space heating in buildings. Due to the relatively constant temperature of the ground at depth (typically 10-14°C in the UK) this produces heat more efficiently in winter than an air source heat pump, and usually with lower carbon emissions than a gas-fired boiler.

Open loop systems require the water extracted to be re-injected into the aquifer at another borehole on another part of the site. A licence from the Environment Agency (EA) is required for both abstraction and discharge although these licences cannot be obtained until a test borehole has been constructed and the appropriate EA tests undertaken.



Advantages: GSHP’s are suitable for use with a centralised heat network. Once installed, this technology will have a low visual impact as the majority of the pipework and plant will be underground. GSHP’s use electricity as a power source and therefore as the grid decarbonises this technology will have low emissions which will likely decrease over time. In addition, they have good air quality and serve both heating and cooling loads

Disadvantages: GSHP’s would require coordination with the Thames Water sewer line and structural piles – existing and new that cover the site (refer to Appendix B). Due to the spacing between boreholes (for both systems) a large area will be required to serve all of the potential heating and cooling loads for the site, with a risk that the boreholes may degrade over time. In addition, the performance would not be guaranteed until testing has been undertaken and in order to work properly without influencing ground conditions a balanced heating and cooling load is required. Therefore, given the phasing of the project where Phase 2 will be built originally (cooling load driven) GSHP will be more suitable when Phase 3 comes on line to provide a balanced load.

3.4.2 Biomass Boilers

A biomass boiler uses a natural fuel such as wood chips or wood pellets for combustion.

Advantages: Since it uses a natural resource that can be replanted it is considered as a renewable energy source subject to the distance the fuel is transported. The carbon dioxide emitted from burning biomass is balanced by that absorbed during the fuel’s production. Biomass heating therefore approaches a carbon neutral process.

Disadvantages: The primary disadvantage of a biomass boiler is that it would require a substantial amount of fuel storage for a development of this size, which would make for an inefficient use of space. Further to this, regular deliveries are required to ensure the boiler works as efficiently and continuously as possible and biomass exhaust gases would require significant treatment to avoid degrading local air quality. In addition, the nature of the fuel within the boiler would require regular cleaning which would increase the downtime of the boiler, whilst also effecting air quality through the emissions.

Due to the reasons highlighted above, biomass boilers are therefore not proposed for the development.



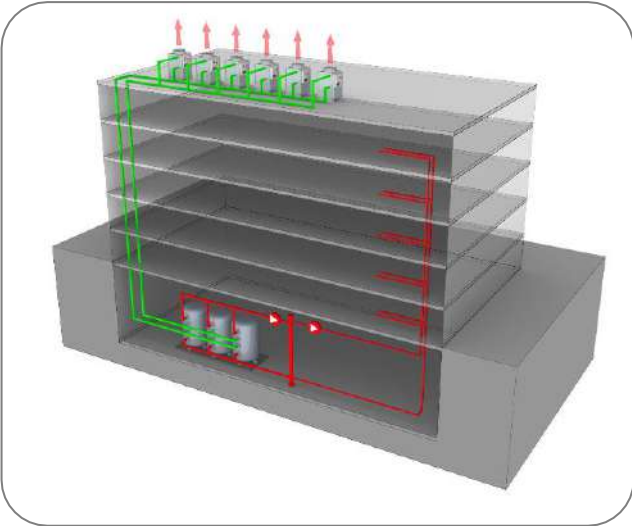
3.4.3 Air Source Heat Pumps

Air source heat pumps absorb heat from the outside air, even if the temperature is as low as -15°C. The air from the outside heats a liquid refrigerant, which is then compressed to increase the temperature. This is then condensed back into a liquid and heat is released. The heat can then be used for heating and hot water systems.

Advantages: The main benefits of ASHP's are that they can provide both heating and cooling as the heat pump can be operated in reverse, and they are suitable for centralised heat networks. They are easy to install (more so than GSHP) and require very little maintenance once installed. Similar to GSHP, they will have decreasing emissions as the grid decarbonises.

Disadvantages: The plant space required on the roof would be high. Their carbon reductions can be lower than GSHP although this depends on being able to achieve maximum utilisation of the GSHP system and a balanced load.

Taking the above into account, ASHP is considered an appropriate technology for Phase 2 of this development and will be investigated further.



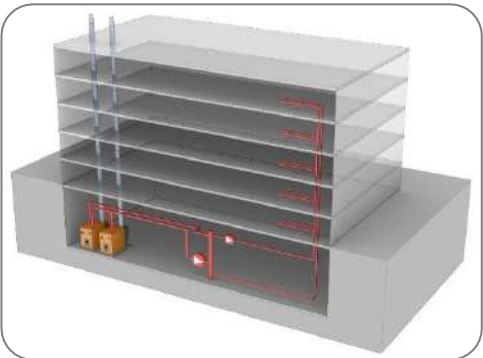
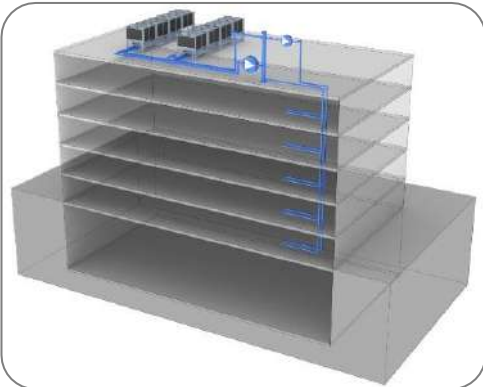
3.4.4 CHP/ Boilers (with Chillers for cooling)

This system would incorporate gas-fired boilers and a gas-fired combined heat and power (CHP) unit to generate heat. Chillers would provide the required cooling demand. This has been the technology of choice over the past decade.

Advantages: This system can be connected to a wider energy scheme like the previous options. There would also be a reduced reliance on the electricity network as the CHP would generate a small amount of power.

Disadvantages: Typically gas fired energy centres create a negative impact on air quality through the NOX gases generated and discharged via flue systems. The CHP and Boiler combination is no longer considered as a low carbon technology and using the latest carbon factors (reflecting the current grid generation) has poor carbon reductions. In addition, separate plant would be required for heating and cooling.

Taking the above into account, chillers and CHP/boilers are not considered an appropriate technology for this development.



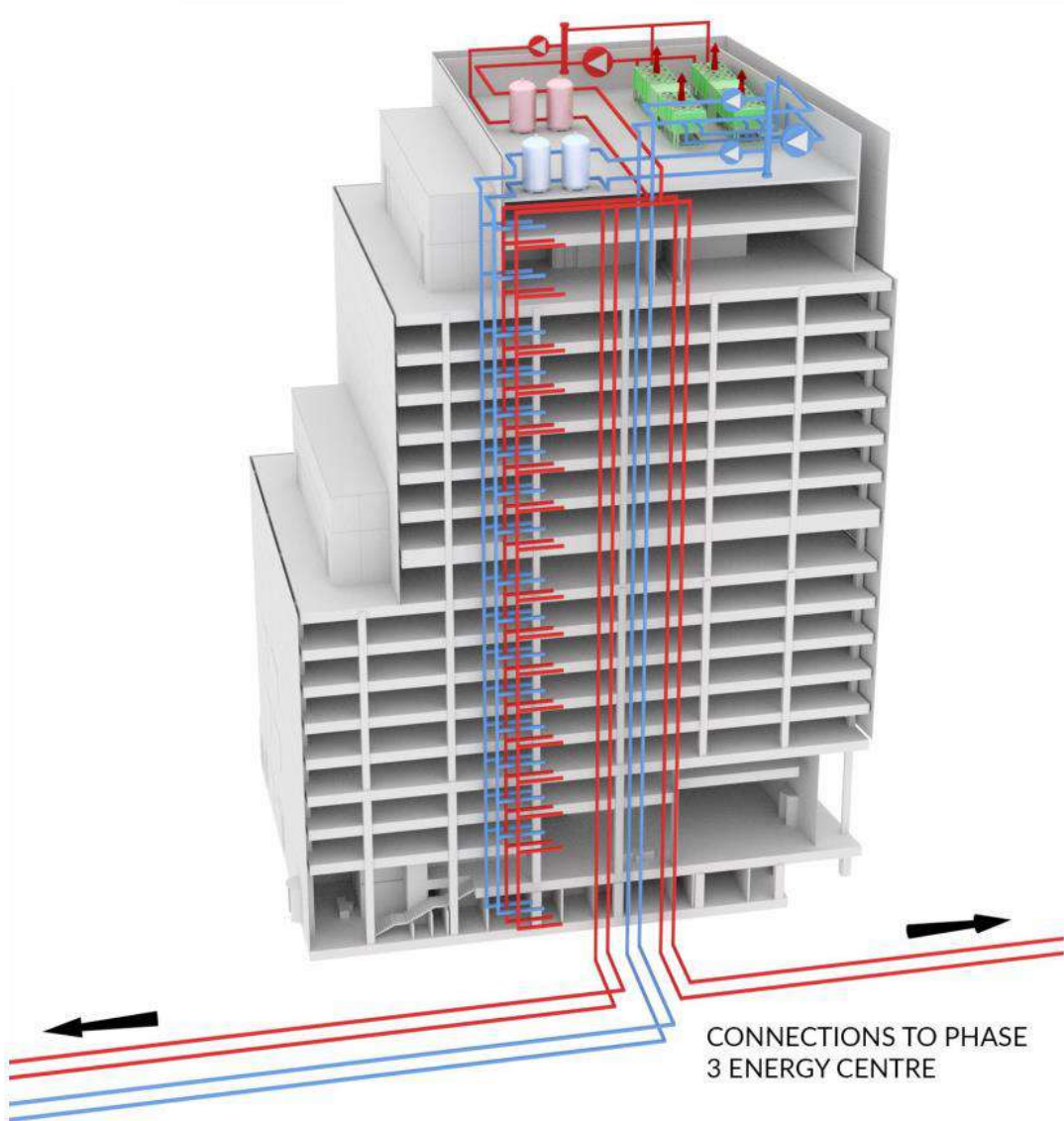
3.5 Summary of Decentralised Energy Options

The table below summarises the main advantages and disadvantages following the above appraisal.

Table 5: Advantages and Disadvantages of Decentralised Energy Options

	CHP and Chillers	ASHP	GSHP
Energy Efficiency	X	✓	✓
Phased Delivery	X	✓	X
Site Suitability	✓	✓	X
Air Quality	X	✓	✓

It can therefore be seen that a decentralised Air Source Heat Pump network would be the optimum solution for Phase 2 with the option of exploring both ASHP and GSHP further for Phase 3. It should be noted that the scheme would design for the peak loads across the site and therefore when the system isn't running at peak capacity then there may be an opportunity to export or share on a wider network.



4. Renewable Technologies.

Another key principle of the design of this development is to maximise the carbon reduction over the long-term life of the building. The most effective way to achieve this is through renewable technologies. These measures are those which serve to reduce the overall emissions of the development through the inclusion of these renewable technologies such as Solar Photovoltaic array (PV panels), Wind Turbines besides others.

4.1 Appraisal of Renewable Technologies

A number of renewable technologies have been appraised in terms of technical and physical feasibility as potential renewable systems for use on the project.



4.1.1 Wind Turbines

Wind turbines use the wind's lift forces to turn aerodynamic blades that turn a rotor thus generating electricity. There are three basic types to consider: horizontal axis (propeller type), vertical access (helical type) and building integrated (where the building design is adapted to suit the wind turbine).

Wind turbines have a significant visual impact and the roof space will be sensitive in townscape terms, which is likely to preclude wind turbines. They can create noise and vibration problems. Additionally, there is limited roof area across the site where clean air flows and good wind speeds can be realised and which are vital to delivering a useful electrical output. Even if a suitable location could be found, the output of a wind turbine and the consequential carbon dioxide emissions will be very limited when compared to the emissions of the whole development.

Due to the reasons highlighted above, wind turbines are therefore not proposed for the development.

4.1.2 Solar Photovoltaics

Solar photovoltaic (PV) cells generate electricity from the sun's energy. Solid PV panels can be either roof or façade mounted (although solar modules fitted on a south facing façade have only 75% the output of roof mounted modules).

Solar PV can be seen as an on-site zero carbon energy source as it will produce useable electrical energy without requiring any energy input. Although the output from the panels is unpredictable and weather dependent, the electrical energy produced by Solar PV panels could be used to provide additional carbon emission reductions and are compatible with the use of other energy generating technologies. Once installed

they are very low maintenance and will also have a low visual impact at street level. In addition, this development has suitable south facing roof space available.

Taking the above into account, solar PV is considered an appropriate technology for this development and will be investigated further.



4.1.3 Solar Water Heating Panels

Solar water heating systems use heat from the sun to heat domestic hot water. The system requires solar panels on the roof, ideally south facing, linked to hot water storage cylinders. For solar water panels to be effective the development should have a high hot water demand.

This development has suitable south facing roof space available and has a high hot water demand due to the residential nature of the development, which initially makes this technology suitable for this development. However, solar water panels are more suited to individual/ standalone dwellings as the hot water produced through the panels will feed directly into the

hot water storage for that particular dwelling. For a development like this where there are high-density dwellings, solar water panels would therefore not be suitable. The panels have a higher maintenance than PV and they are highly dependent on the weather/season, arguably more so than photovoltaics, leading to unpredictability with the hot water load. In addition, the heat gained from the panels cannot be sold back to the grid and so if the hot water is not used once it has been produced it will eventually be wasted.

Due to the reasons highlighted above, solar water heating panels are therefore not proposed for this development.

4.2 Renewable Technology Summary

Following the initial appraisal of Wind Turbines, Solar Photovoltaics (PV) and Solar Water Heating as potential renewable technologies for this development, it has been concluded that the only appropriate technology is PV. As such, photovoltaics will be located on roofs across both Phase 2 and Phase 3 where feasible.

5. Results.

This section will show the results of the detailed modelling which has taken place for Plot G of Phase 2, along with the targets for the outline application of Phase 3.

Appendix C includes the BRUKL document for the Phase 2 site.

5.1 Carbon Savings– Phase 2

Figure 4 below shows that the domestic regulated carbon emissions for Phase 2 are approximately 12% below the Part L 2013 compliant development.

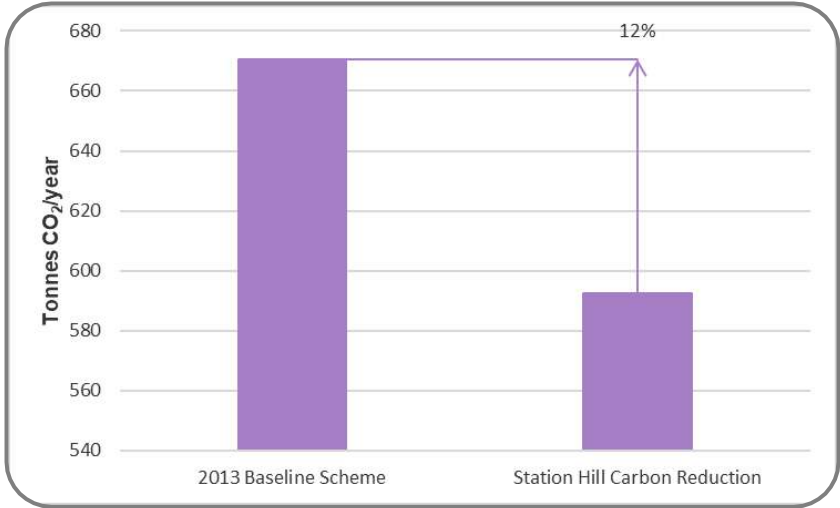


Figure 4 –Regulated Carbon Dioxide Emissions

5.2 Carbon Savings – Phase 3

We are targeting zero carbon for the domestic element of Phase 3, in line with the planning policy. In addition, we are targeting a minimum of 45% onsite improvement over Part L 2013, thus exceeding the minimum target of 35% improvement over Part L 2013 set within the emerging policy

5.3 SAP 10 Carbon Factors

Assessing the modelling results using the SAP 10 Carbon Factors gives the same carbon reduction over Part L 2013, however there are considerably lower site wide CO₂ emissions, due to the reduction in the carbon factor for electricity.

5.4 BREEAM

The Office elements of Plot G are required to achieve a minimum of 4 credits for ENE 01 under BREEAM New Construction 2018 in order to achieve BREEAM ‘Excellent’.

A minimum Energy Performance Ratio for New Constructions (EPR_{NC}) of 0.4, which is equivalent for 4 Ene 01 credits, is the mandatory requirement to achieve an ‘Excellent’ rating.

The individual BRUKL document for the Office elements of Plot G is located in Appendix D. Table 6 below shows that 4 ENE 01 credits are achieved for the Office elements of Plot G (Shell Only).

Table 6: Energy and CO₂ Emissions Summary

	Actual Building	Notional Building
Heating + cooling demand (MJ/m²)	84.9	108.81
Ene 01 Credits (Shell Only)	4	

6. Conclusion.

An energy assessment has been undertaken in line with Reading Borough Council’s Core Strategy and Local Plan.

A range of passive and active energy efficiency measures will be employed on the Proposed Development.

A detailed façade study into the most appropriate passive measures has been conducted for Plot G. This study looked at a plethora of façade options with the aim of limiting the amount of solar gain in summer and achieving the required number of BREEAM ENE 01 credits.

A decentralised Air Source Heat Pump network would be the optimum solution for Phase 2 due to the unbalanced heating and cooling load with the option of exploring both Air Source Heat Pump or Ground Source Heat Pump for Phase 3 to plug into the decentralised network.

When Phase 3 comes forward the scheme will be designed for the peak loads across the entire site and therefore when the system isn’t running at peak capacity then there would be an opportunity to export or share on a wider network in line with Reading’s aspirations. This would depend on how a wider heat pump network is designed and being able to make suitable commercial agreements across sites. A provision will be provided for connecting the Phase 2 Air Source Heat Pump network with the Phase 3 Energy network in the future, with the location of the Phase 3 Energy Centre to be agreed once the design is determined.

In line with the context of the report, detailed modelling has taken place for Phase 2, with target modelling for Phase 3. This detailed modelling shows that the non-domestic regulated carbon emissions for Phase 2 are approximately 12% below the baseline Part L 2013 compliant scheme. Alongside this the Applicant are committed to achieving a minimum 45% reduction for the domestic elements of Phase 3 which exceeds the minimum 35% target set in the emerging policy.

Assessing the modelling results in SAP 10 gives the same carbon reduction over Part L 2013, however there are considerably lower site wide CO₂ emissions, due to the reduction in the carbon factor for electricity.

Table 7 below shows how the energy strategy for Phase 2 and 3 of the Station Hill North development is complying with the policy requirements set out within the adopted RBC planning policy requirements.

Table 7: Policy Compliance

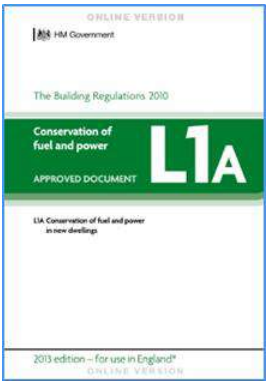
Policy		Notes
BREEAM Excellent	✓	For both Block G and C
Zero Carbon for domestic elements with a minimum 35% onsite reduction	✓	Minimum target set at 45%
Decentralised energy	✓	Provision for ASHP network (with potential to link to ASHP or GSHP)
Part L 2013	✓	Targets achieved using current carbon factors

Appendix A – Policy Requirements, Building Regulations and Targets.

The policies and regulations that are required to be satisfied are summarised as follows.

The Building Regulations

Part L Conservation of Fuel and Power deals with energy efficiency requirements in the Building Regulations. New buildings will be assessed under Approved Document Part L1A (Domestic) and Part L2A (Non-Domestic) of the Building Regulations.



Part L1A 2013 of Building Regulations – New Domestic Elements

On a national level, Part L1A of the Building Regulations sets the energy efficiency requirements in new domestic buildings.

Under Building Regulations Approved Document Part L1A, compliance is achieved by demonstrating that the Dwelling Emission Rate (DER) does not exceed the Target Emission Rate (TER) and that the Dwelling Fabric Efficiency (DFEE) does not exceed the Target Fabric Efficiency (TFEE).

In addition, Part L1A also requires that the fabric elements and the fixed building services all meet minimum energy efficiency standards (Criterion 2), and reasonable provision for limiting solar gain through the building fabric (Criterion 3).

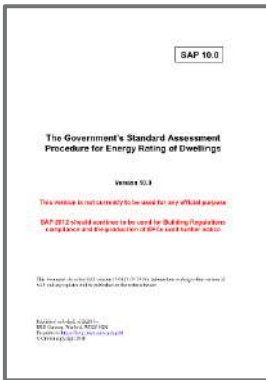


Part L2A 2013 of Building Regulations – New Non-Domestic Elements

On a national level, Part L2A of the Building Regulations sets the energy efficiency requirements in new non-domestic buildings.

Under Building Regulations Approved Document Part L2A: Conservation of Fuel and Power (2013 edition), compliance is achieved by demonstrating that the Building CO₂ Emission Rate (BER) does not exceed the Target CO₂ Emission Rate (TER).

In addition, Part L2A also requires that the fabric elements and the fixed building services all meet minimum energy efficiency standards (Criterion 2), and reasonable provision for limiting solar gain through the building fabric (Criterion 3).

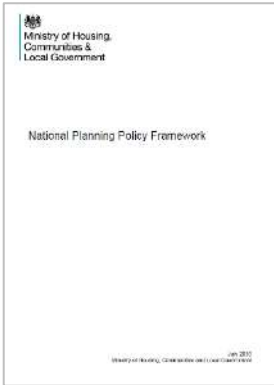


SAP 10.0

The Government's Standard Assessment Procedure for Energy Rating of Dwellings Version 10.0 was released for information in July 2018. It is not currently to be used for any official purpose. However, the GLA will be adopting this from January 2019 prior to it being introduced in the next edition of the Building Regulations Part L.

The carbon factors have been updated to reflect the current decarbonisation of the grid.

National Planning Guidance



The National Planning Policy Framework, July 2018

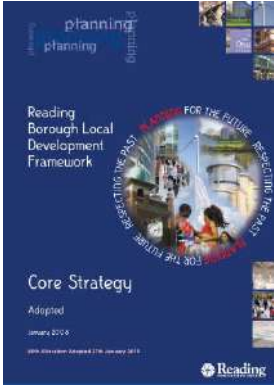
The National Planning Policy Framework (NPPF) was published in July 2018. The NPPF sets out the Government's strategy on the delivery of sustainable development through the planning system. It provides a framework within which locally-prepared plans for housing and other development can be produced.

Planning law requires that applications for planning permission be determined in accordance with the development plan, unless material considerations indicate otherwise. The NPPF must be considered in preparing the development plan, and is a material consideration in planning decisions. Planning policies and decisions must also reflect relevant international obligations and statutory requirements.

The purpose of the planning system is to contribute to the achievement of sustainable development. At a very high level, the objective of sustainable development can be summarised as meeting the needs of the present without compromising the ability of future generations to meet their own needs.

The applicable Development Plan for the Proposed Development is the Reading Borough Local Plan (2019), together with the Reading Borough Core Strategy (2008). Please refer to the following sections for further details.

Local Planning Guidance



Core Strategy, Reading Borough (2008, with alteration adopted 2015)

The Core Strategy sets out the Council's adopted planning strategy for the Borough. It sets out how planning and development will achieve the Reading 2020 vision for the town. It provides a framework for how Reading can grow in a sustainable way in the future. It also sets out how Reading will accommodate the growth expected of it in the emerging South East Plan and through the council's commitment to New Growth Point status.

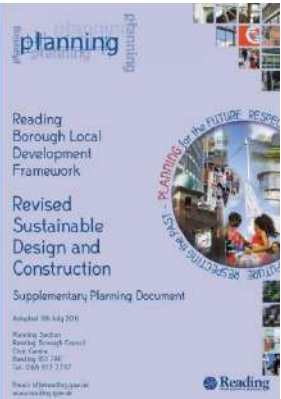
Policy CS1 "Sustainable Construction and Design" states that all new developments must maximise the use of energy efficiency and energy conservation measures in their design, layout and orientation to reduce overall energy demand.

Draft Sustainable Design and Construction Supplementary Planning Document (2019)

A new version of the Draft Sustainable Design and Construction SPD is in consultation until Sept 2019 and forms part of the response to Reading Council recently declaring a climate emergency. When complete this SPD will replace the previous document adopted on 11th July 2011, however as this is still in consultation the previous edition is highlighted below.

This document details how Reading has set out its commitment to become a zero-carbon city by 2050. This is in line with the National planning policy which reflects the Climate Change Act 2008 for at least 34% reduction in greenhouse gases by 2020 and at least 80% by 2050.

The document also shows that all new build residential developments of 10 or more dwellings are required to be zero carbon (or if unachievable, a minimum 35% improvement in the dwelling emission rate over the target emission rate). All new build non-residential development of 1000 sqm or more should achieve BREEAM Excellent as a minimum or BREEAM Very Good for smaller developments.



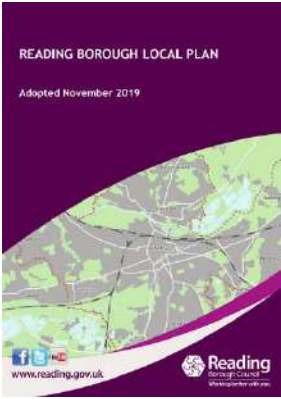
Supplementary Planning Document (SPD) – Revised Sustainable Design and Construction (2011)

This Supplementary Planning Document (SPD) aims to promote high standards of Sustainable Design and Construction, providing detail on how to comply with development plan policies set out in the Reading Borough Local Development Framework Core Strategy (2008).

It also provides practical advice on the forms of sustainable design and construction and how these policy requirements are applied at the local level through policy CS1: Sustainable Construction and Design of the adopted Core Strategy.

This document also states that due to changes to the Building Regulations, the requirement in the Core Strategy's Policy CS1 to 'off-set at least 20% of predicted carbon dioxide emissions' has now been superseded. This Energy Strategy will

therefore not refer to this requirement.



Local Plan, Reading Borough (2019)

This Local Plan identifies the amount of development that will take place, the areas and sites where development is expected to be accommodated, and where it will be restricted, and sets out policies for how planning applications will be decided.

This plan has been prepared in accordance with the National Planning Policy Framework (NPPF) which sets out the overall national approach to planning.

Policy H5 "Standards for New Housing" states that all major new-build residential development should be designed to achieve zero carbon homes.

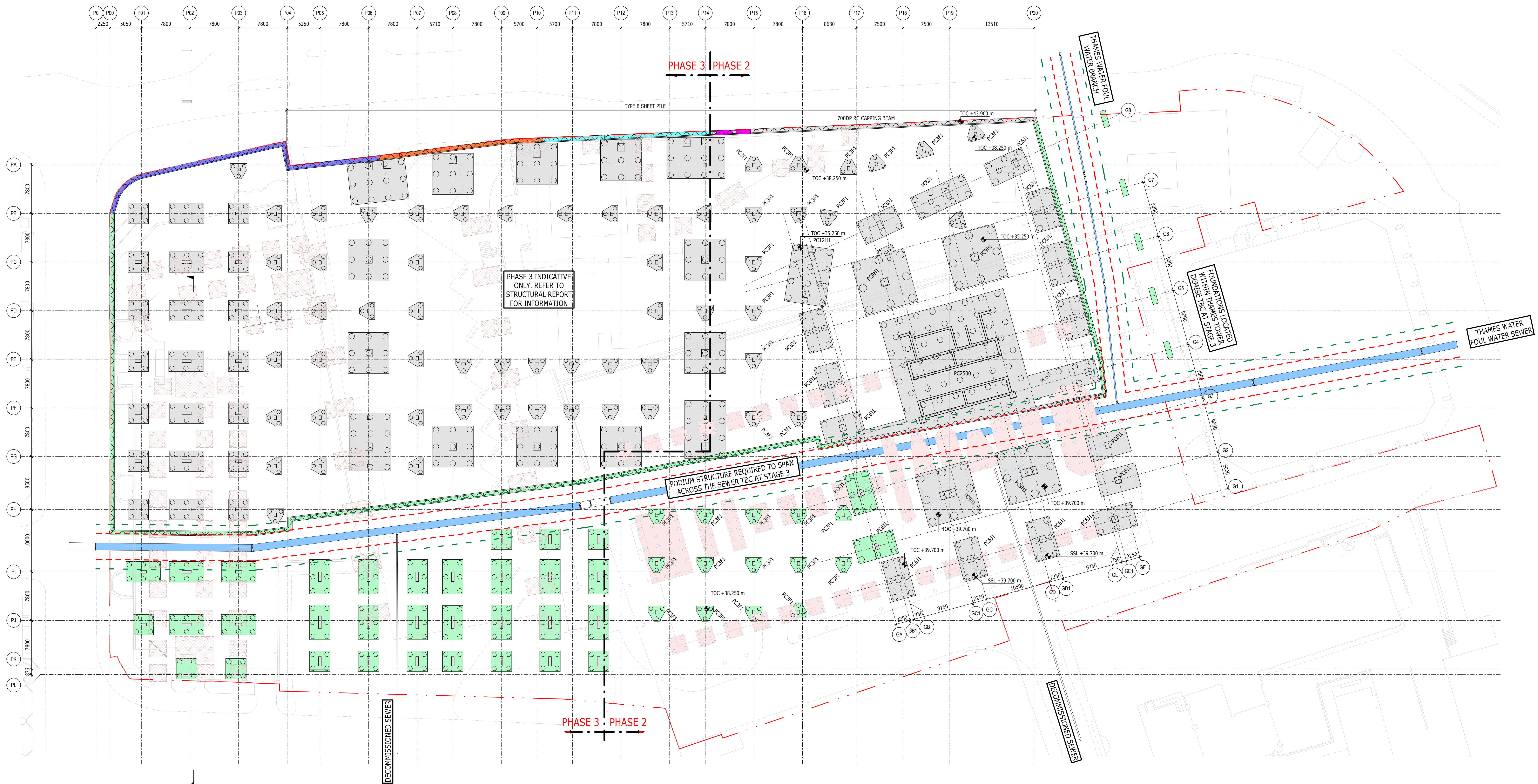
Policy CC2 "Sustainable Design and Construction" states that all major non-residential developments are required to meet the most up-to-date BREEAM 'Excellent' standards where possible. In line with this, the non-residential spaces will

be required to meet the minimum BREEAM ENE01 requirements for an Excellent rating.

Policy CC4 "Decentralised Energy" states that any development of more than 20 dwellings shall consider the inclusion of a CHP plant, or other form of decentralised energy provision, within the site, unless it can be demonstrated that the scheme is not suitable, feasible or viable for this form of energy provision.

Further to this, where there is existing decentralised energy provision, developments of over 10 dwellings will be expected to link into this energy network or demonstrate why this is not feasible.

Appendix B – Structural Piling Drawing.



DESIGN AND CONSTRUCTION OF NEW FOUNDATIONS TO
ACCOUNT FOR GROUND OBSTRUCTIONS ACROSS THE SITE

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- NOTES
1. DO NOT SCALE FROM THIS DRAWING.
 2. ALL DIMENSIONS ARE IN MILLIMETRES U.N.O.
 3. ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM U.N.O.
 4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
 5. FOR EXISTING SITE OVERLAY AND INDICATIVE LOCATIONS OF BELOW GROUND OBSTRUCTIONS REFER TO DRAWING - SHRN-RAM-PN-DR-S-000060
 6. SHEET PILES.
TYPE A - 420mm WIDE Z PROFILE SHEET PILE U.N.O.
TYPE B - 511mm (Min.) WIDE Z PROFILE SHEET PILE.
 7. FOUNDATIONS LOCATED WITHIN THAMES TOWER DEMISE TBC AT STAGE 3.
 8. DESIGN AND CONSTRUCTION OF NEW FOUNDATIONS TO ACCOUNT FOR GROUND OBSTRUCTIONS ACROSS THE SITE.
 9. PODIUM STRUCTURE REQUIRED TO SPAN ACROSS THE SEWER TBC AT STAGE 3.

RC PILECAP SCHEDULE		
REF.	DEPTH (mm)	DESCRIPTION
PC1200	1300	6 PILE 9000IA RC PILECAP
PC1201	1300	8 PILE 9000IA RC PILECAP
PC1202	1300	12 PILE 9000IA RC PILECAP
PC1203	1400	3 PILE 6000IA RC PILECAP
PC1204	1400	3 PILE 6000IA RC PILECAP
PC1205	2500	9 PILE 12000IA RC PILECAP
PC1206	2500	BLOCK G CORE PILECAP
Grand total: 60		

Rev	Description	Date	By	App
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STAGE 2

STATION HILL
READING

RAMBOLL

tel 020 7631 5291 london@ramboll.co.uk
www.ramboll.co.uk

FOUNDATION LEVEL
GENERAL ARRANGEMENT

Project No: 1620004716	Scale (B A1): 1 : 250	Date: JUNE 2019	Drawn: J.F.
Drawing No: SHRN-RAM-PN-FN-DR-S-010085	Rev: P01		

Appendix C - BRUKL for Entire Phase 2.

BRUKL Output Document



Compliance with England Building Regulations Part L 2013

Project name

Shell and Core

Station Hill Phase 2 - Building G

As designed

Date: Tue Aug 27 17:27:06 2019

Administrative information

Building Details

Address: Reading,

Owner Details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.10

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.10

BRUKL compliance check version: v5.4.b.0

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	20.8
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	20.8
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	18.1
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-limit}	U _{a-calc}	U _{i-calc}	Surface where the maximum value occurs*
Wall**	0.35	0.18	0.18	14000021:Surf[0]
Floor	0.25	0.13	0.13	01000018:Surf[56]
Roof	0.25	0.13	0.13	02000015:Surf[58]
Windows***, roof windows, and rooflights	2.2	1.16	1.6	01000018:Surf[59]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

U_{a-limit} = Limiting area-weighted average U-values [W/(m²K)]

U_{a-calc} = Calculated area-weighted average U-values [W/(m²K)]

U_{i-calc} = Calculated maximum individual element U-values [W/(m²K)]

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

** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

*** Display windows and similar glazing are excluded from the U-value check.

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

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

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	0.9 to 0.95

1- HVAC 1 - FCU

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	3.2	0	1.97	0.74
Standard value	2.5*	3.2	N/A	1.6^	0.5

Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES

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

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

"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	Zone	Standard
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1		
01 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
01 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
01 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
01 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
01 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
01 - WCs	-	-	-	-	-	-	-	0.5	-	-	N/A
02 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
02 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
03 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
02 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
03 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
03 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
03 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
02 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
02 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
03 - Circulation	-	-	-	-	-	-	-	0.3	-	-	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
02 - WCs		-	-	-	-	-	-	-	0.5	-	- N/A
03 - WCs		-	-	-	-	-	-	-	0.5	-	- N/A
03 - WCs		-	-	-	-	-	-	-	0.5	-	- N/A
01 - Co-Working Office		-	-	-	-	-	-	-	0.3	-	- N/A
02 - Co-Working Office		-	-	-	-	-	-	-	0.3	-	- N/A
01 - Co-Working Office (W)		-	-	-	-	-	-	-	0.3	-	- N/A
02 - Co-Working Office (W)		-	-	-	-	-	-	-	0.3	-	- N/A
03 - Tenant Office Space		-	-	-	-	-	-	-	0.3	-	- N/A
03 - Tenant Office Space		-	-	-	-	-	-	-	0.3	-	- N/A
03 - Tenant Office Space (W)		-	-	-	-	-	-	-	0.3	-	- N/A
08 - Tenant Office Space		-	-	-	-	-	-	-	0.3	-	- N/A
08 - WCs		-	-	-	-	-	-	-	0.5	-	- N/A
08 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
08 - Tenant Office Space (W)		-	-	-	-	-	-	-	0.3	-	- N/A
08 - Tenant Office Space		-	-	-	-	-	-	-	0.3	-	- N/A
08 - Tenant Office Space (W)		-	-	-	-	-	-	-	0.3	-	- N/A
08 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
08 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
09 - Tenant Office Space		-	-	-	-	-	-	-	0.3	-	- N/A
09 - WCs		-	-	-	-	-	-	-	0.5	-	- N/A
09 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
09 - Tenant Office Space (W)		-	-	-	-	-	-	-	0.3	-	- N/A
09 - Tenant Office Space		-	-	-	-	-	-	-	0.3	-	- N/A
09 - Tenant Office Space (W)		-	-	-	-	-	-	-	0.3	-	- N/A
09 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
09 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
15 - WCs		-	-	-	-	-	-	-	0.5	-	- N/A
15 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
15 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
15 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
15 - Tenant Office Space (W)		-	-	-	-	-	-	-	0.3	-	- N/A
15 - Tenant Office Space (W)		-	-	-	-	-	-	-	0.3	-	- N/A
04 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
04 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
04 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
04 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
04 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
04 - WCs		-	-	-	-	-	-	-	0.5	-	- N/A
04 - WCs		-	-	-	-	-	-	-	0.5	-	- N/A
04 - Tenant Office Space		-	-	-	-	-	-	-	0.3	-	- N/A
04 - Tenant Office Space		-	-	-	-	-	-	-	0.3	-	- N/A
04 - Tenant Office Space (W)		-	-	-	-	-	-	-	0.3	-	- N/A
05 - Circulation		-	-	-	-	-	-	-	0.3	-	- 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
05 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
05 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
05 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
05 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
05 - WCs		-	-	-	-	-	-	-	0.5	-	- N/A
05 - WCs		-	-	-	-	-	-	-	0.5	-	- N/A
05 - Tenant Office Space		-	-	-	-	-	-	-	0.3	-	- N/A
05 - Tenant Office Space		-	-	-	-	-	-	-	0.3	-	- N/A
05 - Tenant Office Space (W)		-	-	-	-	-	-	-	0.3	-	- N/A
06 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
06 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
06 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
06 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
06 - WCs		-	-	-	-	-	-	-	0.5	-	- N/A
06 - WCs		-	-	-	-	-	-	-	0.5	-	- N/A
06 - Tenant Office Space		-	-	-	-	-	-	-	0.3	-	- N/A
06 - Tenant Office Space		-	-	-	-	-	-	-	0.3	-	- N/A
06 - Tenant Office Space (W)		-	-	-	-	-	-	-	0.3	-	- N/A
07 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
07 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
07 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
07 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
07 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
07 - WCs		-	-	-	-	-	-	-	0.5	-	- N/A
07 - WCs		-	-	-	-	-	-	-	0.5	-	- N/A
07 - Tenant Office Space		-	-	-	-	-	-	-	0.3	-	- N/A
07 - Tenant Office Space		-	-	-	-	-	-	-	0.3	-	- N/A
07 - Tenant Office Space (W)		-	-	-	-	-	-	-	0.3	-	- N/A
14 - Tenant Office Space		-	-	-	-	-	-	-	0.3	-	- N/A
14 - WCs		-	-	-	-	-	-	-	0.5	-	- N/A
14 - Tenant Office Space (W)		-	-	-	-	-	-	-	0.3	-	- N/A
14 - Tenant Office Space (W)		-	-	-	-	-	-	-	0.3	-	- N/A
14 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
14 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
14 - Tenant Office Space		-	-	-	-	-	-	-	0.3	-	- N/A
14 - Circulation		-	-	-	-	-	-	-	0.3	-	- N/A
03 - Tenant Office Space (W)		-	-	-	-	-	-	-	0.3	-	- N/A
04 - Tenant Office Space (W)		-	-	-	-	-	-	-	0.3	-	- N/A
05 - Tenant Office Space (W)		-	-	-	-	-	-	-	0.3	-	- N/A
06 - Tenant Office Space (W)		-	-	-	-	-	-	-	0.3	-	- N/A
07 - Tenant Office Space (W)		-	-	-	-	-	-	-	0.3	-	- N/A
08 - Tenant Office Space (W)		-	-	-	-	-	-	-	0.3	-	- 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
09 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
14 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
15 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
13 - Tenant Office Space	-	-	-	-	-	-	-	-	0.3	-	N/A
13 - WCs	-	-	-	-	-	-	-	-	0.5	-	N/A
13 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
13 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
13 - Circulation	-	-	-	-	-	-	-	-	0.3	-	N/A
13 - Circulation	-	-	-	-	-	-	-	-	0.3	-	N/A
13 - Tenant Office Space	-	-	-	-	-	-	-	-	0.3	-	N/A
13 - Circulation	-	-	-	-	-	-	-	-	0.3	-	N/A
13 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
12 - Tenant Office Space	-	-	-	-	-	-	-	-	0.3	-	N/A
12 - WCs	-	-	-	-	-	-	-	-	0.5	-	N/A
12 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
12 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
12 - Circulation	-	-	-	-	-	-	-	-	0.3	-	N/A
12 - Circulation	-	-	-	-	-	-	-	-	0.3	-	N/A
12 - Tenant Office Space	-	-	-	-	-	-	-	-	0.3	-	N/A
12 - Circulation	-	-	-	-	-	-	-	-	0.3	-	N/A
12 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
11 - Tenant Office Space	-	-	-	-	-	-	-	-	0.3	-	N/A
11 - WCs	-	-	-	-	-	-	-	-	0.5	-	N/A
11 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
11 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
11 - Circulation	-	-	-	-	-	-	-	-	0.3	-	N/A
11 - Circulation	-	-	-	-	-	-	-	-	0.3	-	N/A
11 - Tenant Office Space	-	-	-	-	-	-	-	-	0.3	-	N/A
11 - Circulation	-	-	-	-	-	-	-	-	0.3	-	N/A
11 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
10 - Tenant Office Space	-	-	-	-	-	-	-	-	0.3	-	N/A
10 - WCs	-	-	-	-	-	-	-	-	0.5	-	N/A
10 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
10 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
10 - Circulation	-	-	-	-	-	-	-	-	0.3	-	N/A
10 - Circulation	-	-	-	-	-	-	-	-	0.3	-	N/A
10 - Tenant Office Space	-	-	-	-	-	-	-	-	0.3	-	N/A
10 - Circulation	-	-	-	-	-	-	-	-	0.3	-	N/A
10 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A

Shell and core configuration

Zone	Assumed shell?
01 - Circulation	NO
01 - Circulation	NO
01 - Circulation	NO

Shell and core configuration

Zone	Assumed shell?
01 - Circulation	NO
01 - Circulation	NO
01 - Stairs N	NO
01 - Stairs S	NO
01 - WCs	NO
02 - Circulation	NO
02 - Circulation	NO
03 - Circulation	NO
02 - Circulation	NO
03 - Circulation	NO
03 - Circulation	NO
03 - Circulation	NO
02 - Circulation	NO
02 - Circulation	NO
03 - Circulation	NO
02 - Stairs N	NO
03 - Stairs N	NO
02 - Stairs S	NO
03 - Stairs S	NO
02 - WCs	NO
03 - WCs	NO
03 - WCs	NO
01 - Co-Working Office	NO
02 - Co-Working Office	NO
01 - Co-Working Office (W)	NO
02 - Co-Working Office (W)	NO
03 - Tenant Office Space	NO
03 - Tenant Office Space	NO
03 - Tenant Office Space (W)	NO
08 - Stairs N	NO
08 - Stairs S	NO
08 - Tenant Office Space	NO
08 - WCs	NO
08 - Circulation	NO
08 - Tenant Office Space (W)	NO
08 - Tenant Office Space	NO
08 - Tenant Office Space (W)	NO
08 - Circulation	NO
08 - Circulation	NO
09 - Stairs N	NO
09 - Tenant Office Space	NO
09 - WCs	NO
09 - Circulation	NO
09 - Tenant Office Space (W)	NO
09 - Tenant Office Space	NO
09 - Tenant Office Space (W)	NO
09 - Circulation	NO

Shell and core configuration

Zone	Assumed shell?
09 - Circulation	NO
09 - Stairs S	NO
15 - Stairs N	NO
15 - WCs	NO
15 - Circulation	NO
15 - Circulation	NO
15 - Stairs S	NO
15 - Circulation	NO
15 - Tenant Office Space (W)	NO
15 - Tenant Office Space (W)	NO
04 - Circulation	NO
04 - Circulation	NO
04 - Circulation	NO
04 - Circulation	NO
04 - Circulation	NO
04 - Stairs N	NO
04 - Stairs S	NO
04 - WCs	NO
04 - WCs	NO
04 - Tenant Office Space	NO
04 - Tenant Office Space	NO
04 - Tenant Office Space (W)	NO
05 - Circulation	NO
05 - Circulation	NO
05 - Circulation	NO
05 - Circulation	NO
05 - Circulation	NO
05 - Stairs N	NO
05 - Stairs S	NO
05 - WCs	NO
05 - WCs	NO
05 - Tenant Office Space	NO
05 - Tenant Office Space	NO
05 - Tenant Office Space (W)	NO
06 - Circulation	NO
06 - Circulation	NO
06 - Circulation	NO
06 - Circulation	NO
06 - Stairs N	NO
06 - Stairs S	NO
06 - WCs	NO
06 - WCs	NO
06 - Tenant Office Space	NO
06 - Tenant Office Space	NO
06 - Tenant Office Space (W)	NO
07 - Circulation	NO

Shell and core configuration

Zone	Assumed shell?
07 - Circulation	NO
07 - Circulation	NO
07 - Circulation	NO
07 - Circulation	NO
07 - Stairs N	NO
07 - Stairs S	NO
07 - WCs	NO
07 - WCs	NO
07 - Tenant Office Space	NO
07 - Tenant Office Space	NO
07 - Tenant Office Space (W)	NO
14 - Stairs N	NO
14 - Tenant Office Space	NO
14 - WCs	NO
14 - Tenant Office Space (W)	NO
14 - Tenant Office Space (W)	NO
14 - Circulation	NO
14 - Circulation	NO
14 - Stairs S	NO
14 - Tenant Office Space	NO
14 - Circulation	NO
03 - Tenant Office Space (W)	NO
04 - Tenant Office Space (W)	NO
05 - Tenant Office Space (W)	NO
06 - Tenant Office Space (W)	NO
07 - Tenant Office Space (W)	NO
08 - Tenant Office Space (W)	NO
09 - Tenant Office Space (W)	NO
14 - Tenant Office Space (W)	NO
15 - Tenant Office Space (W)	NO
13 - Stairs N	NO
13 - Tenant Office Space	NO
13 - WCs	NO
13 - Tenant Office Space (W)	NO
13 - Tenant Office Space (W)	NO
13 - Circulation	NO
13 - Circulation	NO
13 - Stairs S	NO
13 - Tenant Office Space	NO
13 - Circulation	NO
13 - Tenant Office Space (W)	NO
12 - Stairs N	NO
12 - Tenant Office Space	NO
12 - WCs	NO
12 - Tenant Office Space (W)	NO
12 - Tenant Office Space (W)	NO
12 - Circulation	NO

Shell and core configuration

Zone	Assumed shell?
12 - Circulation	NO
12 - Stairs S	NO
12 - Tenant Office Space	NO
12 - Circulation	NO
12 - Tenant Office Space (W)	NO
11 - Stairs N	NO
11 - Tenant Office Space	NO
11 - WCs	NO
11 - Tenant Office Space (W)	NO
11 - Tenant Office Space (W)	NO
11 - Circulation	NO
11 - Circulation	NO
11 - Stairs S	NO
11 - Tenant Office Space	NO
11 - Circulation	NO
11 - Tenant Office Space (W)	NO
10 - Stairs N	NO
10 - Tenant Office Space	NO
10 - WCs	NO
10 - Tenant Office Space (W)	NO
10 - Tenant Office Space (W)	NO
10 - Circulation	NO
10 - Circulation	NO
10 - Stairs S	NO
10 - Tenant Office Space	NO
10 - Circulation	NO
10 - Tenant Office Space (W)	NO

General lighting and display lighting

Zone name	Luminous efficacy [lm/W]			General lighting [W]
	Luminaire	Lamp	Display lamp	
Standard value	60	60	22	
01 - Circulation	-	100	-	34
01 - Circulation	-	100	-	41
01 - Circulation	-	100	-	103
01 - Circulation	-	100	-	91
01 - Circulation	-	100	-	41
01 - Stairs N	-	100	-	50
01 - Stairs S	-	100	-	49
01 - WCs	-	100	-	272
02 - Circulation	-	100	-	103
02 - Circulation	-	100	-	34
03 - Circulation	-	100	-	27
02 - Circulation	-	100	-	41
03 - Circulation	-	100	-	34
03 - Circulation	-	100	-	103

General lighting and display lighting

Zone name	Luminous efficacy [lm/W]			General lighting [W]
	Luminaire	Lamp	Display lamp	
Standard value	60	60	22	
03 - Circulation	-	100	-	70
02 - Circulation	-	100	-	41
02 - Circulation	-	100	-	91
03 - Circulation	-	100	-	41
02 - Stairs N	-	100	-	50
03 - Stairs N	-	100	-	50
02 - Stairs S	-	100	-	49
03 - Stairs S	-	100	-	49
02 - WCs	-	100	-	272
03 - WCs	-	100	-	175
03 - WCs	-	100	-	175
01 - Co-Working Office	100	-	-	2992
02 - Co-Working Office	100	-	-	3741
01 - Co-Working Office (W)	100	-	-	3631
02 - Co-Working Office (W)	100	-	-	4541
03 - Tenant Office Space	100	-	-	2779
03 - Tenant Office Space	100	-	-	2760
03 - Tenant Office Space (W)	100	-	-	3091
08 - Stairs N	-	100	-	65
08 - Stairs S	-	100	-	65
08 - Tenant Office Space	100	-	-	2600
08 - WCs	-	100	-	316
08 - Circulation	-	100	-	125
08 - Tenant Office Space (W)	100	-	-	684
08 - Tenant Office Space	100	-	-	1194
08 - Tenant Office Space (W)	100	-	-	1759
08 - Circulation	-	100	-	136
08 - Circulation	-	100	-	125
09 - Stairs N	-	100	-	50
09 - Tenant Office Space	100	-	-	2524
09 - WCs	-	100	-	280
09 - Circulation	-	100	-	83
09 - Tenant Office Space (W)	100	-	-	639
09 - Tenant Office Space	100	-	-	1095
09 - Tenant Office Space (W)	100	-	-	1674
09 - Circulation	-	100	-	96
09 - Circulation	-	100	-	84
09 - Stairs S	-	100	-	84
15 - Stairs N	-	100	-	56
15 - WCs	-	100	-	294
15 - Circulation	-	100	-	112
15 - Circulation	-	100	-	95
15 - Stairs S	-	100	-	56

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
15 - Circulation	-	100	-		101
15 - Tenant Office Space (W)	100	-	-		437
15 - Tenant Office Space (W)	100	-	-		584
04 - Circulation	-	100	-		27
04 - Circulation	-	100	-		34
04 - Circulation	-	100	-		103
04 - Circulation	-	100	-		70
04 - Circulation	-	100	-		41
04 - Stairs N	-	100	-		50
04 - Stairs S	-	100	-		49
04 - WCs	-	100	-		175
04 - WCs	-	100	-		175
04 - Tenant Office Space	100	-	-		2779
04 - Tenant Office Space	100	-	-		2760
04 - Tenant Office Space (W)	100	-	-		3091
05 - Circulation	-	100	-		27
05 - Circulation	-	100	-		34
05 - Circulation	-	100	-		103
05 - Circulation	-	100	-		70
05 - Circulation	-	100	-		41
05 - Stairs N	-	100	-		50
05 - Stairs S	-	100	-		49
05 - WCs	-	100	-		175
05 - WCs	-	100	-		175
05 - Tenant Office Space	100	-	-		2779
05 - Tenant Office Space	100	-	-		2760
05 - Tenant Office Space (W)	100	-	-		3091
06 - Circulation	-	100	-		27
06 - Circulation	-	100	-		34
06 - Circulation	-	100	-		103
06 - Circulation	-	100	-		70
06 - Circulation	-	100	-		41
06 - Stairs N	-	100	-		50
06 - Stairs S	-	100	-		49
06 - WCs	-	100	-		175
06 - WCs	-	100	-		175
06 - Tenant Office Space	100	-	-		2779
06 - Tenant Office Space	100	-	-		2760
06 - Tenant Office Space (W)	100	-	-		3091
07 - Circulation	-	100	-		27
07 - Circulation	-	100	-		34
07 - Circulation	-	100	-		103
07 - Circulation	-	100	-		70

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
07 - Circulation	-	100	-		41
07 - Stairs N	-	100	-		50
07 - Stairs S	-	100	-		49
07 - WCs	-	100	-		175
07 - WCs	-	100	-		175
07 - Tenant Office Space	100	-	-		2779
07 - Tenant Office Space	100	-	-		2760
07 - Tenant Office Space (W)	100	-	-		3091
14 - Stairs N	-	100	-		50
14 - Tenant Office Space	100	-	-		2524
14 - WCs	-	100	-		280
14 - Tenant Office Space (W)	100	-	-		639
14 - Tenant Office Space (W)	100	-	-		1674
14 - Circulation	-	100	-		96
14 - Circulation	-	100	-		84
14 - Stairs S	-	100	-		50
14 - Tenant Office Space	100	-	-		1371
14 - Circulation	-	100	-		86
03 - Tenant Office Space (W)	100	-	-		3020
04 - Tenant Office Space (W)	100	-	-		3020
05 - Tenant Office Space (W)	100	-	-		3020
06 - Tenant Office Space (W)	100	-	-		3020
07 - Tenant Office Space (W)	100	-	-		3020
08 - Tenant Office Space (W)	100	-	-		3196
09 - Tenant Office Space (W)	100	-	-		3020
14 - Tenant Office Space (W)	100	-	-		3020
15 - Tenant Office Space (W)	100	-	-		5287
13 - Stairs N	-	100	-		50
13 - Tenant Office Space	100	-	-		2524
13 - WCs	-	100	-		280
13 - Tenant Office Space (W)	100	-	-		639
13 - Tenant Office Space (W)	100	-	-		1674
13 - Circulation	-	100	-		96
13 - Circulation	-	100	-		84
13 - Stairs S	-	100	-		50
13 - Tenant Office Space	100	-	-		1371
13 - Circulation	-	100	-		86
13 - Tenant Office Space (W)	100	-	-		3020
12 - Stairs N	-	100	-		50
12 - Tenant Office Space	100	-	-		2524
12 - WCs	-	100	-		280
12 - Tenant Office Space (W)	100	-	-		639
12 - Tenant Office Space (W)	100	-	-		1674

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name	Standard value	Luminaire	Lamp	Display lamp	
12 - Circulation	-	100	-	96	
12 - Circulation	-	100	-	84	
12 - Stairs S	-	100	-	50	
12 - Tenant Office Space	100	-	-	1371	
12 - Circulation	-	100	-	86	
12 - Tenant Office Space (W)	100	-	-	3020	
11 - Stairs N	-	100	-	50	
11 - Tenant Office Space	100	-	-	2524	
11 - WCs	-	100	-	280	
11 - Tenant Office Space (W)	100	-	-	639	
11 - Tenant Office Space (W)	100	-	-	1674	
11 - Circulation	-	100	-	96	
11 - Circulation	-	100	-	84	
11 - Stairs S	-	100	-	50	
11 - Tenant Office Space	100	-	-	1371	
11 - Circulation	-	100	-	86	
11 - Tenant Office Space (W)	100	-	-	3020	
10 - Stairs N	-	100	-	50	
10 - Tenant Office Space	100	-	-	2524	
10 - WCs	-	100	-	280	
10 - Tenant Office Space (W)	100	-	-	639	
10 - Tenant Office Space (W)	100	-	-	1674	
10 - Circulation	-	100	-	96	
10 - Circulation	-	100	-	84	
10 - Stairs S	-	100	-	50	
10 - Tenant Office Space	100	-	-	1371	
10 - Circulation	-	100	-	86	
10 - Tenant Office Space (W)	100	-	-	3020	

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?
01 - Circulation	N/A	N/A
01 - Circulation	N/A	N/A
01 - Circulation	N/A	N/A
01 - Circulation	N/A	N/A
01 - Circulation	N/A	N/A
01 - WCs	N/A	N/A
02 - Circulation	N/A	N/A
02 - Circulation	N/A	N/A
03 - Circulation	N/A	N/A
02 - Circulation	N/A	N/A
03 - Circulation	N/A	N/A
03 - Circulation	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
03 - Circulation	N/A	N/A
02 - Circulation	N/A	N/A
02 - Circulation	N/A	N/A
03 - Circulation	N/A	N/A
02 - WCs	N/A	N/A
03 - WCs	N/A	N/A
03 - WCs	N/A	N/A
01 - Co-Working Office	NO (-80.7%)	NO
02 - Co-Working Office	NO (-85.7%)	NO
01 - Co-Working Office (W)	NO (-54.6%)	NO
02 - Co-Working Office (W)	NO (-58.9%)	NO
03 - Tenant Office Space	NO (-87.8%)	NO
03 - Tenant Office Space	NO (-85.8%)	NO
03 - Tenant Office Space (W)	NO (-60.5%)	NO
08 - Tenant Office Space	NO (-73.9%)	NO
08 - WCs	N/A	N/A
08 - Circulation	N/A	N/A
08 - Tenant Office Space (W)	NO (-54.4%)	NO
08 - Tenant Office Space	NO (-66.7%)	NO
08 - Tenant Office Space (W)	NO (-37.8%)	NO
08 - Circulation	N/A	N/A
08 - Circulation	N/A	N/A
09 - Tenant Office Space	NO (-83.6%)	NO
09 - WCs	N/A	N/A
09 - Circulation	N/A	N/A
09 - Tenant Office Space (W)	NO (-66.9%)	NO
09 - Tenant Office Space	NO (-75.7%)	NO
09 - Tenant Office Space (W)	NO (-44.4%)	NO
09 - Circulation	N/A	N/A
09 - Circulation	N/A	N/A
15 - WCs	N/A	N/A
15 - Circulation	N/A	N/A
15 - Circulation	N/A	N/A
15 - Circulation	N/A	N/A
15 - Tenant Office Space (W)	NO (-30.3%)	NO
15 - Tenant Office Space (W)	NO (-33.6%)	NO
04 - Circulation	N/A	N/A
04 - Circulation	N/A	N/A
04 - Circulation	N/A	N/A
04 - Circulation	N/A	N/A
04 - Circulation	N/A	N/A
04 - WCs	N/A	N/A
04 - WCs	N/A	N/A
04 - Tenant Office Space	NO (-87.3%)	NO
04 - Tenant Office Space	NO (-85.6%)	NO
04 - Tenant Office Space (W)	NO (-58.3%)	NO
05 - Circulation	N/A	N/A
05 - Circulation	N/A	N/A
05 - Circulation	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
05 - Circulation	N/A	N/A
05 - Circulation	N/A	N/A
05 - WCs	N/A	N/A
05 - WCs	N/A	N/A
05 - Tenant Office Space	NO (-86.9%)	NO
05 - Tenant Office Space	NO (-85.6%)	NO
05 - Tenant Office Space (W)	NO (-57.1%)	NO
06 - Circulation	N/A	N/A
06 - Circulation	N/A	N/A
06 - Circulation	N/A	N/A
06 - Circulation	N/A	N/A
06 - Circulation	N/A	N/A
06 - WCs	N/A	N/A
06 - WCs	N/A	N/A
06 - Tenant Office Space	NO (-86.5%)	NO
06 - Tenant Office Space	NO (-85.5%)	NO
06 - Tenant Office Space (W)	NO (-55.7%)	NO
07 - Circulation	N/A	N/A
07 - Circulation	N/A	N/A
07 - Circulation	N/A	N/A
07 - Circulation	N/A	N/A
07 - Circulation	N/A	N/A
07 - WCs	N/A	N/A
07 - WCs	N/A	N/A
07 - Tenant Office Space	NO (-86.2%)	NO
07 - Tenant Office Space	NO (-85.4%)	NO
07 - Tenant Office Space (W)	NO (-54.4%)	NO
14 - Tenant Office Space	NO (-81.5%)	NO
14 - WCs	N/A	N/A
14 - Tenant Office Space (W)	NO (-45.7%)	NO
14 - Tenant Office Space (W)	NO (-43.1%)	NO
14 - Circulation	N/A	N/A
14 - Circulation	N/A	N/A
14 - Tenant Office Space	NO (-76.6%)	NO
14 - Circulation	N/A	N/A
03 - Tenant Office Space (W)	NO (-61.2%)	NO
04 - Tenant Office Space (W)	NO (-61.1%)	NO
05 - Tenant Office Space (W)	NO (-60.9%)	NO
06 - Tenant Office Space (W)	NO (-60.8%)	NO
07 - Tenant Office Space (W)	NO (-60.6%)	NO
08 - Tenant Office Space (W)	NO (-38.3%)	NO
09 - Tenant Office Space (W)	NO (-59.5%)	NO
14 - Tenant Office Space (W)	NO (-54.2%)	NO
15 - Tenant Office Space (W)	NO (-24.4%)	NO
13 - Tenant Office Space	NO (-82.3%)	NO
13 - WCs	N/A	N/A
13 - Tenant Office Space (W)	NO (-53.2%)	NO
13 - Tenant Office Space (W)	NO (-43.8%)	NO
13 - Circulation	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
13 - Circulation	N/A	N/A
13 - Tenant Office Space	NO (-78.2%)	NO
13 - Circulation	N/A	N/A
13 - Tenant Office Space (W)	NO (-55.4%)	NO
12 - Tenant Office Space	NO (-83%)	NO
12 - WCs	N/A	N/A
12 - Tenant Office Space (W)	NO (-60%)	NO
12 - Tenant Office Space (W)	NO (-44.2%)	NO
12 - Circulation	N/A	N/A
12 - Circulation	N/A	N/A
12 - Tenant Office Space	NO (-79.3%)	NO
12 - Circulation	N/A	N/A
12 - Tenant Office Space (W)	NO (-56.8%)	NO
11 - Tenant Office Space	NO (-83.3%)	NO
11 - WCs	N/A	N/A
11 - Tenant Office Space (W)	NO (-63.9%)	NO
11 - Tenant Office Space (W)	NO (-44.4%)	NO
11 - Circulation	N/A	N/A
11 - Circulation	N/A	N/A
11 - Tenant Office Space	NO (-79.6%)	NO
11 - Circulation	N/A	N/A
11 - Tenant Office Space (W)	NO (-58%)	NO
10 - Tenant Office Space	NO (-83.5%)	NO
10 - WCs	N/A	N/A
10 - Tenant Office Space (W)	NO (-66.3%)	NO
10 - Tenant Office Space (W)	NO (-44.5%)	NO
10 - Circulation	N/A	N/A
10 - Circulation	N/A	N/A
10 - Tenant Office Space	NO (-79.9%)	NO
10 - Circulation	N/A	N/A
10 - Tenant Office Space (W)	NO (-58.9%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	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

Building Use

	Actual	Notional
Area [m ²]	28090.8	28090.8
External area [m ²]	16279.6	16279.6
Weather	SWI	SWI
Infiltration [m ³ /hm ² @ 50Pa]	3	3
Average conductance [W/K]	14704.3	9673.76
Average U-value [W/m ² K]	0.9	0.59
Alpha value* [%]	0.16	10

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

% Area Building Type

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	4.91	1.47
Cooling	3.4	6.98
Auxiliary	14.86	12.02
Lighting	11.2	19.79
Hot water	1.2	0.93
Equipment*	37.79	37.79
TOTAL**	35.57	41.19

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0.44	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	84.9	108.81
Primary energy* [kWh/m ²]	126.71	130.48
Total emissions [kg/m ²]	18.1	20.8

* 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 SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Fan coil systems, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
Actual	44.5	42.7	5	3.5	15.2	2.45	3.4	2.65	4.43
Notional	0	0	0	0	0	0	0	----	----
[ST] No Heating or Cooling									
Actual	0	0	0	0	0	0	0	0	0
Notional	13.9	97.8	1.5	7.2	12.3	2.56	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-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.18	14000021:Surf[0]
Floor	0.2	0.13	01000018:Surf[56]
Roof	0.15	0.13	02000015:Surf[58]
Windows, roof windows, and rooflights	1.5	1.15	01000018:Surf[0]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building
U _{i-Typ} = Typical individual element U-values [W/(m²K)]			U _{i-Min} = Minimum individual element U-values [W/(m²K)]
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

Appendix D – BRUKL for Office Area of Phase 2.

BRUKL Output Document



Compliance with England Building Regulations Part L 2013

Project name

Shell and Core

Station Hill Phase 2 - Building G

As designed

Date: Tue Aug 27 15:43:50 2019

Administrative information

Building Details

Address: Reading,

Owner Details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.10

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.10

BRUKL compliance check version: v5.4.b.0

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	22.3
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	22.3
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	19.7
Are emissions from the building less than or equal to the target?	BER <= TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	U _{a-limit}	U _{a-calc}	U _{i-calc}	Surface where the maximum value occurs*
Wall**	0.35	0.18	0.18	LG000001:Surf[7]
Floor	0.25	0.13	0.13	LG000003:Surf[0]
Roof	0.25	0.13	0.13	LG000003:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.2	1.6	LG000001:Surf[2]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

U_{a-limit} = Limiting area-weighted average U-values [W/(m²K)]

U_{a-calc} = Calculated area-weighted average U-values [W/(m²K)]

U_{i-calc} = Calculated maximum individual element U-values [W/(m²K)]

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

** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

*** Display windows and similar glazing are excluded from the U-value check.

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

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

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	0.9 to 0.95

1- HVAC 1 - FCU

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	3.2	0	1.97	0.74
Standard value	2.5*	3.2	N/A	1.6^	0.5

Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES

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

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

"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	Zone	Standard
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1		
00 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
00 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
00 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
00 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
00 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
00 - Meeting Room	-	-	-	-	-	-	-	0.3	-	-	N/A
00 - Multi-Function Room	-	-	-	-	-	-	-	0.3	-	-	N/A
01 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
01 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
01 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
01 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
01 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
01 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
01 - WCs	-	-	-	-	-	-	-	0.5	-	-	N/A
02 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
02 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A
03 - Circulation	-	-	-	-	-	-	-	0.3	-	-	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	
02 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A	
03 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A	
03 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A	
03 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A	
02 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A	
02 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A	
03 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A	
02 - WCs	-	-	-	-	-	-	-	0.5	-	-	N/A	
03 - WCs	-	-	-	-	-	-	-	0.5	-	-	N/A	
03 - WCs	-	-	-	-	-	-	-	0.5	-	-	N/A	
LG - Fitness Suite and Cycle Hub	-	-	-	-	-	-	-	0.3	-	-	N/A	
LG - Office Entrance (LG)	-	-	-	-	-	-	-	0.3	-	-	N/A	
01 - Co-Working Office	-	-	-	-	-	-	-	0.3	-	-	N/A	
02 - Co-Working Office	-	-	-	-	-	-	-	0.3	-	-	N/A	
00 - Co-Working Hub (Ground)	-	-	-	-	-	-	-	0.3	-	-	N/A	
00 - WCs	-	-	-	-	-	-	-	0.5	-	-	N/A	
00 - Retail/Restaurant	-	-	-	-	-	-	-	0.3	-	-	N/A	
00 - Restaurant Kitchen	-	-	-	-	-	-	-	0.3	-	-	N/A	
01 - Co-Working Office (W)	-	-	-	-	-	-	-	0.3	-	-	N/A	
02 - Co-Working Office (W)	-	-	-	-	-	-	-	0.3	-	-	N/A	
00 - Reception/Entrance (Ground)	-	-	-	-	-	-	-	0.3	-	-	N/A	
03 - Tenant Office Space	-	-	-	-	-	-	-	0.3	-	-	N/A	
03 - Tenant Office Space	-	-	-	-	-	-	-	0.3	-	-	N/A	
03 - Tenant Office Space (W)	-	-	-	-	-	-	-	0.3	-	-	N/A	
08 - Tenant Office Space	-	-	-	-	-	-	-	0.3	-	-	N/A	
08 - WCs	-	-	-	-	-	-	-	0.5	-	-	N/A	
08 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A	
08 - Tenant Office Space (W)	-	-	-	-	-	-	-	0.3	-	-	N/A	
08 - Tenant Office Space	-	-	-	-	-	-	-	0.3	-	-	N/A	
08 - Tenant Office Space (W)	-	-	-	-	-	-	-	0.3	-	-	N/A	
08 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A	
08 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A	
09 - Tenant Office Space	-	-	-	-	-	-	-	0.3	-	-	N/A	
09 - WCs	-	-	-	-	-	-	-	0.5	-	-	N/A	
09 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A	
09 - Tenant Office Space (W)	-	-	-	-	-	-	-	0.3	-	-	N/A	
09 - Tenant Office Space	-	-	-	-	-	-	-	0.3	-	-	N/A	
09 - Tenant Office Space (W)	-	-	-	-	-	-	-	0.3	-	-	N/A	
09 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A	
09 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A	
15 - WCs	-	-	-	-	-	-	-	0.5	-	-	N/A	
15 - Circulation	-	-	-	-	-	-	-	0.3	-	-	N/A	
15 - Circulation	-	-	-	-	-	-	-	0.3	-	-	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
15 - Circulation	-	-	-	-	-	-	-	0.3	-	-	-	N/A
15 - Tenant Office Space (W)	-	-	-	-	-	-	-	0.3	-	-	-	N/A
15 - Tenant Office Space (W)	-	-	-	-	-	-	-	0.3	-	-	-	N/A
04 - Circulation	-	-	-	-	-	-	-	0.3	-	-	-	N/A
04 - Circulation	-	-	-	-	-	-	-	0.3	-	-	-	N/A
04 - Circulation	-	-	-	-	-	-	-	0.3	-	-	-	N/A
04 - Circulation	-	-	-	-	-	-	-	0.3	-	-	-	N/A
04 - Circulation	-	-	-	-	-	-	-	0.3	-	-	-	N/A
04 - Circulation	-	-	-	-	-	-	-	0.3	-	-	-	N/A
04 - WCs	-	-	-	-	-	-	-	0.5	-	-	-	N/A
04 - WCs	-	-	-	-	-	-	-	0.5	-	-	-	N/A
04 - Tenant Office Space	-	-	-	-	-	-	-	0.3	-	-	-	N/A
04 - Tenant Office Space	-	-	-	-	-	-	-	0.3	-	-	-	N/A
04 - Tenant Office Space (W)	-	-	-	-	-	-	-	0.3	-	-	-	N/A
05 - Circulation	-	-	-	-	-	-	-	0.3	-	-	-	N/A
05 - Circulation	-	-	-	-	-	-	-	0.3	-	-	-	N/A
05 - Circulation	-	-	-	-	-	-	-	0.3	-	-	-	N/A
05 - Circulation	-	-	-	-	-	-	-	0.3	-	-	-	N/A
05 - Circulation	-	-	-	-	-	-	-	0.3	-	-	-	N/A
05 - WCs	-	-	-	-	-	-	-	0.5	-	-	-	N/A
05 - WCs	-	-	-	-	-	-	-	0.5	-	-	-	N/A
05 - Tenant Office Space	-	-	-	-	-	-	-	0.3	-	-	-	N/A
05 - Tenant Office Space	-	-	-	-	-	-	-	0.3	-	-	-	N/A
05 - Tenant Office Space (W)	-	-	-	-	-	-	-	0.3	-	-	-	N/A
06 - Circulation	-	-	-	-	-	-	-	0.3	-	-	-	N/A
06 - Circulation	-	-	-	-	-	-	-	0.3	-	-	-	N/A
06 - Circulation	-	-	-	-	-	-	-	0.3	-	-	-	N/A
06 - Circulation	-	-	-	-	-	-	-	0.3	-	-	-	N/A
06 - Circulation	-	-	-	-	-	-	-	0.3	-	-	-	N/A
06 - WCs	-	-	-	-	-	-	-	0.5	-	-	-	N/A
06 - WCs	-	-	-	-	-	-	-	0.5	-	-	-	N/A
06 - Tenant Office Space	-	-	-	-	-	-	-	0.3	-	-	-	N/A
06 - Tenant Office Space	-	-	-	-	-	-	-	0.3	-	-	-	N/A
06 - Tenant Office Space (W)	-	-	-	-	-	-	-	0.3	-	-	-	N/A
07 - Circulation	-	-	-	-	-	-	-	0.3	-	-	-	N/A
07 - Circulation	-	-	-	-	-	-	-	0.3	-	-	-	N/A
07 - Circulation	-	-	-	-	-	-	-	0.3	-	-	-	N/A
07 - Circulation	-	-	-	-	-	-	-	0.3	-	-	-	N/A
07 - Circulation	-	-	-	-	-	-	-	0.3	-	-	-	N/A
07 - WCs	-	-	-	-	-	-	-	0.5	-	-	-	N/A
07 - WCs	-	-	-	-	-	-	-	0.5	-	-	-	N/A
07 - Tenant Office Space	-	-	-	-	-	-	-	0.3	-	-	-	N/A
07 - Tenant Office Space	-	-	-	-	-	-	-	0.3	-	-	-	N/A
07 - Tenant Office Space (W)	-	-	-	-	-	-	-	0.3	-	-	-	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
14 - Tenant Office Space	-	-	-	-	-	-	-	-	0.3	-	N/A
14 - WCs	-	-	-	-	-	-	-	-	0.5	-	N/A
14 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
14 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
14 - Circulation	-	-	-	-	-	-	-	-	0.3	-	N/A
14 - Circulation	-	-	-	-	-	-	-	-	0.3	-	N/A
14 - Tenant Office Space	-	-	-	-	-	-	-	-	0.3	-	N/A
14 - Circulation	-	-	-	-	-	-	-	-	0.3	-	N/A
03 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
04 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
05 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
06 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
07 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
08 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
09 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
14 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
15 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
13 - Tenant Office Space	-	-	-	-	-	-	-	-	0.3	-	N/A
13 - WCs	-	-	-	-	-	-	-	-	0.5	-	N/A
13 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
13 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
13 - Circulation	-	-	-	-	-	-	-	-	0.3	-	N/A
13 - Circulation	-	-	-	-	-	-	-	-	0.3	-	N/A
13 - Tenant Office Space	-	-	-	-	-	-	-	-	0.3	-	N/A
13 - Circulation	-	-	-	-	-	-	-	-	0.3	-	N/A
13 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
12 - Tenant Office Space	-	-	-	-	-	-	-	-	0.3	-	N/A
12 - WCs	-	-	-	-	-	-	-	-	0.5	-	N/A
12 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
12 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
12 - Circulation	-	-	-	-	-	-	-	-	0.3	-	N/A
12 - Circulation	-	-	-	-	-	-	-	-	0.3	-	N/A
12 - Tenant Office Space	-	-	-	-	-	-	-	-	0.3	-	N/A
12 - Circulation	-	-	-	-	-	-	-	-	0.3	-	N/A
12 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
11 - Tenant Office Space	-	-	-	-	-	-	-	-	0.3	-	N/A
11 - WCs	-	-	-	-	-	-	-	-	0.5	-	N/A
11 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
11 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
11 - Circulation	-	-	-	-	-	-	-	-	0.3	-	N/A
11 - Circulation	-	-	-	-	-	-	-	-	0.3	-	N/A
11 - Tenant Office Space	-	-	-	-	-	-	-	-	0.3	-	N/A
11 - Circulation	-	-	-	-	-	-	-	-	0.3	-	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
11 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
10 - Tenant Office Space	-	-	-	-	-	-	-	-	0.3	-	N/A
10 - WCs	-	-	-	-	-	-	-	-	0.5	-	N/A
10 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
10 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A
10 - Circulation	-	-	-	-	-	-	-	-	0.3	-	N/A
10 - Circulation	-	-	-	-	-	-	-	-	0.3	-	N/A
10 - Tenant Office Space	-	-	-	-	-	-	-	-	0.3	-	N/A
10 - Circulation	-	-	-	-	-	-	-	-	0.3	-	N/A
10 - Tenant Office Space (W)	-	-	-	-	-	-	-	-	0.3	-	N/A

Shell and core configuration

Zone	Assumed shell?
00 - Circulation	NO
00 - Circulation	NO
00 - Circulation	NO
00 - Circulation	NO
00 - Circulation	NO
00 - Meeting Room	NO
00 - Multi-Function Room	NO
00 - Stairs N	NO
00 - Stairs S	NO
01 - Circulation	NO
01 - Circulation	NO
01 - Circulation	NO
01 - Circulation	NO
01 - Circulation	NO
01 - Stairs N	NO
01 - Stairs S	NO
01 - WCs	NO
02 - Circulation	NO
02 - Circulation	NO
03 - Circulation	NO
02 - Circulation	NO
03 - Circulation	NO
03 - Circulation	NO
03 - Circulation	NO
02 - Circulation	NO
02 - Circulation	NO
03 - Circulation	NO
02 - Stairs N	NO
03 - Stairs N	NO
02 - Stairs S	NO
03 - Stairs S	NO
02 - WCs	NO

Shell and core configuration

Zone	Assumed shell?
03 - WCs	NO
03 - WCs	NO
LG - Fitness Suite and Cycle Hub	NO
LG - Office Entrance (LG)	NO
01 - Co-Working Office	NO
02 - Co-Working Office	NO
00 - Co-Working Hub (Ground)	NO
00 - WCs	NO
00 - Retail/Restaurant	NO
00 - Restaurant Kitchen	NO
01 - Co-Working Office (W)	NO
02 - Co-Working Office (W)	NO
00 - Reception/Entrance (Ground)	NO
03 - Tenant Office Space	NO
03 - Tenant Office Space	NO
03 - Tenant Office Space (W)	NO
08 - Stairs N	NO
08 - Stairs S	NO
08 - Tenant Office Space	NO
08 - WCs	NO
08 - Circulation	NO
08 - Tenant Office Space (W)	NO
08 - Tenant Office Space	NO
08 - Tenant Office Space (W)	NO
08 - Circulation	NO
08 - Circulation	NO
09 - Stairs N	NO
09 - Tenant Office Space	NO
09 - WCs	NO
09 - Circulation	NO
09 - Tenant Office Space (W)	NO
09 - Tenant Office Space	NO
09 - Tenant Office Space (W)	NO
09 - Circulation	NO
09 - Circulation	NO
09 - Stairs S	NO
15 - Stairs N	NO
15 - WCs	NO
15 - Circulation	NO
15 - Circulation	NO
15 - Stairs S	NO
15 - Circulation	NO
15 - Tenant Office Space (W)	NO
15 - Tenant Office Space (W)	NO
04 - Circulation	NO
04 - Circulation	NO
04 - Circulation	NO

Shell and core configuration

Zone	Assumed shell?
04 - Circulation	NO
04 - Circulation	NO
04 - Stairs N	NO
04 - Stairs S	NO
04 - WCs	NO
04 - WCs	NO
04 - Tenant Office Space	NO
04 - Tenant Office Space	NO
04 - Tenant Office Space (W)	NO
05 - Circulation	NO
05 - Circulation	NO
05 - Circulation	NO
05 - Circulation	NO
05 - Circulation	NO
05 - Stairs N	NO
05 - Stairs S	NO
05 - WCs	NO
05 - WCs	NO
05 - Tenant Office Space	NO
05 - Tenant Office Space	NO
05 - Tenant Office Space (W)	NO
06 - Circulation	NO
06 - Circulation	NO
06 - Circulation	NO
06 - Circulation	NO
06 - Circulation	NO
06 - Stairs N	NO
06 - Stairs S	NO
06 - WCs	NO
06 - WCs	NO
06 - Tenant Office Space	NO
06 - Tenant Office Space	NO
06 - Tenant Office Space (W)	NO
07 - Circulation	NO
07 - Circulation	NO
07 - Circulation	NO
07 - Circulation	NO
07 - Circulation	NO
07 - Stairs N	NO
07 - Stairs S	NO
07 - WCs	NO
07 - WCs	NO
07 - Tenant Office Space	NO
07 - Tenant Office Space	NO
07 - Tenant Office Space (W)	NO
14 - Stairs N	NO
14 - Tenant Office Space	NO

Shell and core configuration

Zone	Assumed shell?
14 - WCs	NO
14 - Tenant Office Space (W)	NO
14 - Tenant Office Space (W)	NO
14 - Circulation	NO
14 - Circulation	NO
14 - Stairs S	NO
14 - Tenant Office Space	NO
14 - Circulation	NO
03 - Tenant Office Space (W)	NO
04 - Tenant Office Space (W)	NO
05 - Tenant Office Space (W)	NO
06 - Tenant Office Space (W)	NO
07 - Tenant Office Space (W)	NO
08 - Tenant Office Space (W)	NO
09 - Tenant Office Space (W)	NO
14 - Tenant Office Space (W)	NO
15 - Tenant Office Space (W)	NO
13 - Stairs N	NO
13 - Tenant Office Space	NO
13 - WCs	NO
13 - Tenant Office Space (W)	NO
13 - Tenant Office Space (W)	NO
13 - Circulation	NO
13 - Circulation	NO
13 - Stairs S	NO
13 - Tenant Office Space	NO
13 - Circulation	NO
13 - Tenant Office Space (W)	NO
12 - Stairs N	NO
12 - Tenant Office Space	NO
12 - WCs	NO
12 - Tenant Office Space (W)	NO
12 - Tenant Office Space (W)	NO
12 - Circulation	NO
12 - Circulation	NO
12 - Stairs S	NO
12 - Tenant Office Space	NO
12 - Circulation	NO
12 - Tenant Office Space (W)	NO
11 - Stairs N	NO
11 - Tenant Office Space	NO
11 - WCs	NO
11 - Tenant Office Space (W)	NO
11 - Tenant Office Space (W)	NO
11 - Circulation	NO
11 - Circulation	NO
11 - Stairs S	NO

Shell and core configuration

Zone	Assumed shell?
11 - Tenant Office Space	NO
11 - Circulation	NO
11 - Tenant Office Space (W)	NO
10 - Stairs N	NO
10 - Tenant Office Space	NO
10 - WCs	NO
10 - Tenant Office Space (W)	NO
10 - Tenant Office Space (W)	NO
10 - Circulation	NO
10 - Circulation	NO
10 - Stairs S	NO
10 - Tenant Office Space	NO
10 - Circulation	NO
10 - Tenant Office Space (W)	NO

General lighting and display lighting

Zone name	Standard value	Luminous efficacy [lm/W]			General lighting [W]
		Luminaire	Lamp	Display lamp	
00 - Circulation	-	60	100	-	49
00 - Circulation	-	60	100	-	40
00 - Circulation	-	60	100	-	103
00 - Circulation	-	60	100	-	50
00 - Circulation	-	60	100	-	112
00 - Meeting Room	100	-	-	-	323
00 - Multi-Function Room	100	-	-	-	566
00 - Stairs N	-	60	100	-	56
00 - Stairs S	-	60	100	-	56
01 - Circulation	-	60	100	-	34
01 - Circulation	-	60	100	-	41
01 - Circulation	-	60	100	-	103
01 - Circulation	-	60	100	-	91
01 - Circulation	-	60	100	-	41
01 - Stairs N	-	60	100	-	50
01 - Stairs S	-	60	100	-	49
01 - WCs	-	60	100	-	272
02 - Circulation	-	60	100	-	103
02 - Circulation	-	60	100	-	34
03 - Circulation	-	60	100	-	27
02 - Circulation	-	60	100	-	41
03 - Circulation	-	60	100	-	34
03 - Circulation	-	60	100	-	103
03 - Circulation	-	60	100	-	70
02 - Circulation	-	60	100	-	41
02 - Circulation	-	60	100	-	91
03 - Circulation	-	60	100	-	41

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name	Standard value	Luminaire	Lamp	Display lamp	
02 - Stairs N	-	-	100	-	50
03 - Stairs N	-	-	100	-	50
02 - Stairs S	-	-	100	-	49
03 - Stairs S	-	-	100	-	49
02 - WCs	-	-	100	-	272
03 - WCs	-	-	100	-	175
03 - WCs	-	-	100	-	175
LG - Fitness Suite and Cycle Hub	-	-	100	-	346
LG - Office Entrance (LG)	-	-	100	65	383
01 - Co-Working Office	100	-	-	-	2992
02 - Co-Working Office	100	-	-	-	3741
00 - Co-Working Hub (Ground)	100	-	-	-	1057
00 - WCs	-	-	100	-	62
00 - Retail/Restaurant	-	-	100	65	1634
00 - Restaurant Kitchen	-	-	100	-	690
01 - Co-Working Office (W)	100	-	-	-	3631
02 - Co-Working Office (W)	100	-	-	-	4541
00 - Reception/Entrance (Ground)	-	-	100	65	1380
03 - Tenant Office Space	100	-	-	-	2779
03 - Tenant Office Space	100	-	-	-	2760
03 - Tenant Office Space (W)	100	-	-	-	3091
08 - Stairs N	-	-	100	-	65
08 - Stairs S	-	-	100	-	65
08 - Tenant Office Space	100	-	-	-	2600
08 - WCs	-	-	100	-	316
08 - Circulation	-	-	100	-	125
08 - Tenant Office Space (W)	100	-	-	-	684
08 - Tenant Office Space	100	-	-	-	1194
08 - Tenant Office Space (W)	100	-	-	-	1759
08 - Circulation	-	-	100	-	136
08 - Circulation	-	-	100	-	125
09 - Stairs N	-	-	100	-	50
09 - Tenant Office Space	100	-	-	-	2524
09 - WCs	-	-	100	-	280
09 - Circulation	-	-	100	-	83
09 - Tenant Office Space (W)	100	-	-	-	639
09 - Tenant Office Space	100	-	-	-	1095
09 - Tenant Office Space (W)	100	-	-	-	1674
09 - Circulation	-	-	100	-	96
09 - Circulation	-	-	100	-	84
09 - Stairs S	-	-	100	-	84
15 - Stairs N	-	-	100	-	56
15 - WCs	-	-	100	-	294

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name	Standard value	Luminaire	Lamp	Display lamp	
15 - Circulation	-	-	100	-	112
15 - Circulation	-	-	100	-	95
15 - Stairs S	-	-	100	-	56
15 - Circulation	-	-	100	-	101
15 - Tenant Office Space (W)	100	-	-	-	437
15 - Tenant Office Space (W)	100	-	-	-	584
04 - Circulation	-	-	100	-	27
04 - Circulation	-	-	100	-	34
04 - Circulation	-	-	100	-	103
04 - Circulation	-	-	100	-	70
04 - Circulation	-	-	100	-	41
04 - Stairs N	-	-	100	-	50
04 - Stairs S	-	-	100	-	49
04 - WCs	-	-	100	-	175
04 - WCs	-	-	100	-	175
04 - Tenant Office Space	100	-	-	-	2779
04 - Tenant Office Space	100	-	-	-	2760
04 - Tenant Office Space (W)	100	-	-	-	3091
05 - Circulation	-	-	100	-	27
05 - Circulation	-	-	100	-	34
05 - Circulation	-	-	100	-	103
05 - Circulation	-	-	100	-	70
05 - Circulation	-	-	100	-	41
05 - Stairs N	-	-	100	-	50
05 - Stairs S	-	-	100	-	49
05 - WCs	-	-	100	-	175
05 - WCs	-	-	100	-	175
05 - Tenant Office Space	100	-	-	-	2779
05 - Tenant Office Space	100	-	-	-	2760
05 - Tenant Office Space (W)	100	-	-	-	3091
06 - Circulation	-	-	100	-	27
06 - Circulation	-	-	100	-	34
06 - Circulation	-	-	100	-	103
06 - Circulation	-	-	100	-	70
06 - Circulation	-	-	100	-	41
06 - Stairs N	-	-	100	-	50
06 - Stairs S	-	-	100	-	49
06 - WCs	-	-	100	-	175
06 - WCs	-	-	100	-	175
06 - Tenant Office Space	100	-	-	-	2779
06 - Tenant Office Space	100	-	-	-	2760
06 - Tenant Office Space (W)	100	-	-	-	3091
07 - Circulation	-	-	100	-	27

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name	Standard value	Luminaire	Lamp	Display lamp	
07 - Circulation	-	60	100	22	34
07 - Circulation	-	60	100	-	103
07 - Circulation	-	60	100	-	70
07 - Circulation	-	60	100	-	41
07 - Stairs N	-	60	100	-	50
07 - Stairs S	-	60	100	-	49
07 - WCs	-	60	100	-	175
07 - WCs	-	60	100	-	175
07 - Tenant Office Space	100	-	-	-	2779
07 - Tenant Office Space	100	-	-	-	2760
07 - Tenant Office Space (W)	100	-	-	-	3091
14 - Stairs N	-	60	100	-	50
14 - Tenant Office Space	100	-	-	-	2524
14 - WCs	-	60	100	-	280
14 - Tenant Office Space (W)	100	-	-	-	639
14 - Tenant Office Space (W)	100	-	-	-	1674
14 - Circulation	-	60	100	-	96
14 - Circulation	-	60	100	-	84
14 - Stairs S	-	60	100	-	50
14 - Tenant Office Space	100	-	-	-	1371
14 - Circulation	-	60	100	-	86
03 - Tenant Office Space (W)	100	-	-	-	3020
04 - Tenant Office Space (W)	100	-	-	-	3020
05 - Tenant Office Space (W)	100	-	-	-	3020
06 - Tenant Office Space (W)	100	-	-	-	3020
07 - Tenant Office Space (W)	100	-	-	-	3020
08 - Tenant Office Space (W)	100	-	-	-	3196
09 - Tenant Office Space (W)	100	-	-	-	3020
14 - Tenant Office Space (W)	100	-	-	-	3020
15 - Tenant Office Space (W)	100	-	-	-	5287
13 - Stairs N	-	60	100	-	50
13 - Tenant Office Space	100	-	-	-	2524
13 - WCs	-	60	100	-	280
13 - Tenant Office Space (W)	100	-	-	-	639
13 - Tenant Office Space (W)	100	-	-	-	1674
13 - Circulation	-	60	100	-	96
13 - Circulation	-	60	100	-	84
13 - Stairs S	-	60	100	-	50
13 - Tenant Office Space	100	-	-	-	1371
13 - Circulation	-	60	100	-	86
13 - Tenant Office Space (W)	100	-	-	-	3020
12 - Stairs N	-	60	100	-	50
12 - Tenant Office Space	100	-	-	-	2524

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name	Standard value	Luminaire	Lamp	Display lamp	
12 - WCs	-	60	100	-	280
12 - Tenant Office Space (W)	100	-	-	-	639
12 - Tenant Office Space (W)	100	-	-	-	1674
12 - Circulation	-	60	100	-	96
12 - Circulation	-	60	100	-	84
12 - Stairs S	-	60	100	-	50
12 - Tenant Office Space	100	-	-	-	1371
12 - Circulation	-	60	100	-	86
12 - Tenant Office Space (W)	100	-	-	-	3020
11 - Stairs N	-	60	100	-	50
11 - Tenant Office Space	100	-	-	-	2524
11 - WCs	-	60	100	-	280
11 - Tenant Office Space (W)	100	-	-	-	639
11 - Tenant Office Space (W)	100	-	-	-	1674
11 - Circulation	-	60	100	-	96
11 - Circulation	-	60	100	-	84
11 - Stairs S	-	60	100	-	50
11 - Tenant Office Space	100	-	-	-	1371
11 - Circulation	-	60	100	-	86
11 - Tenant Office Space (W)	100	-	-	-	3020
10 - Stairs N	-	60	100	-	50
10 - Tenant Office Space	100	-	-	-	2524
10 - WCs	-	60	100	-	280
10 - Tenant Office Space (W)	100	-	-	-	639
10 - Tenant Office Space (W)	100	-	-	-	1674
10 - Circulation	-	60	100	-	96
10 - Circulation	-	60	100	-	84
10 - Stairs S	-	60	100	-	50
10 - Tenant Office Space	100	-	-	-	1371
10 - Circulation	-	60	100	-	86
10 - Tenant Office Space (W)	100	-	-	-	3020

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?
00 - Circulation	N/A	N/A
00 - Circulation	N/A	N/A
00 - Circulation	N/A	N/A
00 - Circulation	N/A	N/A
00 - Circulation	N/A	N/A
00 - Meeting Room	N/A	N/A
00 - Multi-Function Room	N/A	N/A
01 - Circulation	N/A	N/A
01 - Circulation	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
01 - Circulation	N/A	N/A
01 - Circulation	N/A	N/A
01 - Circulation	N/A	N/A
01 - WCs	N/A	N/A
02 - Circulation	N/A	N/A
02 - Circulation	N/A	N/A
03 - Circulation	N/A	N/A
02 - Circulation	N/A	N/A
03 - Circulation	N/A	N/A
03 - Circulation	N/A	N/A
03 - Circulation	N/A	N/A
02 - Circulation	N/A	N/A
02 - Circulation	N/A	N/A
03 - Circulation	N/A	N/A
02 - WCs	N/A	N/A
03 - WCs	N/A	N/A
03 - WCs	N/A	N/A
LG - Fitness Suite and Cycle Hub	NO (-30%)	NO
LG - Office Entrance (LG)	NO (-44.1%)	NO
01 - Co-Working Office	NO (-76.7%)	NO
02 - Co-Working Office	NO (-84.2%)	NO
00 - Co-Working Hub (Ground)	NO (-24%)	NO
00 - WCs	N/A	N/A
00 - Retail/Restaurant	NO (-10.6%)	NO
00 - Restaurant Kitchen	N/A	N/A
01 - Co-Working Office (W)	NO (-52.2%)	NO
02 - Co-Working Office (W)	NO (-58.6%)	NO
00 - Reception/Entrance (Ground)	NO (-22.2%)	NO
03 - Tenant Office Space	NO (-87.8%)	NO
03 - Tenant Office Space	NO (-85.8%)	NO
03 - Tenant Office Space (W)	NO (-60.5%)	NO
08 - Tenant Office Space	NO (-73.9%)	NO
08 - WCs	N/A	N/A
08 - Circulation	N/A	N/A
08 - Tenant Office Space (W)	NO (-54.4%)	NO
08 - Tenant Office Space	NO (-66.7%)	NO
08 - Tenant Office Space (W)	NO (-37.8%)	NO
08 - Circulation	N/A	N/A
08 - Circulation	N/A	N/A
09 - Tenant Office Space	NO (-83.6%)	NO
09 - WCs	N/A	N/A
09 - Circulation	N/A	N/A
09 - Tenant Office Space (W)	NO (-66.9%)	NO
09 - Tenant Office Space	NO (-75.7%)	NO
09 - Tenant Office Space (W)	NO (-44.4%)	NO
09 - Circulation	N/A	N/A
09 - Circulation	N/A	N/A
15 - WCs	N/A	N/A
15 - Circulation	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
15 - Circulation	N/A	N/A
15 - Circulation	N/A	N/A
15 - Tenant Office Space (W)	NO (-30.3%)	NO
15 - Tenant Office Space (W)	NO (-33.6%)	NO
04 - Circulation	N/A	N/A
04 - Circulation	N/A	N/A
04 - Circulation	N/A	N/A
04 - Circulation	N/A	N/A
04 - Circulation	N/A	N/A
04 - WCs	N/A	N/A
04 - WCs	N/A	N/A
04 - Tenant Office Space	NO (-87.3%)	NO
04 - Tenant Office Space	NO (-85.6%)	NO
04 - Tenant Office Space (W)	NO (-58.3%)	NO
05 - Circulation	N/A	N/A
05 - Circulation	N/A	N/A
05 - Circulation	N/A	N/A
05 - Circulation	N/A	N/A
05 - Circulation	N/A	N/A
05 - WCs	N/A	N/A
05 - WCs	N/A	N/A
05 - Tenant Office Space	NO (-86.9%)	NO
05 - Tenant Office Space	NO (-85.6%)	NO
05 - Tenant Office Space (W)	NO (-57.1%)	NO
06 - Circulation	N/A	N/A
06 - Circulation	N/A	N/A
06 - Circulation	N/A	N/A
06 - Circulation	N/A	N/A
06 - WCs	N/A	N/A
06 - WCs	N/A	N/A
06 - Tenant Office Space	NO (-86.5%)	NO
06 - Tenant Office Space	NO (-85.5%)	NO
06 - Tenant Office Space (W)	NO (-55.7%)	NO
07 - Circulation	N/A	N/A
07 - Circulation	N/A	N/A
07 - Circulation	N/A	N/A
07 - Circulation	N/A	N/A
07 - Circulation	N/A	N/A
07 - WCs	N/A	N/A
07 - WCs	N/A	N/A
07 - Tenant Office Space	NO (-86.2%)	NO
07 - Tenant Office Space	NO (-85.4%)	NO
07 - Tenant Office Space (W)	NO (-54.4%)	NO
14 - Tenant Office Space	NO (-81.5%)	NO
14 - WCs	N/A	N/A
14 - Tenant Office Space (W)	NO (-45.7%)	NO
14 - Tenant Office Space (W)	NO (-43.1%)	NO
14 - Circulation	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
14 - Circulation	N/A	N/A
14 - Tenant Office Space	NO (-76.6%)	NO
14 - Circulation	N/A	N/A
03 - Tenant Office Space (W)	NO (-61.2%)	NO
04 - Tenant Office Space (W)	NO (-61.1%)	NO
05 - Tenant Office Space (W)	NO (-60.9%)	NO
06 - Tenant Office Space (W)	NO (-60.8%)	NO
07 - Tenant Office Space (W)	NO (-60.6%)	NO
08 - Tenant Office Space (W)	NO (-38.3%)	NO
09 - Tenant Office Space (W)	NO (-59.5%)	NO
14 - Tenant Office Space (W)	NO (-54.2%)	NO
15 - Tenant Office Space (W)	NO (-24.4%)	NO
13 - Tenant Office Space	NO (-82.3%)	NO
13 - WCs	N/A	N/A
13 - Tenant Office Space (W)	NO (-53.2%)	NO
13 - Tenant Office Space (W)	NO (-43.8%)	NO
13 - Circulation	N/A	N/A
13 - Circulation	N/A	N/A
13 - Tenant Office Space	NO (-78.2%)	NO
13 - Circulation	N/A	N/A
13 - Tenant Office Space (W)	NO (-55.4%)	NO
12 - Tenant Office Space	NO (-83%)	NO
12 - WCs	N/A	N/A
12 - Tenant Office Space (W)	NO (-60%)	NO
12 - Tenant Office Space (W)	NO (-44.2%)	NO
12 - Circulation	N/A	N/A
12 - Circulation	N/A	N/A
12 - Tenant Office Space	NO (-79.3%)	NO
12 - Circulation	N/A	N/A
12 - Tenant Office Space (W)	NO (-56.8%)	NO
11 - Tenant Office Space	NO (-83.3%)	NO
11 - WCs	N/A	N/A
11 - Tenant Office Space (W)	NO (-63.9%)	NO
11 - Tenant Office Space (W)	NO (-44.4%)	NO
11 - Circulation	N/A	N/A
11 - Circulation	N/A	N/A
11 - Tenant Office Space	NO (-79.6%)	NO
11 - Circulation	N/A	N/A
11 - Tenant Office Space (W)	NO (-58%)	NO
10 - Tenant Office Space	NO (-83.5%)	NO
10 - WCs	N/A	N/A
10 - Tenant Office Space (W)	NO (-66.3%)	NO
10 - Tenant Office Space (W)	NO (-44.5%)	NO
10 - Circulation	N/A	N/A
10 - Circulation	N/A	N/A
10 - Tenant Office Space	NO (-79.9%)	NO
10 - Circulation	N/A	N/A
10 - Tenant Office Space (W)	NO (-58.9%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	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

Building Use

	Actual	Notional
Area [m ²]	30077	30077
External area [m ²]	22283.1	22283.1
Weather	SWI	SWI
Infiltration [m ³ /hm ² @ 50Pa]	3	3
Average conductance [W/K]	17588.4	11478.1
Average U-value [W/m ² K]	0.79	0.52
Alpha value* [%]	0.22	10

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

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	5.63	1.63
Cooling	3.35	6.83
Auxiliary	15.75	12.61
Lighting	11.77	20.98
Hot water	2.25	1.97
Equipment*	39.47	39.47
TOTAL**	38.75	44.01

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0.41	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	90.71	108.2
Primary energy* [kWh/m ²]	141.72	142.52
Total emissions [kg/m ²]	19.7	22.3

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

HVAC Systems Performance

System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Fan coil systems, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
Actual	50.9	42.2	5.8	3.4	16.1	2.45	3.4	2.65	4.43
Notional	0	0	0	0	0	0	0	----	----
[ST] No Heating or Cooling									
Actual	0	0	0	0	0	0	0	0	0
Notional	15.5	95.7	1.7	7	12.9	2.56	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-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.18	LG000001:Surf[7]
Floor	0.2	0.13	LG000003:Surf[0]
Roof	0.15	0.13	LG000003:Surf[1]
Windows, roof windows, and rooflights	1.5	1.15	01000018:Surf[0]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building
U _{i-Typ} = Typical individual element U-values [W/(m²K)]			U _{i-Min} = Minimum individual element U-values [W/(m²K)]
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3



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