

Dyne House and the Island Site Tunnel Building

Energy Strategy

Highgate School

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Executive Summary

Introduction

AECOM has been commissioned by Highgate School ('the Applicant') to produce an energy statement in support of a detailed planning application for the redevelopment of their Dyne House and the Island Suite Tunnel Building site at Southwood Lane ('the Site') in the London Borough of Haringey.

This document summarises the options considered during design of the building redevelopment (hereafter referred to as the 'Proposed Development') for reducing carbon emissions through energy efficiency measures, low carbon energy supply from decentralised sources and the integration of renewable energy technologies.

Development description

The proposed development consists of *redevelopment of Dyne House, to include: 1) Retention, refurbishment and extension of the principal five storey (plus plant and lift over run) Dyne House structure; 2) Demolition and redevelopment of the rear extension and associated buildings with a part one, part two storey structure; 3) Retention of the Parade Ground open space, with new sports pitch surface; 4) Associated improvements to the Island Site access and underground tunnel, including demolition and redevelopment of service block; and 5) Associated landscaping and improved provision for emergency services, servicing and disabled parking.*

The building is to be used as a secondary school building. For full details and the scope of the application, refer to the Hopkins Architects Design and Access Statement.

Policy review

The energy strategy for the proposed development responds to national, regional and local planning policies, including but not limited to:

- National Planning Policy Framework.
- UK Climate Change Act.
- Building Regulations 2021 and Future Buildings Standard.
- GLA Energy Assessment Guidance 2022.
- The London Plan 2021.
- Haringey Strategic Policies 2013 – 2016.
- Haringey Development Management DPD 2017.

Proposed energy strategy

The energy strategy for the proposed development is:

1. Energy efficient fabric and buildings services design;
2. A GSHP system to provide heating and cooling;
3. A PV array on the roof of the building.

The carbon emissions at each stage in the energy hierarchy are summarised below.

Summary Figure 1 shows the carbon baseline, and emissions and savings with the proposed energy strategy, at each step in the energy hierarchy. Calculations at this stage suggest this strategy would save 1.6 tCO₂/year, which is 9% of the baseline emissions of 18.7 tCO₂/year. This is also summarised

in Summary Table 1 and Summary Table 2. A small increase in modelled carbon emissions occurs at the "be lean" stage of the energy hierarchy. Further details and explanation of this increase are provided at the end of this summary.

Carbon emissions for new buildings (tCO ₂ /year)		
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	18.7	24.2
After energy demand reduction	19.3	24.2
After heat network/CHP	19.3	24.2
After renewable energy	17.1	24.2

Summary Table 1 Carbon emissions after each stage of the energy hierarchy.

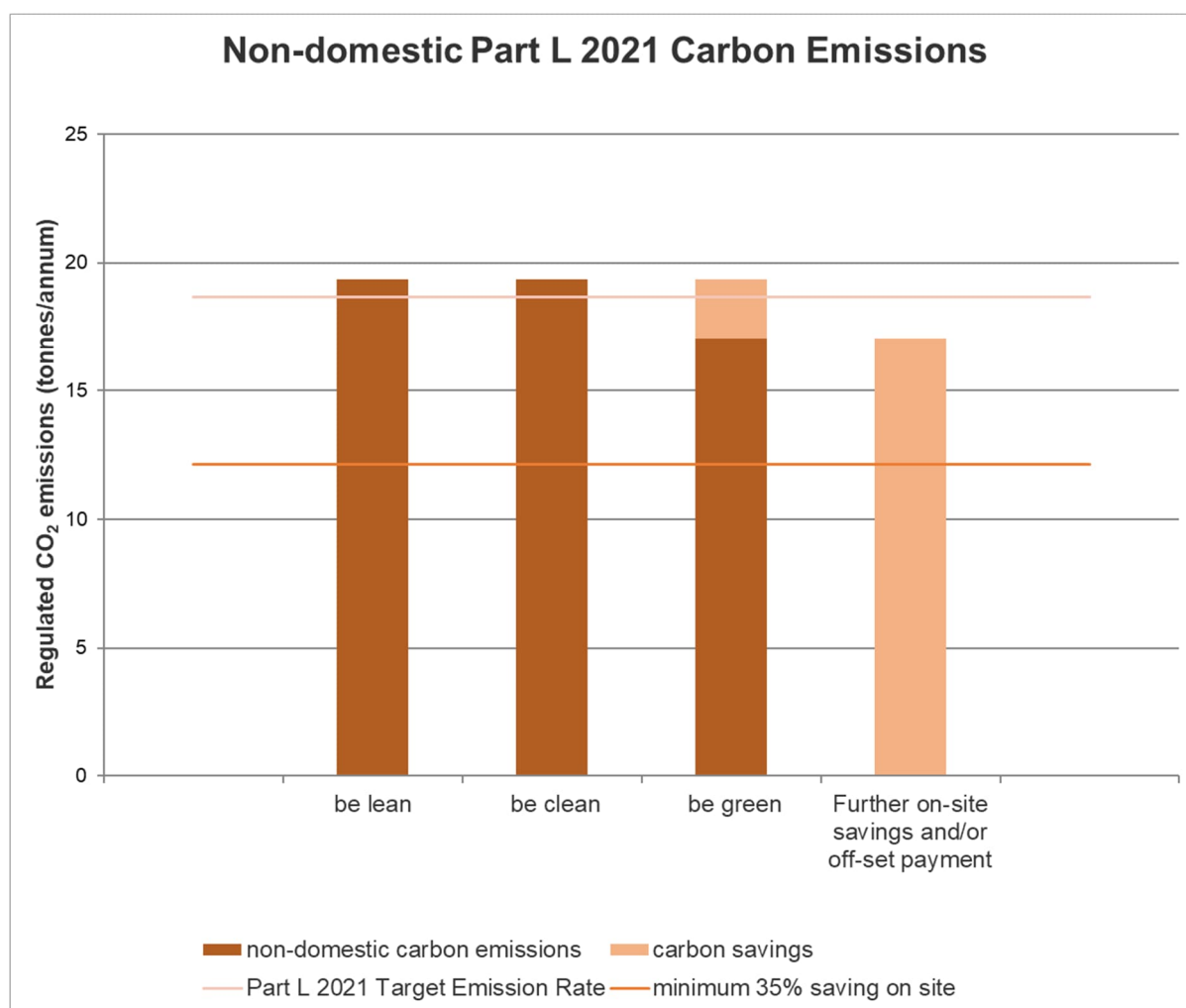
Regulated new-building carbon savings		
	(tCO ₂ /year)	(%)
Savings from energy demand reduction	-0.7	-4%
Savings from heat network/CHP	0.0	0%
Savings from renewable energy	2.3	12%
Total cumulative savings	1.6	9%

Summary Table 2 Regulated carbon savings from each stage of the energy hierarchy

The shortfall in savings relative to the 'zero carbon' 100% regulated emission saving target is 17.1 tCO₂/year, which is a cumulative total over 30 years of 512 tCO₂ that is expected to be addressed through offsetting. Based on a carbon offsetting rate of £95/tonne, this results in an estimated carbon offset payment of approximately £48,645, subject to agreement with LBH. This is summarised in Summary Table 3.

	Annual (tCO ₂)	Cumulative shortfall (tCO ₂)
Total Target Savings	18.7	-
Shortfall	17.1	512
Cash in-lieu contribution (£)	-	£48,645

Summary Table 3 Carbon savings shortfall and offset payment



Summary Figure 1 Proposed energy strategy: Energy Hierarchy CO₂ baseline, emissions and savings

Comparison with carbon saving targets

‘Be Lean’ target

GLA planning policy encourages on-site regulated carbon savings of 15% against the baseline from energy efficiency measures alone (the ‘Be Lean’ stage). The proposed development does not achieve “be lean” carbon savings over the Part L 2021 regulated baseline. This is despite the proposed building having efficient building fabric and services. The main reason for this is the updates to the notional building in Part L 2021, which have been made to improve the overall performance of all buildings. In particular, the following changes to the Part L notional building have impacted the ability of the proposed building to meet Building Regulations through energy efficiency alone:

- Lighting in the notional building is now LED lighting, which matches the performance of efficient lighting options available. Lighting savings compared to the notional building are now more difficult to achieve than under Part L 2013. The proposed building has efficient lighting and controls including daylight dimming and PIR controls.
- Hot water provision for buildings without gas boilers now assumes that air source heat pumps provide some water heating. This gives the notional building a water heating efficiency greater than 1. In the proposed building, the main hot water demands are from toilets, which are spread through the building. For small, dispersed and intermittent hot water demands such as this, direct electric point of use water heating is preferable to heat pumps, minimising storage and distribution losses. Direct electric water heating is proposed for the building. This means that the building has higher energy demand for hot water than the Part L notional building and therefore includes an increase in energy demand and associated emissions against the baseline.

The 2021 update to building regulations are aimed to improve efficiency across all new buildings in England. This important improvement has lowered the scope available for buildings to achieve improvements relative to the notional building and makes it difficult to meet building regulations through energy efficiency alone, or meet the GLA 15% “be lean” savings target. The *GLA Note to accompany GLA Energy Assessment Guidance 2022* acknowledges that non-domestic developments may find meeting the be lean targets difficult, but advises that applicants should follow the energy hierarchy to ensure that carbon savings are maximised. The proposed development provides efficient building fabric, in line with the energy hierarchy, to maximise available operational carbon savings.

‘Be Green’ target

GLA planning policy has an overall regulated savings target of 100%. In addition, it encourages on-site regulated carbon savings of 35% against the baseline after the ‘Be Green’ stage. This has proved difficult to achieve for the proposed development. This is due in part to the difficulties and modelling limitations in meeting the “be lean” target described above.

The development achieves regulated carbon savings of 12% from low or zero carbon technologies, namely ground source heat pumps and PV panels. The heating and cooling demands of the proposed building are met using heat pumps. As discussed in section 3.2.1 and above, point of use water heaters are proposed as hot water demands are generally limited to toilet areas.

After heating, cooling and hot water generating technologies are applied to the building heating, cooling and DHW demands, the remaining energy uses can only be decarbonised further through electricity generating technologies. As outlined in section 6, the only suitable energy generating technology for the site is PV panels. An area of building roof on the main Dyne House building was identified as the only suitable area for PV panels. Panels have been included on this part of the building. Further electricity generation (and therefore carbon savings) is therefore not possible using available suitable technologies.

The *GLA Note to accompany GLA Energy Assessment Guidance 2022* acknowledges that non-domestic developments may find meeting the overall carbon savings targets difficult, but advises that applicants should follow the energy hierarchy to ensure that carbon savings are maximised. The proposed development includes appropriate low and zero carbon technologies, in line with the energy hierarchy, to maximise available operational carbon savings

1. Introduction and background

AECOM has been commissioned by Highgate School ('the Applicant') to produce an energy statement in support of a detailed planning application for the redevelopment of their Dyne House and the Island Suite Tunnel Building site at Southwood Lane ('the Site') in the London Borough of Haringey.

This document summarises the options considered during design of the building redevelopment (hereafter referred to as the 'Proposed Development') for reducing carbon emissions through energy efficiency measures, low carbon energy supply from decentralised sources and the integration of renewable energy technologies.

1.1 Development Description

The proposed development consists of *redevelopment of Dyne House, to include: 1) Retention, refurbishment and extension of the principal five storey (plus plant and lift over run) Dyne House structure; 2) Demolition and redevelopment of the rear extension and associated buildings with a part one, part two storey structure; 3) Retention of the Parade Ground open space, with new sports pitch surface; 4) Associated improvements to the Island Site access and underground tunnel, including demolition and redevelopment of service block; and 5) Associated landscaping and improved provision for emergency services, servicing and disabled parking.*

The building is to be used as a secondary school building. For full details and the scope of the application, refer to the Hopkins Architects Design and Access Statement.

1.2 Policy Review

This section summarises the key national, regional and local planning policy applicable to the proposed development. A full planning policy review is included in Appendix G.

1.2.1 National Legislation and Policy Drivers

1.2.1.1 UK Climate Change Act

The Climate Change Act (2008) sets a legally binding target to reduce UK carbon emissions by 100% by 2050, against a 1990 baseline.

The Act is the driver behind a framework of national strategy and policy documents such as the UK Low Carbon Transition Plan (2009) and previously anticipated zero carbon homes policy. These in turn have informed the development of local planning policy and updates to the Building Regulations.

1.2.1.2 National Planning Policy Framework

The National Planning Policy Framework (NPPF) prescribes government planning policy and outlines the way in which this is to be applied. The document sets out a framework for local plan development and illustrates national-scale policy aims. The NPPF includes requirements for new development which assist in supporting the transition to a low carbon future.

1.2.1.3 Building Regulations and Future Buildings Standard

Part L of the Building Regulations in England is the key mechanism that prescribes standards for the energy performance of new and the refurbishment of existing buildings in the UK, based on metrics such as the estimated level of primary energy demand and CO₂ emissions. Approved Documents set out the measures required to comply with Building Regulations.

The final version of the new Part L 2021 Approved Documents was published in December 2021 and was adopted in June 2022.

The Approved Documents set out the performance of the notional building against which the 2021 targets are to be set. For new buildings this is estimated to deliver a 31% carbon saving on average compared to the previous 2013 standards.

Development on Dyne House and the Island Suite Tunnel Building is outside the window for transitional arrangements for Part L 2013. Therefore, the development will be required to be built in line with Part L 2021 standards and as such these standards are an important consideration in developing the energy strategy for the proposed development.

The building is required to meet the Part L 2021 standards, and has been modelled using the new Part L 2021 compliant software.

1.2.2 Regional Policy Drivers

1.2.2.1 Greater London Authority (GLA)

Local planning policy is set within the context of London-wide policy and guidance. The following are identified as potentially relevant to the application:

- The London Plan, March 2021.
- Sustainable Design and Construction Supplementary Planning Guidance, April 2014.
- GLA Energy Assessment Guidance, June 2022.

For energy purposes, the regional policy requires that developments reduce their CO₂ emissions in accordance with the Energy Hierarchy and make the fullest contribution to London's adaptation to climate change. In order to meet the 'zero-carbon target', a minimum on-site reduction in regulated CO₂ emissions of at least 35% beyond Building Regulations is required for a major development. Non-residential developments should achieve a 15% reduction through energy efficiency measures. Where the zero-carbon target cannot be met, the remaining carbon emissions should be offset to the 100% target.

The regional policy also seeks:

- Minimisation of the overheating risk and the demand for cooling;
- On-site renewable energy generation;
- Commitment to site wide networks with a single energy centre, where feasible; and
- Allowance for connection to existing or planned district heating networks identified in the area.

This energy statement aims to follow GLA guidance on preparing energy assessments, which sets out "how to prepare an energy assessment to accompany strategic planning applications... [and] demonstrate that climate change mitigation measures comply with London Plan energy policies". The 2022 guidance on preparing energy statements is focussed on responding to the updates to Building Regulations.

The following excerpts and summaries provide an outline of planning policy expectations with regard to energy and CO₂ emissions from the building development.

1.2.2.2 London Plan (2021) Policy SI 2 Minimising Greenhouse Gas Emissions

This policy outlines an energy hierarchy which developments should follow to reduce their carbon emissions and peak energy demand.

Any shortfall in on-site carbon savings relative to the 35% target should be made up through offsetting, in agreement with the borough. Arrangements for offsetting are the responsibility of the Local Planning Authority. GLA Energy Planning Guidance states that Boroughs should use a carbon offset price of £95/tonne or set their own price based on local viability evidence.

GLA Energy Assessment Guidance (June 2022) states that developments should use Part L 2021 of the Building Regulations when calculating emissions and demonstrating compliance with GLA energy planning policies.

1.2.2.3 London Plan (2021) Policy SI 3 Energy Infrastructure

Part A of Policy SI 3 states that development plans should identify any necessary energy infrastructure requirements and identify any nearby existing or proposed heating and cooling

networks. It outlines a heating hierarchy prioritising communal heating over individual building scale systems.

1.2.2.4 London Plan (2021) Policy SI 4 Managing Heat Risk

Part A states that: *Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure.*

Part B states that: *Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with a cooling hierarchy.*

GLA Energy Assessment Guidance (April 2020) provides further guidance regarding the cooling hierarchy in line with Policy SI 4.

1.2.2.5 Energy Assessment Guidance (June 2022)

An updated guidance document for the production of Energy Assessments was published by GLA in June 2022¹ to reflect the national policy updates and how these relate to the London Plan. The document includes updates to guidance, including:

- How London Plan policies apply now that Part L 2021 has taken effect;
- How to demonstrate carbon improvements from the 'be lean' stage of the hierarchy; and
- Requirement to report the Energy Use Intensity (EUI) and space heating demand of the development and explains how to report them;

The most significant elements of this update is the confirmation that the GLA expects developments to achieve the overall 35% onsite reduction and the 'be lean' reductions of 10% for residential and 15% for non-residential uses, against the new Part L 2021, which includes more stringent fabric standards, and as such an overall greater savings compared to previous guidance. However, a cover note² to the updated guidance confirms that it is expected this may be difficult to achieve for non-residential developments.

1.2.2.6 Be Seen Energy Monitoring Guidance (September 2021)

The GLA has published 'Be Seen' energy monitoring guidance document³ which sets out the requirements of London Plan Policy SI 2, including the expectations on planning applicants throughout the monitoring period. The final version was published for adoption in September 2021.

The Be Seen policy requires energy monitoring information to be reported to the GLA through the 'Be Seen' spreadsheet and webform.

1.2.2.7 Whole Life-Cycle Carbon Assessments Guidance (March 2022)

The GLA requires a separate Whole Life-Cycle Carbon Assessment report to be submitted to the GLA which considers both the embodied carbon and operational carbon expected to arise as a result of the Proposed Development.

1.2.2.8 The London Plan March 2021 Improving Air Quality

The London Plan requires proposals to address air quality risks as per Policy SI 1 Improving air quality. Alternatively, where an air quality assessment has been undertaken, this can be referenced.

1.2.3 Local policy drivers

1.2.3.1 London Borough of Haringey (LBH) Strategic Policies

The Haringey Strategic Policies 2013 – 2016 document (March 2013, consolidated with alterations since 2017) policies in terms of energy largely refer to the London Plan.

¹ GLA, June 2022; Energy Assessment Guidance. Available at: https://www.london.gov.uk/sites/default/files/gla_energy_assessment_guidance_june_2022_0.pdf

² GLA, 15th June 2022; Note to accompany GLA Energy Assessment Guidance 2022. Available at https://www.london.gov.uk/sites/default/files/energy_assessment_guidance_cover_note_june_2022_july_update.pdf

³ GLA, September 2021; 'Be Seen' energy monitoring guidance. Available at: ['Be seen' energy monitoring guidance | London City Hall](#)

Policy SP4 Working towards a low carbon Haringey requires that all new residential developments should be zero carbon from 2016 onwards and all non-residential developments should be zero carbon from 2019. It also states:

The Council will promote low- and zero-carbon energy generation through the following measures:

- 1. Requiring all developments to assess, identify and implement, where viable, site-wide and area-wide decentralised energy facilities including the potential to link into a wider network;*
- 2. Establishing local networks of decentralised heat and energy facilities by requiring developers to prioritise connection to existing or planned networks where feasible;*
- 3. Working with neighbouring boroughs and other partners to explore ways of implementing sub-regional decentralised energy networks including the potential in the Upper Lee Valley Opportunity Area; and*
- 4. All new developments are required, where viable, to achieve a reduction in predicted carbon dioxide emissions of 20% from on site renewable energy regeneration, which can include connections to local sources of decentralised renewable energy.*

1.2.3.2 LBH Development Management DPD

The Development Management DPD (adopted July 2017) policy DM22 covers decentralised energy. It confirms that *subject to other policy requirements, proposals that contribute to the provision and use of Decentralised Energy network infrastructure will be supported.*

In addition, policy DM21 outlines that new developments are expected to take measures to reduce carbon emissions and overheating in line with the energy and overheating hierarchies. It also confirms that where emissions targets cannot be fully met on site, offset payments may be considered.

1.2.3.3 Highgate School SPD

The Highgate School Supplementary Planning Document (March 2021) was developed “to help give more certainty to the local community about future development in the School’s estate”.

Paragraph 4.27 acknowledges that the mechanical and electrical systems of the school are in need of modernisation to make them more sustainable and energy efficient. It states that “*Whilst it would be desirable to establish a school-wide decentralised heat and energy facility, including the potential link into a wider network should one come forward, the fragmented nature of the School’s estate makes this unviable. The Council will assess the approach to energy and carbon conservation against policy on a site-by-site basis in the detailed planning application stage looking to make each building as energy efficient as possible.*”

Paragraph 5.26 confirms that the Council will support development which reduces energy demand and carbon emissions.

1.2.4 Summary of key energy targets

The key energy targets relevant to the Proposed Development are summarised as follows:

- Ensure that efficiency standards are sufficient to meet Part L 2021 Target Emission Rates prior to any allowance for low carbon or renewable energy supply options. Target 15% savings from energy efficiency;
- Achieve the 100% saving standard for non-residential buildings (including 35% on-site savings) by additional on-site savings and/or offsetting the remaining regulated CO₂ emissions through contribution to offset funds; and
- Where viable, achieve a 20% carbon saving from on-site renewable technologies.

1.2.5 London Borough of Haringey Quality Review Panel and Pre-Application Consultation

Highgate School have engaged with Haringey through a Quality Review Panel consultation. As described on Haringey's website, the QRP *"brings together a team of independent professionals from a range of backgrounds to scrutinise all major development proposals. The QRP advises applicants, council officers and the Planning Committee on their consideration of how well a development scheme is meeting the principles of the Haringey Development Charter (see Policy DM1 in Haringey's Development Management DPD)"*.

A Report of Formal Review Meeting: Dyne House, Highgate School dated 2nd February 2022 which included the following comments in relation to energy and low carbon design:

- *The decision to retain and remodel the structure of Dyne House provides a strong basis for the project's sustainability and low carbon design.*
- *There may be potential for a holistic energy strategy, exploring the re-use of waste heat.*
- *Although the school has a recently installed a gas heating system, the site should be future proofed for installation of more efficient systems such as heat pumps. Considering space requirements to allow this will be essential.*
- *While a 35 per cent reduction in CO₂ emissions beyond Building Regulation requirements is proposed, the panel would encourage the team to aim for a more ambitious target.*
- *The Department for Education's School Output Specification Generic Design Brief (November 2021) and Technical Annex 2H: Energy provide a useful benchmark for setting energy and sustainability targets.*
- *Both photovoltaic panels and biodiverse roofs are proposed, and achieving the ideal balance between these will need careful thought.*
- *South facing glazed corridors risk overheating and may benefit from greater solidity or shading.*

A further pre-application sustainability meeting was held 11th February 2022 where AECOM presented the sustainability strategy for Dyne House. Haringey provided a Pre-Application Planning Advice Note in response and the comment included the following specific items in relation to Dyne House:

- *Address how the noise from the classrooms to adjacent classrooms or properties is mitigated during hot weather.*
- *Submit a plan to show which spaces require mechanical cooling.*
- *Submit details of the mechanical cooling energy demand (kW h/m²/year), energy use, specification of equipment and efficiency, and how the cooling demand has been reduced as far as possible in line with the Cooling Hierarchy for those spaces.*
- *Submit a plan showing which areas will rely on passive/natural ventilation and how the strategy will work.*
- *Add commentary on why the roofs of buildings to rear will not be able to viably accommodate solar PV.*
- *Consider the potential solar gains of the front façade.*
- *Good to see the GSHP proposal, please ensure you provide the relevant spec and details for this in the application. Include detail on whether it will meet 100% of the space heating/hot water demand.*

2. Baseline CO₂ emissions and annual energy demand

2.1 Building energy modelling

The proposed development was modelled to establish baseline regulated carbon emissions. A copy of the GLA carbon reporting spreadsheet summary page is included in Appendix A and a full excel version has been submitted with this energy strategy.

The VE Compliance module of IES Virtual Environment version 2022.1 was used to establish the regulated Target Emission Rate (TER) of the new-build non-domestic elements of “a development that complies with Part L 2021 of the Building Regulations”, which is the baseline specified in 2022 GLA guidance on preparing energy assessments.

Unregulated emissions from electricity use were estimated using the equipment load prediction from the Building Regulations UK Part L (BRUKL) output sheet.

The treated floor area as modelled, the TER and resulting CO₂ emissions are set out in Table 1. Note that the definition of treated floor area for the purposes of Part L of the Building Regulations differs from the definitions of gross and net areas widely used for other purposes. For these reasons, the areas used for modelling will differ from the areas cited in other documents submitted as part of the planning application. The Design and Access Statement submitted with the planning application should be referred to for definitive gross and net areas for the proposed development.

Use	Total Floor Area (m ²)	TER (kgCO ₂ /m ² /year)	Carbon emissions (tCO ₂ /year)
Overall new-build	5,795.7	3.2	18.7

Table 1 Modelled baseline carbon emissions

The BRUKL output document for the building is included in Appendix B.

2.1.1 Carbon emissions baseline

The total regulated carbon emissions baseline for the proposed development was calculated to be 18.7 tCO₂/year (based on Part L 2021 carbon emissions factors). Additional unregulated emissions (e.g. from office, school and teaching equipment/appliances and similar plug-in loads) are calculated to be 24.2 tCO₂/year. Baseline emissions for the existing Site are summarised in Table 2.

	Site-wide carbon emissions (tCO ₂ /year)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	18.7	24.2

Table 2 Baseline carbon emissions

3. 'Be Lean' – Energy demand reduction

3.1 General approach

GLA Guidance on the Preparation of Energy Strategies states that a new development should exceed Building Regulations requirements (Part L 2021) through demand reduction measures alone. Non-domestic areas should aim for a 15% improvement from energy efficiency measures, as proposed in the London Plan 2021. To this end, consideration has been given to the passive design of the proposed development in order to target these requirements.

The passive design measures included in the proposed buildings are outlined in the Design and Access Statement, and include:

- Efficient building fabric with U-values optimised to reduce heating and cooling loads.
- Solar control glazing to optimise daylighting and thermal gains whilst minimising cooling demand.
- Service routes minimised to reduce heat loss.
- Solid panels and shading included in the building façade to manage solar gains.

The modelled glazed area of the façade (including underground areas) is 20.1%.

Energy efficient equipment has also been proposed where practicable, including energy efficient lighting and ventilation systems. The BRUKL input document is included in Appendix C and confirms the full specifications used when modelling the savings from energy efficiency. All proposed values meet or exceed the Part L2A minimum values. Table 3 outlines the key building fabric performance parameters included in the building energy modelling for the "be lean" stage.

Element	U-value (W/m ² K)	g-value (EN ISO 410)	Visible light transmittance
Roof	0.13	N/A	N/A
Exposed walls	0.15	N/A	N/A
Exposed floors and ground floors	0.13	N/A	N/A
Windows and glazed doors	1.20	0.29	0.60
Rooflights	1.80	0.40	0.71
Opaque vehicle access and similar large doors	1.50	N/A	N/A
Opaque pedestrian doors and high usage entrance doors	2.20	N/A	N/A

Table 3 Proposed building fabric performance

The approach taken to energy efficiency is to aim for a consistent incremental improvement across the majority of energy efficiency parameters, avoiding reliance on exceptionally demanding specifications for particular fabric or services elements, and retaining flexibility and scope for optimisation during detailed design. Consideration was also given to achieving a balance between reducing energy demands and the avoidance of overheating.

3.2 Carbon emissions – 'Be Lean'

Incorporating the energy efficiency measures summarised above, the regulated carbon emissions for the proposed development were calculated at the 'be lean' stage of the GLA energy hierarchy.

Incorporating the energy efficiency measures described above, the calculated regulated carbon emissions are 19.3 tCO₂/year, as shown in Table 4.

As summarised in Table 5 below, this represents an increase of 0.7 tCO₂/year or 4% from the baseline regulated emissions. Further details and explanation of this increase are provided in section 3.2.1.

	Carbon emissions for new building (tCO ₂ /year)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	18.7	24.2
After energy demand reduction	19.3	24.2

Table 4 Carbon emissions after demand reduction

	Regulated new-build carbon savings	
	(tCO ₂ /year)	(%)
Savings from energy demand reduction	-0.7	-4%

Table 5 Regulated carbon savings from energy efficiency

3.2.1 Modelling and design limitations – ‘Be Lean’

GLA planning policy encourages on-site regulated carbon savings of 15% against the baseline from energy efficiency measures alone (the ‘Be Lean’ stage). The proposed development does not achieve carbon savings over the Part L 2021. This is despite the proposed building having efficient building fabric and services. The main reason for this is the updates to the notional building in Part L 2021, which have been made to improve the overall performance of all buildings. In particular, the following changes to the Part L notional building have impacted the ability of the proposed building to meet Building Regulations through energy efficiency alone:

- Lighting in the notional building is now LED lighting, which matches the performance of efficient lighting options available. Lighting savings compared to the notional building are now more difficult to achieve than under Part L 2013. The proposed building has efficient lighting and controls including daylight dimming and PIR controls.
- Hot water provision for buildings without gas boilers now assumes that air source heat pumps provide some water heating. This gives the notional building a water heating efficiency greater than 1. In the proposed building, the main hot water demands are from toilets, which are spread through the building. For small, dispersed and intermittent hot water demands such as this, direct electric point of use water heating is preferable to heat pumps, eliminating storage and distribution losses. Direct electric water heating is proposed for the building. This means that the building has higher energy demand for hot water than the Part L notional building and therefore includes an increase in energy demand and associated emissions against the baseline.

The 2021 update to building regulations are aimed to improve efficiency across all new buildings in England. This important improvement has lowered the scope available for buildings to achieve improvements relative to the notional building and makes it difficult to meet building regulations through energy efficiency alone, or meet the GLA 15% “be lean” savings target. The GLA *Note to accompany GLA Energy Assessment Guidance 2022* acknowledges that non-domestic developments may find meeting the be lean targets difficult, but advises that applicants should follow the energy hierarchy to ensure that carbon savings are maximised. The proposed development provides efficient building fabric, in line with the energy hierarchy, to maximise available operational carbon savings.

3.3 Energy use intensity and space heating demand

AECOM calculated the energy use intensity using the GLA “be seen” methodology. Space heating demands were also calculated using the Part L modelling software. These are reported in Table 6.

Building Type	EUI (kW h/m ² /year)	Space heating demand (kW h/m ² /year)	Methodology used	Notes
School	79.1	50.1	Be seen/TM54	Re-use of constant air volume AHU equipment for the auditorium increases space heating demands (and therefore EUI) compared to variable systems. Current modelling also does not include recirculation of air which will be included in the design to reduce heating demand. This will be addressed to reduce energy consumption where possible during detailed design and will be included in later building energy modelling.

Table 6 Energy use intensity and space heating demand

4. Overheating risk analysis

In accordance with the GLA and Haringey guidance on preparing energy assessments, the overheating risk has been considered for the proposed development.

The building is a school building and has generally been designed to use natural ventilation. Wherever practical, passive solutions to minimise heat and solar gains to reduce overheating have been considered.

The cooling hierarchy has been considered in order to reduce the cooling loads where possible, as outlined below:

1. Minimising internal heat generation through energy efficient design:

- Where possible the heat distribution infrastructure within the proposed building has been designed to minimise pipe lengths.
- Efficient lighting has been specified which incorporates dimming in areas where there is sufficient daylight.

2. Reducing the amount of heat entering the building in summer:

- High performance solar control glazing has been specified which will reduce heat gains through windows.
- Vertical shading fins have been included to the western elevation to reduce solar gains.
- Building insulation reduces conductive heat gains.
- Green roofs and gardens increase albedo and provide a source of evaporative cooling.

3. Use of thermal mass and high ceilings to manage the heat within the building:

- The main tower of the building reuses the existing structure, which limits the scope to manage ceiling heights or to add additional thermal mass. The concrete frame will provide some limited thermal mass benefits when used in conjunction with the proposed night-time ventilation.

4. Passive ventilation:

- Natural ventilation is included to all spaces where possible.

5. Mechanical ventilation:

- In rooms where natural ventilation is not feasible, such as in music rooms (where openable windows could result in excessive unwanted noise), or rooms without windows, such as the auditorium, mechanical ventilation is proposed.

6. Active Cooling:

- Mechanical ventilation includes providing tempered air to rooms which would otherwise overheat, and providing active cooling to IT server rooms and the auditorium.

4.1 Overheating modelling

In line with GLA and Haringey policy, AECOM has undertaken thermal modelling in line with CIBSE TM52 for the proposed development.

Mitigation measures were tested and included in the proposed development to ensure that all spaces pass the CIBSE TM52 criteria for the London weather centre DSY1 2020 high emissions scenario 50th percentile weather file (as required in Haringey planning policy). Iterative steps were taken in line with the cooling hierarchy above to help mitigate overheating risk whilst avoiding unnecessary use of mechanical ventilation or cooling. This demonstrates compliance with Haringey and GLA policy.

In addition, the final design was also modelled using the DSY2 and DSY3 weather files. GLA and Haringey policy requires that buildings are modelled using these weather files, although compliance for all spaces is not required. Although some spaces continue to pass the criteria in TM52 under these weather files, some spaces fail.

As described above, measures to mitigate overheating risk have been introduced in line with the cooling hierarchy. This helps to reduce overheating risk even under the weather scenarios where some rooms will likely overheat on some days. In line with Haringey policy, the overheating report outlines some additional measures which could be retrofitted to the proposed building in future if further mitigation is required. These include:

- Installation of ceiling fans.
- Installation of phase-change MVHR units to provide passive temperature lopping.
- Further mechanical cooling.

The measures above could be included at a later stage if required, although some (fans and mechanical cooling) would involve an increase in the energy demands of the building and are therefore not proposed at this stage.

4.2 Overheating summary

The proposed development was modelled and assessed against the CIBSE TM52 overheating criteria using the DSY1, DSY2 and DSY3 criteria. An iterative process was followed to add in passive and active mitigation measures in line with the cooling hierarchy.

The proposed building passes the TM52 overheating criteria when modelled using the DSY1 weather file. This meets GLA and Haringey planning policy. In line with policy, the building was also modelled under DSY2 and DSY3 weather files. Some rooms fail when these weather files are used. Potential future retrofit options are included in the overheating report.

More information on overheating, including a copy of the overheating modelling results is included in the overheating report in Appendix E.

5. 'Be Clean' – Decentralised energy

5.1 Decentralised heat networks

The London Plan 2021 expects developers to consider carbon savings which are achievable through decentralised energy networks. Policy SI3 confirms that major development proposals within Heat Network Priority Areas should have a communal heating system. The heat source for the communal heating system should be selected in accordance with the following heating hierarchy:

1. Connect to local existing or planned heat networks;
2. Use zero-emission or local secondary heat sources (in conjunction with heat pump, if required);
3. Use low emission CHP (only where there is a case for CHP to enable the delivery of an area-wide heat network);
4. Use ultra-low NO_x gas boilers.

Relevant options for the proposed development are considered below in the context of these policies. The London Plan 2021 moves away from CHP as a preferred option as decarbonisation of grid electricity makes heat pump and other electric based technologies more favourable.

The current GLA guidance on preparing energy statements also outlines a hierarchy for selecting energy systems which can be summarised as follows:

1. Connection to an area wide heat network
2. Communal heating systems (Site wide or building level)
3. Individual heating systems.

The GLA guidance on preparing energy assessments refers to Part L 2021 and its associated carbon factors and are used for energy strategies. This report has followed the guidance and a move away from CHP technology has been reflected in this energy strategy.

5.1.1 Connection to existing or planned heat networks

The London Heat Map⁴ has been consulted in order to determine whether there are any existing or planned heat networks within the vicinity of the development. In the map extract in Figure 1 below, the site location is marked with a red star. The map shows that there are no existing heat networks in the vicinity of the proposed development (which would be shown in red if these were present). There are also no proposed networks (which would be shown in orange). The site lies on the boundary of the heat network priority area.

⁴ <https://maps.london.gov.uk/heatmap>

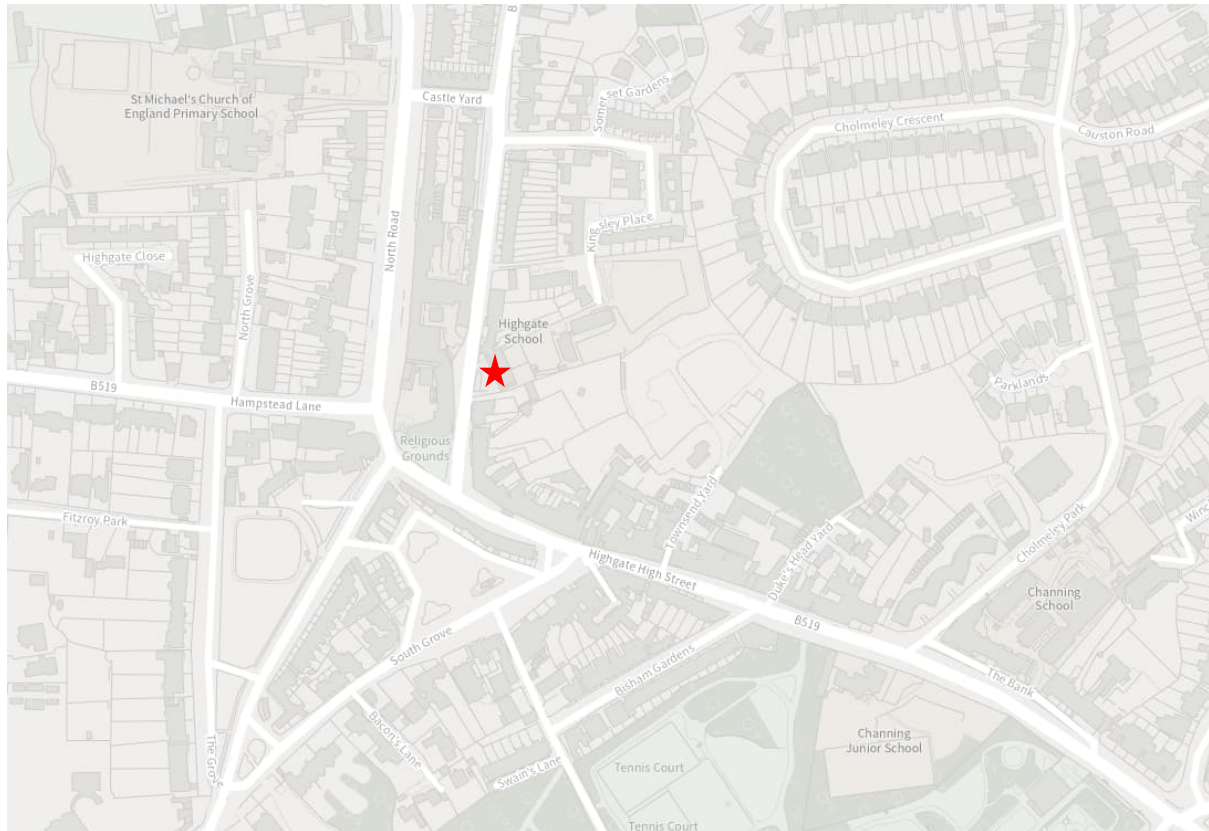


Figure 1 Extract from London Heat Map (the site is shown with a red star)

In addition to consulting the heat map, AECOM also contacted LBH to enquire as to whether there were any other networks near to the site which are not included in the heat map. A reply confirmed there are no nearby heat networks. A copy of the correspondence with LBH is included in Appendix F.

Connection to the wider school site was also considered for the proposed building. Connecting the wider school estate could provide opportunities to utilise waste heat from other buildings if this were available.

The buildings opposite Dyne House which form part of the school estate on the opposite side of Southwood Lane were considered to investigate if any were suitable for connection to Dyne House. The chapel, library, undercroft, central hall and entrance lodge are listed historic buildings, and no redevelopment of these buildings is planned. The science block (which is being considered under a separate planning application) is also within the curtilage of a listed building and therefore has limited scope for major aesthetic changes, such as additional insulation to allow low-temperature heat distribution. A lower temperature heat distribution system is proposed for Dyne House to maximise the operational efficiency of the ground source heat pumps. Space for plant in the science block is also limited, and it is expected that the proposed heat pumps for the science block will not be able to provide any heat for "export" to the proposed Dyne House site. Further, it is expected that the proposed ground source heat pump system for Dyne House (discussed in 6) will also have limited capacity to provide heat to other buildings due to the constrained nature of the site limiting borehole array size.

In addition, the addition of pipes to connect the proposed development to other school buildings would introduce distribution losses between the buildings which could be avoided by building-scale heating systems. Separate systems also simplify control of the system, which would otherwise be required to select between multiple heat sources.

The LBH Highgate School SPD acknowledges that connection of the school buildings together in a heat network is unviable. It states that *"Whilst it would be desirable to establish a school-wide decentralised heat and energy facility, including the potential link into a wider network should one come forward, the fragmented nature of the School's estate makes this unviable. The Council will assess the approach to energy and carbon conservation against policy on a site-by-site basis in the detailed planning application stage looking to make each building as energy efficient as possible."*

For the reasons outlined above, connection of the site to the wider school estate is not proposed. As described in 5.1.2, the proposed development is designed to have a building-scale heating system, and connection to wider heat networks is not considered likely to provide operational carbon benefits to this development.

5.1.2 Site-wide heat network

It is proposed that a building scale network is provided for the proposed development. A single heat network will serve the majority of the building. Some small spaces, such as stair wells, which cannot be efficiently reached by centralised systems will have direct electric heaters to provide heating whilst avoiding excessive heat losses delivering heat over long distances to meet small demands.

Access to the site for connection to a future district heating network is not easily available. Direct access to the proposed GSHP plant room (located close to the proposed borehole locations) from the main road would require passing pipes through the existing Dyne House structure, which is being retained. An alternative route via Kingsley Place would add a significant distance on to the required pipework.

In any case, as outlined in section 6, ground source heat pumps are proposed for the site, which are a low-carbon form of heating which will have reducing operational carbon emissions as the electricity grid decarbonises in future. Any potential heat network is unlikely to provide lower operational carbon emissions and the proposed development will not have significant amounts of heating available for export, weakening any case for connection to a wider network.

Based on the above, incorporating infrastructure to connect to a wider district heating network to the proposed development is not proposed. Instead, a building scale GSHP based system is proposed to provide long-term low-carbon operation.

5.2 Air Quality

The impacts of the development on local air quality have been considered during design. The Site falls within Haringey Air Quality Management Area (AQMA). An Air Quality Assessment has been prepared for the proposed development and is submitted with the planning application and should be consulted for more detailed information on air quality.

No combustion on Site is proposed for the normal regulated operation of the proposed development and this is expected to help to limit the negative impacts from the operation of the building on local air quality.

The Air Quality Assessment concludes that *"the proposed development is air quality neutral"*.

5.3 'Be Clean' results summary

Connection to district heating networks or installation of on-site CHP systems is not proposed for this Site. Therefore, the carbon savings for this stage of the energy hierarchy remain the same as after the 'Be Lean' stage. For completeness, the carbon emissions and savings for this stage of the energy hierarchy are shown in the following section.

5.3.1 Site carbon emissions – 'Be Clean'

After decentralised energy, the calculated regulated carbon emissions are 19.3 tCO₂/year, as shown in Table 7.

As summarised in Table 8, the proposed development achieved no carbon savings from CHP or district heat networks.

	Carbon emissions (tCO ₂ /year)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	18.7	24.2
After energy demand reduction ('Be Lean')	19.3	24.2
After heat network/CHP ('Be Clean')	19.3	24.2

Table 7 Carbon emissions after district heating

	Regulated carbon savings	
	(tCO ₂ /year)	(%)
Savings from energy demand reduction	-0.7	-4%
Savings from heat network/CHP	0	0%

Table 8 Regulated carbon savings from district heating

6. 'Be Green' – Renewable Energy

This section provides a summary of the feasibility assessment carried out into the options for incorporating low and zero carbon energy technologies into the proposed development and details the system which will be adopted.

6.1 Technology options appraisal

6.1.1 Scope

The London Plan states that within the framework of the energy hierarchy (Policy SI 2), major development proposals should provide a reduction in expected carbon emissions through the use of on-site renewable energy generation, where feasible. This section summarises the appraisal of renewable options that has been undertaken for the proposed development. The following technologies were considered:

- Photovoltaics (PV);
- Solar thermal water heating;
- Ground source heat pumps (GSHP);
- Air source heat pumps (ASHP);
- Biomass heating; and
- Wind turbines.

6.1.2 Feasibility Assessment

Photovoltaics

AECOM considered the potential to install PV on the roof of the proposed development. Avoiding overshadowing of a PV array is critical to its energy output, carbon savings, and cost-effectiveness, so the first step in assessing PV options for a site is to identify suitable unshaded locations to mount PV panels.

An area on the roof of the tallest section of Dyne House was identified as suitable for PV panels. Other areas to the east of the building are significantly lower and would be shaded by taller parts of the building, or by nearby buildings and trees. The eastern part of the building slopes significantly away from the main road and is flanked by trees to the south which would shade panels installed on this part of the building.

Figure 2 shows the proposed location of the PV panels on the roof of the western part of the building.

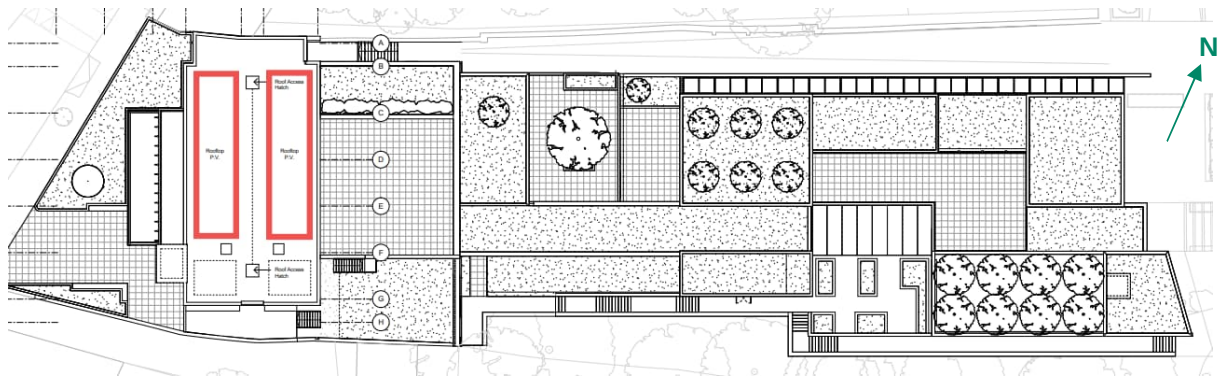


Figure 2 Proposed PV location (red outline). North direction is approximate.

It is estimated that the available roof areas identified could accommodate approximately 76 m² of PV panels, at an orientation of 156° from north.

The electricity generation of the proposed PV array was modelled using the Part L compliance software. The performance and assumptions of the proposed system are summarised in Table 9.

Item	Value
PV module nominal efficiency (%)	21
Nominal cell temperature (NOCT) (°C)	45
Reference irradiance for NOCT (W/m²)	800
Temperature coefficient for module efficiency (1/κ)	0.004
Electrical conversion efficiency	0.97
Area of panels (m²)	76
Azimuth (° clockwise from north)	156
Inclination (° from horizontal)	10
Annual electricity generation (kW h)	13,736
Annual carbon savings (tCO₂/year)	1.9
Annual carbon savings (%)	10%

Table 9 PV summary

AECOM found that a PV array of approximately 76 m² of panel area could produce, 13,736 kW h of electricity per year, saving approximately 1.9 tCO₂/year.

Solar thermal water heating

PV has been proposed for the building and solar thermal water heating would compete with PV for the available roof space with PV. Hot water demand is limited to toilet areas in the building and is expected to be relatively small. It is intended that hot water is provided by point of use water heaters to avoid unnecessary storage and distribution losses. PV panels generate electricity which could be used to provide electricity for water heating, as well as for other building electricity demands. PV panels can also export energy over summer and weekends when the school building is likely to be unused and therefore have no demand for heating or hot water.

Accommodating the inclusion of solar thermal collectors would also require additional infrastructure and plant space. As the site has a significant regulated and unregulated electricity load, it is judged that PV would be more suitable for the proposed development than solar thermal water heating.

It is considered that no further study of solar thermal water heating is warranted at this stage as PV is preferred over solar thermal water heating.

Heat pumps

Water source heat pumps

There are no significant bodies of water nearby to the site which could be used for water source heat pumps.

Ground source heat pumps

Ground source heat pump (GSHP) technology could be used to provide heating and cooling to the proposed building. AECOM investigated the potential to incorporate GSHP technology into the proposed development.

Closed loop GSHP systems were investigated by AECOM for their potential to provide heating and cooling to the building. Absorber loops could be installed under the parade ground. AECOM contacted Genius Energy Lab, a GSHP designer, to assess the amount of heating and cooling a GSHP system could provide to the proposed development. Genius Energy Lab confirmed that a system could meet the entire heating needs of the building. Figure 3 shows the proposed borehole locations for the site. Final quantity and locations of boreholes will be dependent upon ground conditions which will be determined by a borehole specialist.

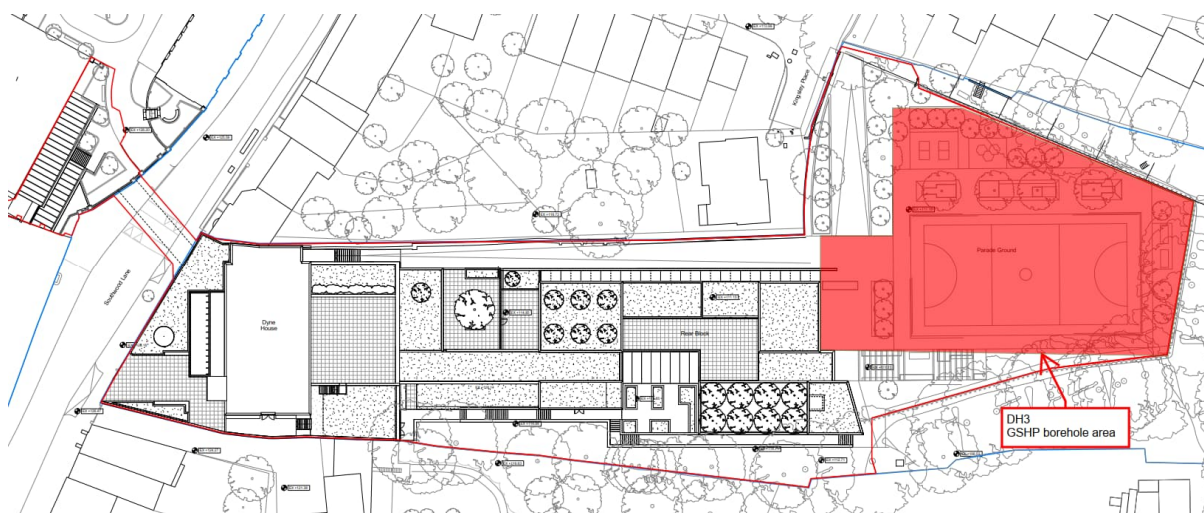


Figure 3 Proposed borehole location under the parade ground (shown in red shading)

The proposed system is to be an unbalanced system, as the building has a significantly larger heating demand than cooling demand. Unbalanced systems used primarily for heating generally cool the ground by 1-2°C before the ground temperature stabilises. The design of the proposed system will take into account building energy demands and ground conditions to ensure that the ground is not excessively cooled by the proposed system and that the proposed efficiencies are maintained. It is proposed that the AECOM MEP team undertake detailed design, incorporating the Ground Source Heat Pump Association's Vertical Borehole Standard and Good Practice Guide to ensure that the GSHP remains efficient long-term.

Detailed source and sink temperatures are not available at this stage of design. AECOM proposed SCoP and SEER values to Genius Energy Lab who confirmed that these are realistic estimates at this stage and that it is expected that these values can be improved upon during detailed design. Proposed GSHP efficiencies are shown in Table 10.

Parameter	Value
GSHP CoP (heating)	3.5
GSHP SEER (cooling)	5.0

Table 10 GSHP performance

Thermal stores will be optimised during detailed design to increase system efficiency.

Air source heat pumps

It is expected that the GSHP system will be able to meet all of the heating and cooling demands of the proposed building. Ground source heat pumps are generally more efficient than air source heat pumps so would be preferred in terms of operational carbon performance. In addition, the project team are aware of potential sensitivities to noise from external plant from neighbours and equipment which can utilise indoor plant is therefore preferred.

For the above reasons, AECOM judged that no further investigation of air source heat pumps was warranted.

Heat pump carbon savings

Adding the GSHP system as described above into the energy modelling for the site, the energy and carbon savings were calculated using the BER calculated after the incorporation of the ground source heat pumps and comparing this to the TER of the baseline building. This allows for carbon savings from the proposed heat pump efficiency improvements over the baseline building to be estimated. The calculated carbon savings from heat pumps for the proposed development is shown in Table 11.

Parameter	Value
CO ₂ savings from heat pumps (tCO ₂ /year)	0.4
CO ₂ savings from heat pumps (%)	2.2%

Table 11 Heat pump carbon savings

AECOM found that using a GSHP system to meet the heating and cooling demand for the development could save approximately 0.4 tCO₂/year.

Biomass heating

Biomass heating is expected to have unacceptable local air quality impacts. In addition, the site does not have sufficient space for storage of the required fuel and deliveries to the site would generate unnecessary vehicle journeys onto already congested central London roads. Based on the above, AECOM judged that no further investigation of biomass heating was warranted.

Wind turbines

A rule of thumb is that to make operational and financial sense micro-wind systems need to be sited in locations with an annual average wind speed of at least 5 m/s. This condition is rarely met in urban areas. In any case, it is likely that a wind turbine would have unacceptable visual impacts. For these reasons, AECOM judged that no further investigation of wind turbines was warranted.

6.2 Carbon emissions – ‘Be Green’

Ground source heat pumps and photovoltaic panels are proposed for the site. The carbon savings from the inclusion of renewable technologies (for the ‘Be Green’ stage of the energy hierarchy) are summarised in this section.

Incorporating the heat pump and PV technology described above, the calculated regulated carbon emissions for the proposed development are 17.1 tCO₂/year, as shown in Table 12.

As summarised in Table 13 below, this represents a saving of 2.3 tCO₂/year or 12% of baseline regulated emissions achieved by installing renewable technologies on site.

	Carbon emissions for new buildings (tCO ₂ /year)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	18.7	24.2
After energy demand reduction	19.3	24.2
After heat network/CHP	19.3	24.2
After renewable energy	17.1	24.2

Table 12 Carbon emissions after renewable energy

	Regulated non-domestic carbon savings	
	(tCO ₂ /year)	(%)
Savings from energy demand reduction	-0.7	-4%
Savings from heat network/CHP	0.0	0%
Savings from renewable energy	2.3	12%

Table 13 Regulated carbon savings from renewable energy

6.3 Energy monitoring – ‘Be Seen’

A separate Be Seen report has been produced by AECOM and should be referred to for compliance with the GLA Be Seen guidance.

7. Flexibility and peak energy demand

The London Plan 2021 policies SI 2 and SI 3 encourage developments to minimise both annual and peak energy demand. This section outlines the measures taken to reduce peak energy demand and increase energy flexibility in the proposed development.

Table 14 outlines the site-wide peak demand, capacity, and flexibility potential for the proposed development.

	Electrical	Heat	Enabled through...
Estimate peak demand (MW)	0.354	Note 2	Realistic estimates of demand profiles and peak demand. ^{Note 1}
Available capacity (MW)	TBC	N/A	Early engagement with the DNO or IDNO to establish available capacity. ^{Note 3}
Flexibility potential (MW)	0.008	N/A	Modelling of flexibility using demand profiles. ^{Note 4}
Revised peak demand (MW)	0.346	N/A	Revision to peak demand considering available capacity, engagement with third parties and flexibility potential. ^{Note 5}
Percentage flexibility predicted (%)	2.3%	N/A	Calculations from flexibility potential as a proportion of peak demand.
<i>Notes:</i> 1. Estimated from current MEP design at this stage. Calculated peak loads accounts for measures already included in design, including reduced demands due to heat pumps, DHW storage and improved building fabric performance. 2. As the proposed development is designed to produce heat from electricity, the heating figures are not relevant and heat demand is included in the electrical demand column – in line with the GLA guidance document. 3. Discussions with the DNO have not taken place at this stage. The site has an existing supply which is expected to be increased through the provision of a new sub-station to increase the available supply capacity. Discussions will take place with the DNO at an appropriate stage of design once the building energy demands can be more reliably predicted. 4. Flexibility potential has been calculated including 50% of peak PV generation. 5. The current peak demand estimate already accounts for reduced peak demands from building fabric and services efficiency, use of GSHPs and DHW stores. Additional flexibility is estimated through an estimation of the PV contribution.			

Table 14 Summary of site-wide peak demand, capacity and flexibility potential

A number of measures are included in the building to reduce peak energy demand. Passive design measures as outlined in previous sections reduce overall energy demands, in turn reducing peak demand. In addition, a number of additional measures further reduce peak demand. These are summarised in Table 15.

Flexibility achieved through	Yes/No	Details
Electrical energy storage (kW h) capacity	No	No electrical energy storage is proposed.
Heat energy storage (kW h) capacity	Yes	DHW storage is included allowing hot water to be generated gradually, further contributing to reducing peak demands. Thermal stores will be optimised during detailed design to reduce peak demands.
Renewable energy generation (load matching)	Yes	Photovoltaic (PV) panels on the roof help meet the peak electrical demand of the building, reducing the draw from the network. Use of heat pumps over direct electrical systems reduce the peak demands for electricity to provide heating. Efficiencies of heating and cooling systems will be maximised to reduce annual and peak energy demand.
Gateway to enable automated demand response	No	Not included – the building demands are relatively small and there is not scope in the proposed systems to include this.
Smart systems integration (e.g. smart charge points for EV, gateway etc.)	No	Not included.

Table 15 Summary of peak demand flexibility interventions

8. Conclusion

8.1 Baseline

The proposed development was modelled to establish baseline regulated carbon emissions. The building was modelled using Building Regulations Part L 2021 compliant software.

An estimate of unregulated electricity use and the associated carbon emissions was also made.

The regulated baseline carbon emissions were calculated to be 18.7 tCO₂/year. The site-wide unregulated emissions were calculated to be 24.2 tCO₂/year.

8.2 'Be Lean' – Energy demand reduction

The passive design measures included in the proposed building are outlined in the Design and Access Statement which is submitted in support of the planning application and summarised in Section 3.1.

The approach taken to energy efficiency is to aim for a consistent incremental improvement across the majority of energy efficiency parameters, avoiding reliance on exceptionally demanding specifications for particular fabric or services elements, and retaining flexibility and scope for optimisation during detailed design. Consideration was also given to achieving a balance between reducing energy demands and the avoidance of overheating.

Based on the proposed fabric and energy efficiency measures, the regulated carbon emissions were calculated to be 19.3 tCO₂/year. This represents a small increase from the baseline of 4%. The reasons for this increase despite the good building fabric and services specifications are outlined in Section 3.2.1.

8.3 'Be Clean' – District heating

A review of the London Heat Map indicates that the site lies on the boundary of the heat network priority area, but there are no existing district heat networks near to the site. The absence of nearby networks was also confirmed by LBH.

Consideration was given to connecting to the wider school site, but it was judged that this was not suitable due to plant space requirements and the introduction of additional heat losses.

On-site CHP is no longer a low carbon option and was not considered suitable for the site.

As no connection to a district heating network or on-site CHP system is proposed, no carbon savings are reported from the 'Be Clean' stage of the energy hierarchy.

8.4 'Be Green' - Renewable energy generation

A feasibility assessment of low and zero carbon technology options for the site found GSHP and PV panels to be suitable for the site. Other technologies were ruled out due to site constraints, air quality, noise and access issues or incompatibility with the preferred options.

Ground source heat pumps are proposed to provide heating and cooling to the building. Detailed design will ensure that the ground temperature is not excessively lowered and that good efficiency can be maintained. The hot water demand is generally limited to toilet areas and will be met by point of use electric water heaters to reduce storage and distribution losses. Calculations at this stage suggest that the proposed heat pump systems could save approximately 0.4 tCO₂/year, which is 2.2% of regulated baseline emissions.

An area of roof suitable for approximately 76 m² of PV panels was identified on the proposed building. It was calculated that a PV array on this roof area could supply approximately 13,736 kW h of electricity per year, with a carbon saving of 1.9 tCO₂/year, which is 10% of baseline regulated emissions.

The regulated carbon emissions after the 'Be Green' stage of the energy hierarchy were calculated to be 17.1 tCO₂/year.

The above emissions represent a saving against the baseline of 12% from the 'Be Green' stage of the energy hierarchy.

8.5 Energy monitoring – 'Be Seen'

A separate Be Seen report has been produced by AECOM and should be referred to for compliance with the GLA Be Seen guidance.

8.6 Carbon offsetting

In order to meet the GLA carbon reduction target of 100% of baseline regulated emissions for non-residential developments, it will be necessary to offset the residual regulated carbon emissions. Over a 30-year period it is estimated that the cumulative shortfall would be 512 tCO₂. This would result in an estimated payment of approximately £48,645 at the GLA carbon offset price of £95/tonne. This is subject to agreement with LBH.

8.7 Proposed energy strategy

The proposed energy strategy for the proposed development is:

1. Energy efficient fabric and buildings services design;
2. A GSHP system to provide heating and cooling;
3. A PV array on the roof of the building.

The carbon emissions at each stage in the energy hierarchy are summarised below.

Figure 4 shows the carbon baseline, and emissions and savings with the proposed energy strategy, at each step in the energy hierarchy. Calculations at this stage suggest this strategy would save 1.6 tCO₂/year, which is 9% of the baseline emissions of 18.7 tCO₂/year. This is also summarised in Table 16 and Table 17.

	Carbon emissions for new buildings (tCO ₂ /year)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	18.7	24.2
After energy demand reduction	19.3	24.2
After heat network/CHP	19.3	24.2
After renewable energy	17.1	24.2

Table 16 Carbon emissions after each stage of the energy hierarchy

Regulated new-building carbon savings		
	(tCO ₂ /year)	(%)
Savings from energy demand reduction	-0.7	-4%
Savings from heat network/CHP	0.0	0%
Savings from renewable energy	2.3	12%
Total cumulative savings	1.6	9%

Table 17 Regulated carbon savings from each stage of the energy hierarchy

The shortfall in savings relative to the 'zero carbon' 100% regulated emission saving target is 17.1 tCO₂/year, which is a cumulative total over 30 years of 512 tCO₂ that is expected to be addressed through offsetting. This results in an estimated carbon offset payment of approximately £48,645, subject to agreement with LBH. This is summarised in Table 18 and Figure 4.

	Annual (tCO ₂)	Cumulative shortfall (tCO ₂)
Total Target Savings	18.7	-
Shortfall	17.1	512
Cash in-lieu contribution (£)	-	£48,645

Table 18 Carbon savings shortfall and offset payment

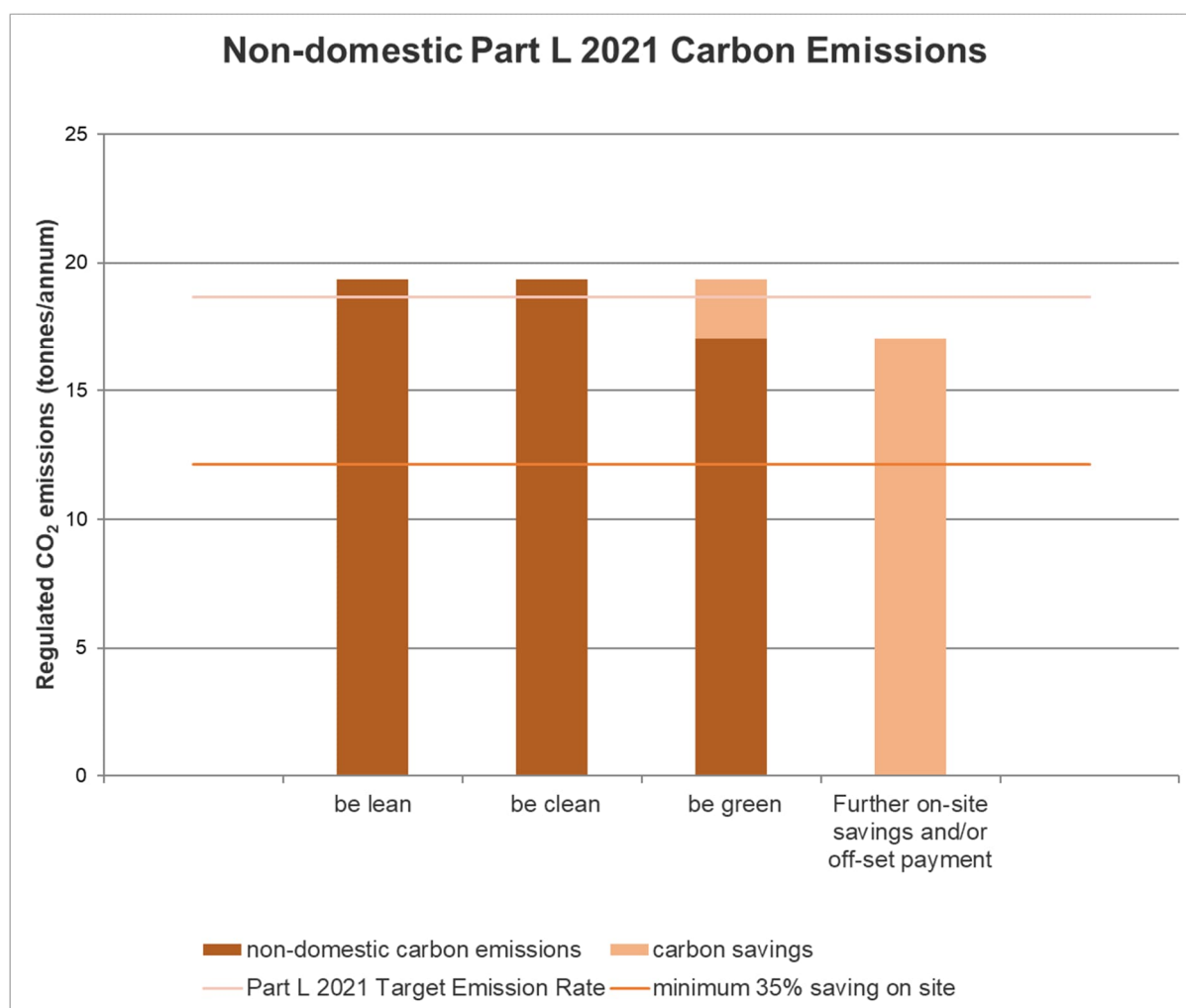


Figure 4 Proposed energy strategy: Energy Hierarchy CO₂ baseline, emissions and savings

8.7.1 Comparison with carbon saving targets

8.7.1.1 'Be Lean' target

GLA planning policy encourages on-site regulated carbon savings of 15% against the baseline from energy efficiency measures alone (the 'Be Lean' stage). The proposed development does not achieve carbon savings over the Part L 2021. This is despite the proposed building having efficient building fabric and services. The main reason for this is the updates to the notional building in Part L 2021, which have been made to improve the overall performance of all buildings. In particular, the following changes to the Part L notional building have impacted the ability of the proposed building to meet Building Regulations through energy efficiency alone:

- Lighting in the notional building is now LED lighting, which matches the performance of efficient lighting options available. Lighting savings compared to the notional building are now more difficult to achieve than under Part L 2013. The proposed building has efficient lighting and controls including daylight dimming and PIR controls.
- Hot water provision for buildings without gas boilers now assumes that air source heat pumps provide some water heating. This gives the notional building a water heating efficiency greater than 1. In the proposed building, the main hot water demands are from toilets, which are spread through the building. For small, dispersed and intermittent hot water demands such as this, direct electric point of use water heating is preferable to heat pumps, eliminating storage and distribution losses. Direct electric water heating is proposed for the building. This means that the building has higher energy demand for hot water than the Part L notional building and therefore includes an increase in energy demand and associated emissions against the baseline.

The 2021 update to building regulations are aimed to improve efficiency across all new buildings in England. This important improvement has lowered the scope available for buildings to achieve

improvements relative to the notional building and makes it difficult to meet building regulations through energy efficiency alone, or meet the GLA 15% “be lean” savings target. The *GLA Note to accompany GLA Energy Assessment Guidance 2022* acknowledges that non-domestic developments may find meeting the be lean targets difficult, but advises that applicants should follow the energy hierarchy to ensure that carbon savings are maximised. The proposed development provides efficient building fabric, in line with the energy hierarchy, to maximise available operational carbon savings.

8.7.1.2 ‘Be Green’ target

GLA planning policy encourages on-site regulated carbon savings of 35% against the baseline after the ‘Be Green’ stage. This has proved difficult to achieve for the proposed development. This is due in part to the difficulties and modelling limitations in meeting the “be lean” target described above.

The development achieves regulated carbon savings of 12% from low or zero carbon technologies, namely ground source heat pumps and PV panels. The heating and cooling demands of the proposed building are met using heat pumps. As discussed in section 3.2.1 and above, point of use water heaters are proposed as hot water demands are generally limited to toilet areas.

After heating, cooling and hot water generating technologies are applied to the building heating, cooling and DHW demands, the remaining energy uses can only be decarbonised further through electricity generating technologies. As outlined in section 6, the only suitable energy generating technology for the site is PV panels. An area of building roof on the main Dyne House building was identified as the only suitable area for PV panels. Panels have been included on this part of the building. Further electricity generation (and therefore carbon savings) is therefore not possible using available suitable technologies.

The *GLA Note to accompany GLA Energy Assessment Guidance 2022* acknowledges that non-domestic developments may find meeting the overall carbon savings targets difficult, but advises that applicants should follow the energy hierarchy to ensure that carbon savings are maximised. The proposed development includes appropriate low and zero carbon technologies, in line with the energy hierarchy, to maximise available operational carbon savings

Appendix A GLA Carbon Reporting Spreadsheets

A full Microsoft Excel copy of the GLA carbon reporting spreadsheet has been submitted with this assessment.

Part L 2021 Performance

Residential

Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for residential buildings

	Carbon Dioxide Emissions for residential buildings (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	0.0	
After energy demand reduction (be lean)	0.0	
After heat network connection (be clean)	0.0	
After renewable energy (be green)	0.0	

Table 2: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for residential buildings

	Regulated residential carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)
Be lean: savings from energy demand reduction	0.0	0%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.0	0%
Cumulative on site savings	0.0	0%
Annual savings from off-set payment	0.0	-
(Tonnes CO ₂)		
Cumulative savings for off-set payment	0	-
Cash in-lieu contribution (£)	0	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development'

Non-residential

Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for non-residential buildings

	Carbon Dioxide Emissions for non-residential buildings (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	18.7	24.2
After energy demand reduction (be lean)	19.3	24.2
After heat network connection (be clean)	19.3	24.2
After renewable energy (be green)	17.1	24.2

Table 4: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for non-residential buildings

	Regulated non-residential carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)
Be lean: savings from energy demand reduction	-0.7	-4%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	2.3	12%
Total Cumulative Savings	1.6	9%
Annual savings from off-set payment	17.1	-
(Tonnes CO ₂)		
Cumulative savings for off-set payment	512	-
Cash in-lieu contribution (£)	48,645	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development'

Appendix B BRUKL output documents

Project name

Dyne House inc. Island - Be Lean

As designed

Date: Mon Aug 22 09:06:31 2022

Administrative information

Building Details

Address:

Certifier details

Name: AECOM

Telephone number: 0113 301 8400

Address: 2 City Walk, Leeds, LS11 9AR

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.16

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.16

BRUKL compliance module version: v6.1.c.0

Foundation area [m²]: 580.79The CO₂ emission and primary energy rates of the building must not exceed the targets

The building does not comply with England Building Regulations Part L 2021

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	3.22
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	3.34
Target primary energy rate (TPER), kWh/m ² annum	34.4
Building primary energy rate (BPER), kWh/m ² annum	35.74
Do the building's emission and primary energy rates exceed the targets?	BER > TER BPER > TPER

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

Fabric element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.15	0.15	01000002:Surf[2]
Floors	0.18	0.13	0.13	01000007:Surf[0]
Pitched roofs	0.16	-	-	No Pitched roofs in building
Flat roofs	0.18	0.13	0.13	01000002:Surf[1]
Windows** and roof windows	1.6	1.2	1.2	01000002:Surf[6]
Rooflights***	2.2	1.8	1.8	03000009:Surf[1]
Personnel doors^	1.6	1.78	2.2	01000000:Surf[7]
Vehicle access & similar large doors	1.3	-	-	No Vehicle access doors in building
High usage entrance doors	3	-	-	No High usage entrance doors in building

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

* 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.

*** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

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

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	3

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

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

1- Radiators only

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.78	-	0.2	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- Radiators with Extract

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.78	-	0.2	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

3- FCU

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.78	5	0	1.4	0.89
Standard value	2.5*	4.5**	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					
** Standard shown is for air-cooled chillers >=400 kW. For chillers <400 kW, limiting SEER is 4.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

4- Radiators with MVHR

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.78	-	0.2	-	0.89
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

5- VAV (existing areas)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.78	5	0	1.4	0.89
Standard value	2.5*	4.5**	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					
** Standard shown is for air-cooled chillers >=400 kW. For chillers <400 kW, limiting SEER is 4.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

6- Radiators with S&E (AHU)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.78	-	0.2	-	0.89
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

7- Temperature lopping

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.78	5	0	1.4	0.89
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

8- Elec Panel heaters (with MV)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	0.2	-	0.89
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
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 balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

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	2.3	2	0.5	0.5	0.4	1		
-01 Control Room		-	-	-	-	-	-	-	0.2	-	-	N/A
-02 Electronic library		-	-	-	0.8	-	-	-	-	-	-	N/A
-02 Existing Recital Room		-	-	-	0.8	-	-	-	-	-	-	N/A
-03 Quiet Study Area		-	-	-	0.8	-	-	-	-	-	-	N/A
-03 Quiet Study area 01		-	-	-	0.8	-	-	-	-	-	-	N/A
-03_Seminar room 01		-	-	-	0.8	-	-	-	-	-	-	N/A
-03_Seminar room 02		-	-	-	0.8	-	-	-	-	-	-	N/A
-03_Seminar room 03		-	-	-	0.8	-	-	-	-	-	-	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	2.3	2	0.5	0.5	0.4	1	Zone	Standard
-03_Seminar room 04	-	-	-	0.8	-	-	-	-	-	-	N/A
-03_Seminar room 05	-	-	-	0.8	-	-	-	-	-	-	N/A
-03_Seminar room 06	-	-	-	0.8	-	-	-	-	-	-	N/A
-03_Seminar room 07	-	-	-	0.8	-	-	-	-	-	-	N/A
-03_Seminar room 08	-	-	-	0.8	-	-	-	-	-	-	N/A
-03_Seminar room 09	-	-	-	0.8	-	-	-	-	-	-	N/A
-03_Seminar room 10	-	-	-	0.8	-	-	-	-	-	-	N/A
-03_Seminar room 11	-	-	-	0.8	-	-	-	-	-	-	N/A
-03_Seminar room 12	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Break Out 01	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Break Out 02	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Break Out 03	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Break Out 04	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Break Out Space 01	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Break Out Space 02	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_EP 01	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_EP 02	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_EP 03	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_EP 04	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_EP 05	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Head Music Office 01	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Head Music Office 02	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Music Director Office	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Music Staff Office	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Music Teaching	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Music Teaching 01	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Music Teaching 02	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Visiting Staff Base	-	-	-	0.8	-	-	-	-	-	-	N/A
-05 Band Practice	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 Control Room	-	-	-	-	-	-	-	0.2	-	-	N/A
-05 Keyboard Classroom	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 Music Library	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 Music Recording Studio	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 01	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 02	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 03	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 04	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 05	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 06	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 07	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 08	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 08	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 09	-	-	-	1.4	-	-	-	-	-	-	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	2.3	2	0.5	0.5	0.4	1	Zone	Standard
-05 SP 11	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 12	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 13	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 14	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 15	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 16	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 17	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 18	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 19	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 20	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 21	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 22	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 23	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 24	-	-	-	1.4	-	-	-	-	-	-	N/A
00_Cafe/Food Court	-	-	-	0.8	-	-	-	-	-	-	N/A
01_Collaborative Area	-	-	-	0.8	-	-	-	-	-	-	N/A
01_Departmental Staff Base	-	-	-	0.8	-	-	-	-	-	-	N/A
01_Meeting Room 02	-	-	-	0.8	-	-	-	-	-	-	N/A
01_Seminar Room 09	-	-	-	0.8	-	-	-	-	-	-	N/A
01_Seminar Room 10	-	-	-	0.8	-	-	-	-	-	-	N/A
02_Flexible Seminar Room 05	-	-	-	0.8	-	-	-	-	-	-	N/A
02_Flexible Seminar Room 06	-	-	-	0.8	-	-	-	-	-	-	N/A
02_IT Study Area	-	-	-	-	-	-	-	0.2	-	-	N/A
02_Meeting Room	-	-	-	0.8	-	-	-	-	-	-	N/A
02_Sixth Form Staff Office - UCAS	-	-	-	0.8	-	-	-	-	-	-	N/A
03_Computer Studies	-	-	-	-	-	-	-	0.2	-	-	N/A
03_Departmental Staff Base	-	-	-	0.8	-	-	-	-	-	-	N/A
03_Flexible Seminar Room 03	-	-	-	0.8	-	-	-	-	-	-	N/A
03_Flexible Seminar Room 04	-	-	-	0.8	-	-	-	-	-	-	N/A
03_Meeting Room	-	-	-	0.8	-	-	-	-	-	-	N/A
04_Collaborative Area	-	-	-	0.8	-	-	-	-	-	-	N/A
04_Flexible Seminar Room 01	-	-	-	0.8	-	-	-	-	-	-	N/A
04_Flexible Seminar Room 02	-	-	-	0.8	-	-	-	-	-	-	N/A
04_Meeting Room	-	-	-	0.8	-	-	-	-	-	-	N/A
04_Seminar Room 01	-	-	-	0.8	-	-	-	-	-	-	N/A
04_Seminar Room 02	-	-	-	0.8	-	-	-	-	-	-	N/A
04_Seminar Room 03	-	-	-	0.8	-	-	-	-	-	-	N/A
04_Sixth Form Staff Office - Senior Staff	-	-	-	0.8	-	-	-	-	-	-	N/A
Island_Female WCs	-	-	-	1.4	-	-	-	-	-	-	N/A
Island_Male WCs	-	-	-	1.4	-	-	-	-	-	-	N/A
Island_AWC	-	-	-	1.4	-	-	-	-	-	-	N/A

General lighting and display lighting		General luminaire		Display light source	
Zone name		Efficacy [lm/W]		Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95		80	0.3
-01 Auditorium Lobby		95		-	-
-01 Auditorium Plant Room		95		-	-
-01 Control Room		95		-	-
-01 Disabled WC		95		-	-
-01 Female WC		95		-	-
-01 L-01 Circulation		95		-	-
-01 L-01 Stair 01		95		-	-
-01 Male WC		95		-	-
-01 Plant		95		-	-
-01 Storage		95		-	-
-02 Auditorium Storage and Stage Circulation		95		-	-
-02 Electronic library		95		-	-
-02 Existing Auditorium		95		-	-
-02 Existing Recital Room		95		-	-
-02 L-02 Circulation (including bridge link)		95		-	-
-02 L-02 Circulation 2		95		-	-
-02_Stair Circulation		95		-	-
-02_STR 03		95		-	-
-03 Quiet Study Area		95		-	-
-03 Quiet Study area 01		95		-	-
-04_STR		95		-	-
-03_A WC		95		-	-
-03_Circulation 01		95		-	-
-03_Circulation 02		95		-	-
-03_Comms Room		95		-	-
-03_CS		95		-	-
-03_F WC		95		-	-
-03_Lobby 1		95		-	-
-03_Lobby 2		95		-	-
-03_M WC		95		-	-
-03_Seminar room 01		95		-	-
-03_Seminar room 02		95		-	-
-03_Seminar room 03		95		-	-
-03_Seminar room 04		95		-	-
-03_Seminar room 05		95		-	-
-03_Seminar room 06		95		-	-
-03_Seminar room 07		95		-	-
-03_Seminar room 08		95		-	-
-03_Seminar room 09		95		-	-
-03_Seminar room 10		95		-	-
-03_Seminar room 11		95		-	-
-03_Seminar room 12		95		-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
-03_Stair 04		95	-	-
-03_STR 03		95	-	-
-03_WC Lobby		95	-	-
-04_Break Out 01		95	-	-
-04_Break Out 02		95	-	-
-04_Break Out 03		95	-	-
-04_Break Out 04		95	-	-
-04_Break Out Space 01		95	-	-
-04_Break Out Space 02		95	-	-
-04_Circulation		95	-	-
-04_CS		95	-	-
-04_EP 01		95	-	-
-04_EP 02		95	-	-
-04_EP 03		95	-	-
-04_EP 04		95	-	-
-04_EP 05		95	-	-
-04_General Storage		95	-	-
-04_Head Music Office 01		95	-	-
-04_Head Music Office 02		95	-	-
-04_Lobby 01		95	-	-
-04_Lobby 02		95	-	-
-04_Music Director Office		95	-	-
-04_Music Staff Office		95	-	-
-04_Music Teaching		95	-	-
-04_Music Teaching 01		95	-	-
-04_Music Teaching 02		95	-	-
-04_Plant		95	-	-
-04_STR-04		95	-	-
-04_Visiting Staff Base		95	-	-
-04_WC		95	-	-
-05 AWC		95	-	-
-05 Band Practice		95	-	-
-05 Circulation		95	-	-
-05 Circulation 02		95	-	-
-05 Circulation 03		95	-	-
-05 Control Room		95	-	-
-05 CS		95	-	-
-05 Disabled WC		95	-	-
-05 F-WC		95	-	-
-05 General Storage		95	-	-
-05 Keyboard Classroom		95	-	-
-05 Large Practice		95	-	-
-05 Lobby		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
-05 Lobby 01		95	-	-
-05 Lobby 02		95	-	-
-05 Lobby 03		95	-	-
-05 LP Store		95	-	-
-05 M-WC		95	-	-
-05 Music Instrument Store		95	-	-
-05 Music IT		95	-	-
-05 Music Library		95	-	-
-05 Music Recording Studio		95	-	-
-05 Plant		95	-	-
-05 SP 01		95	-	-
-05 SP 02		95	-	-
-05 SP 03		95	-	-
-05 SP 04		95	-	-
-05 SP 05		95	-	-
-05 SP 06		95	-	-
-05 SP 07		95	-	-
-05 SP 08		95	-	-
-05 SP 08		95	-	-
-05 SP 09		95	-	-
-05 SP 11		95	-	-
-05 SP 12		95	-	-
-05 SP 13		95	-	-
-05 SP 14		95	-	-
-05 SP 15		95	-	-
-05 SP 16		95	-	-
-05 SP 17		95	-	-
-05 SP 18		95	-	-
-05 SP 19		95	-	-
-05 SP 20		95	-	-
-05 SP 21		95	-	-
-05 SP 22		95	-	-
-05 SP 23		95	-	-
-05 SP 24		95	-	-
-05 Store		95	-	-
-05 STR-03		95	-	-
-05 STR-04		95	-	-
-05 WC		95	-	-
-05 WC Corridor		95	-	-
00_Cafe/Food Court		95	-	-
00_IT Patch Panel Room		95	-	-
00_L00 Stair 02 Lobby		95	-	-
00_LV Switch Room		95	-	-

General lighting and display lighting		General luminaire		Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80		0.3
00_Sixth Form Common Room		95	-		-
00_ST		95	-		-
00_ST		95	-		-
00_Stair 01 Lobby		95	-		-
00_STR 01		95	-		-
00_STR 02		95	-		-
01_Circulation		95	-		-
01_Collaborative Area		95	-		-
01_Departmental Staff Base		95	-		-
01_Head of Sixth Form Office		95	-		-
01_L01 Stair 02 Lobby		95	-		-
01_L01 Toilet Lobby		95	-		-
01_L01 Toilets		95	-		-
01_Lift Lobby		95	-		-
01_Meeting Room 02		95	-		-
01_Seminar Room 09		95	-		-
01_Seminar Room 10		95	-		-
01_Seminar Room 11		95	-		-
01_Sixth Form Staff Office		95	-		-
01_Stair 01		95	-		-
01_Stair 02		95	-		-
01_Stair Lobby		95	-		-
01_WC		95	-		-
02_Collaborative Area		95	-		-
02_Flexible Seminar Room 05		95	-		-
02_Flexible Seminar Room 06		95	-		-
02_IT Study Area		95	-		-
02_L02 Circulation		95	-		-
02_L02 Stair 01 Lobby		95	-		-
02_L02 Toilets		95	-		-
02_Lift Lobby		95	-		-
02_Meeting Room		95	-		-
02_Seminar Room 07		95	-		-
02_Sixth Form Staff Office - UCAS		95	-		-
02_Stair 02		95	-		-
02_Stair Lobby		95	-		-
02_STR 01		95	-		-
02_WC		95	-		-
02_WC Lobby		95	-		-
03_Computer Studies		95	-		-
03_Departmental Staff Base		95	-		-
03_Flexible Seminar Room 03		95	-		-
03_Flexible Seminar Room 04		95	-		-

General lighting and display lighting		General luminaire		Display light source	
Zone name		Efficacy [lm/W]		Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95		80	0.3
03_L03 Circulation		95		-	-
03_L03 Toilets		95		-	-
03_Meeting Room		95		-	-
03_Seminar Room 04		95		-	-
03_Stair Lobby 01		95		-	-
03_Stair Lobby 02		95		-	-
03_Lift Lobby		95		-	-
03_STR 01		95		-	-
03_STR 02		95		-	-
03_WC		95		-	-
03_WC Lobby		95		-	-
04_Collaborative Area		95		-	-
04_Flexible Seminar Room 01		95		-	-
04_Flexible Seminar Room 02		95		-	-
04_L04 Circulation		95		-	-
04_L04 Stair 01 Lobby		95		-	-
04_L04 Toilets		95		-	-
04_Meeting Room		95		-	-
04_Seminar Room 01		95		-	-
04_Seminar Room 02		95		-	-
04_Seminar Room 03		95		-	-
04_Sixth Form Staff Office - Senior Staff		95		-	-
04_Stair Lobby		95		-	-
04_Lift Lobby		95		-	-
04_STR 01		95		-	-
04_STR 02		95		-	-
04_WC		95		-	-
04_WC Lobby		95		-	-
-05 Circulation 01		95		-	-
-01 Informal Assembly Area		95		-	-
Island_Female WCs		95		-	-
Island_Male WCs		95		-	-
Island_AWC		95		-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
-01 Control Room	N/A	N/A
-02 Electronic library	NO (-71.4%)	NO
-02 Existing Auditorium	N/A	N/A
-02 Existing Recital Room	N/A	N/A
-03 Quiet Study Area	YES (+340.3%)	NO
-03 Quiet Study area 01	NO (-35.2%)	NO
-03_Comms Room	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
-03_Seminar room 01	NO (-54.5%)	NO
-03_Seminar room 02	NO (-32.7%)	NO
-03_Seminar room 03	NO (-37.6%)	NO
-03_Seminar room 04	NO (-32.1%)	NO
-03_Seminar room 05	NO (-31.3%)	NO
-03_Seminar room 06	NO (-71.3%)	NO
-03_Seminar room 07	NO (-44.7%)	NO
-03_Seminar room 08	NO (-77%)	NO
-03_Seminar room 09	NO (-22%)	NO
-03_Seminar room 10	NO (-11.8%)	NO
-03_Seminar room 11	NO (-18.8%)	NO
-03_Seminar room 12	NO (-34.1%)	NO
-04_Break Out 01	NO (-69.7%)	NO
-04_Break Out 02	N/A	N/A
-04_Break Out 03	NO (-79.8%)	NO
-04_Break Out 04	N/A	N/A
-04_Break Out Space 01	N/A	N/A
-04_Break Out Space 02	N/A	N/A
-04_EP 01	N/A	N/A
-04_EP 02	N/A	N/A
-04_EP 03	N/A	N/A
-04_EP 04	N/A	N/A
-04_EP 05	N/A	N/A
-04_Head Music Office 01	N/A	N/A
-04_Head Music Office 02	N/A	N/A
-04_Music Director Office	NO (-85.2%)	NO
-04_Music Staff Office	NO (-86.5%)	NO
-04_Music Teaching	NO (-92.7%)	NO
-04_Music Teaching 01	NO (-88.3%)	NO
-04_Music Teaching 02	NO (-88.7%)	NO
-04_Visiting Staff Base	NO (-90.3%)	NO
-05 Band Practice	NO (-59.7%)	NO
-05 Control Room	N/A	N/A
-05 Keyboard Classroom	NO (-17.9%)	NO
-05 Large Practice	NO (-50.5%)	NO
-05 Music IT	N/A	N/A
-05 Music Recording Studio	N/A	N/A
-05 SP 01	N/A	N/A
-05 SP 02	N/A	N/A
-05 SP 03	N/A	N/A
-05 SP 04	N/A	N/A
-05 SP 05	N/A	N/A
-05 SP 06	N/A	N/A
-05 SP 07	N/A	N/A
-05 SP 08	N/A	N/A
-05 SP 08	N/A	N/A
-05 SP 09	N/A	N/A
-05 SP 11	N/A	N/A
-05 SP 12	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
-05 SP 13	N/A	N/A
-05 SP 14	N/A	N/A
-05 SP 15	N/A	N/A
-05 SP 16	N/A	N/A
-05 SP 17	N/A	N/A
-05 SP 18	N/A	N/A
-05 SP 19	N/A	N/A
-05 SP 20	N/A	N/A
-05 SP 21	N/A	N/A
-05 SP 22	N/A	N/A
-05 SP 23	N/A	N/A
-05 SP 24	N/A	N/A
00_Cafe/Food Court	N/A	N/A
00_IT Patch Panel Room	N/A	N/A
00_Sixth Form Common Room	NO (-8.4%)	NO
01_Collaborative Area	NO (-31.7%)	NO
01_Departmental Staff Base	NO (-62.8%)	NO
01_Head of Sixth Form Office	NO (-87.4%)	NO
01_Meeting Room 02	NO (-88.3%)	NO
01_Seminar Room 09	NO (-52.1%)	NO
01_Seminar Room 10	NO (-52.1%)	NO
01_Seminar Room 11	NO (-87.3%)	NO
01_Sixth Form Staff Office	NO (-40.7%)	NO
02_Collaborative Area	NO (-27.8%)	NO
02_Flexible Seminar Room 05	NO (-52.5%)	NO
02_Flexible Seminar Room 06	NO (-52.1%)	NO
02_IT Study Area	NO (-5.5%)	NO
02_Meeting Room	NO (-88.5%)	NO
02_Seminar Room 07	NO (-40.9%)	NO
02_Sixth Form Staff Office - UCAS	NO (-64.6%)	NO
03_Computer Studies	NO (-3.2%)	NO
03_Departmental Staff Base	NO (-65.1%)	NO
03_Flexible Seminar Room 03	NO (-52.9%)	NO
03_Flexible Seminar Room 04	NO (-52.1%)	NO
03_Meeting Room	NO (-89.4%)	NO
03_Seminar Room 04	NO (-38%)	NO
04_Collaborative Area	NO (-27.7%)	NO
04_Flexible Seminar Room 01	NO (-53.8%)	NO
04_Flexible Seminar Room 02	NO (-52.3%)	NO
04_Meeting Room	NO (-87.6%)	NO
04_Seminar Room 01	NO (-25.5%)	NO
04_Seminar Room 02	NO (-24.7%)	NO
04_Seminar Room 03	NO (-25.2%)	NO
04_Sixth Form Staff Office - Senior Staff	NO (-64.2%)	NO
-01 Informal Assembly Area	NO (-42.5%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	5796.7	5796.7
External area [m ²]	9778.7	9417
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	3
Average conductance [W/K]	2679.79	2896.92
Average U-value [W/m ² K]	0.27	0.31
Alpha value* [%]	24.22	10

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
12	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
88	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	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	3.72	4.37
Cooling	0.33	0.18
Auxiliary	5.07	4.49
Lighting	6.63	6.61
Hot water	8.25	7.44
Equipment*	30.73	30.73
TOTAL **	24	23.08

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

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0.02
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>0</i>	<i>0.02</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	42.16	46.04
Primary energy [kWh/m ²]	35.74	34.4
Total emissions [kg/m ²]	3.34	3.22

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] GSHP/WSHP, [HFT] Electricity, [CFT] Electricity										
Actual	32.6	65.4	3.3	4	20	2.78	4.5	2.78	5	
Notional	24.2	38.5	2.4	2.3	16.1	2.78	4.63	----	----	
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	26.7	14	2.7	0.9	8.1	2.78	4.5	2.78	5	
Notional	31.5	3.9	3.2	0.4	5	2.78	2.84	----	----	
[ST] Central heating using water: radiators, [HS] GSHP/WSHP, [HFT] Electricity, [CFT] Electricity										
Actual	34.4	0	3.4	0	3.2	2.78	0	2.78	0	
Notional	36.2	0	3.6	0	5.1	2.78	0	----	----	
[ST] Central heating using water: radiators, [HS] GSHP/WSHP, [HFT] Electricity, [CFT] Electricity										
Actual	38.6	0	3.9	0	3.9	2.78	0	2.78	0	
Notional	46.1	0	4.6	0	5.6	2.78	0	----	----	
[ST] Central heating using water: radiators, [HS] GSHP/WSHP, [HFT] Electricity, [CFT] Electricity										
Actual	45.9	0	4.6	0	1.2	2.78	0	2.78	0	
Notional	58.9	0	5.9	0	1.2	2.78	0	----	----	
[ST] Single-duct VAV, [HS] GSHP/WSHP, [HFT] Electricity, [CFT] Electricity										
Actual	28.7	24.1	2.9	1.5	12.6	2.78	4.5	2.78	5	
Notional	51.9	10.6	5.2	0.6	7.8	2.78	4.63	----	----	
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
Actual	23.8	0	6.6	0	7.4	1	0	1	0	
Notional	30.3	0	6	0	1.8	1.41	0	----	----	
[ST] Central heating using water: radiators, [HS] GSHP/WSHP, [HFT] Electricity, [CFT] Electricity										
Actual	33.4	0	3.3	0	14	2.78	0	2.78	0	
Notional	62.4	0	6.2	0	1.5	2.78	0	----	----	
[ST] No Heating or Cooling										
Actual	0	0	0	0	0	0	0	0	0	
Notional	0	0	0	0	0	0	0	----	----	

Key to terms

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

Project name

Dyne House inc. Island

As designed

Date: Mon Aug 22 08:25:12 2022

Administrative information

Building Details

Address:

Certifier details

Name: AECOM

Telephone number: 0113 301 8400

Address: 2 City Walk, Leeds, LS11 9AR

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.16

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.16

BRUKL compliance module version: v6.1.c.0

Foundation area [m²]: 580.79The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	3.22
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	2.94
Target primary energy rate (TPER), kWh/m ² annum	34.4
Building primary energy rate (BPER), kWh/m ² annum	31.34
Do the building's emission and primary energy rates exceed the targets?	BER ≤ TER BPER ≤ TPER

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

Fabric element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.15	0.15	01000002:Surf[2]
Floors	0.18	0.13	0.13	01000007:Surf[0]
Pitched roofs	0.16	-	-	No Pitched roofs in building
Flat roofs	0.18	0.13	0.13	01000002:Surf[1]
Windows** and roof windows	1.6	1.2	1.2	01000002:Surf[6]
Rooflights***	2.2	1.8	1.8	03000009:Surf[1]
Personnel doors^	1.6	1.78	2.2	01000000:Surf[7]
Vehicle access & similar large doors	1.3	-	-	No Vehicle access doors in building
High usage entrance doors	3	-	-	No High usage entrance doors in building

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

* 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.

*** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

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

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	3

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

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

1- Radiators only

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	-	0.2	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- Radiators with Extract

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	-	0.2	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

3- FCU

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	5	0	1.4	0.89
Standard value	2.5*	4.5**	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					
** Standard shown is for air-cooled chillers >=400 kW. For chillers <400 kW, limiting SEER is 4.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

4- Radiators with MVHR

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	-	0.2	-	0.89
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

5- VAV (existing areas)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	5	0	1.4	0.89
Standard value	2.5*	4.5**	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					
** Standard shown is for air-cooled chillers >=400 kW. For chillers <400 kW, limiting SEER is 4.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

6- Radiators with S&E (AHU)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	-	0.2	-	0.89
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

7- Temperature lopping

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	5	0	1.4	0.89
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

8- Elec Panel heaters (with MV)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	0.2	-	0.89
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
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 balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

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	2.3	2	0.5	0.5	0.4	1		
-01 Control Room		-	-	-	-	-	-	-	0.2	-	-	N/A
-02 Electronic library		-	-	-	0.8	-	-	-	-	-	-	N/A
-02 Existing Recital Room		-	-	-	0.8	-	-	-	-	-	-	N/A
-03 Quiet Study Area		-	-	-	0.8	-	-	-	-	-	-	N/A
-03 Quiet Study area 01		-	-	-	0.8	-	-	-	-	-	-	N/A
-03_Seminar room 01		-	-	-	0.8	-	-	-	-	-	-	N/A
-03_Seminar room 02		-	-	-	0.8	-	-	-	-	-	-	N/A
-03_Seminar room 03		-	-	-	0.8	-	-	-	-	-	-	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	2.3	2	0.5	0.5	0.4	1	Zone	Standard
-03_Seminar room 04	-	-	-	0.8	-	-	-	-	-	-	N/A
-03_Seminar room 05	-	-	-	0.8	-	-	-	-	-	-	N/A
-03_Seminar room 06	-	-	-	0.8	-	-	-	-	-	-	N/A
-03_Seminar room 07	-	-	-	0.8	-	-	-	-	-	-	N/A
-03_Seminar room 08	-	-	-	0.8	-	-	-	-	-	-	N/A
-03_Seminar room 09	-	-	-	0.8	-	-	-	-	-	-	N/A
-03_Seminar room 10	-	-	-	0.8	-	-	-	-	-	-	N/A
-03_Seminar room 11	-	-	-	0.8	-	-	-	-	-	-	N/A
-03_Seminar room 12	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Break Out 01	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Break Out 02	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Break Out 03	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Break Out 04	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Break Out Space 01	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Break Out Space 02	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_EP 01	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_EP 02	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_EP 03	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_EP 04	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_EP 05	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Head Music Office 01	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Head Music Office 02	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Music Director Office	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Music Staff Office	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Music Teaching	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Music Teaching 01	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Music Teaching 02	-	-	-	0.8	-	-	-	-	-	-	N/A
-04_Visiting Staff Base	-	-	-	0.8	-	-	-	-	-	-	N/A
-05 Band Practice	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 Control Room	-	-	-	-	-	-	-	0.2	-	-	N/A
-05 Keyboard Classroom	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 Music Library	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 Music Recording Studio	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 01	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 02	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 03	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 04	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 05	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 06	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 07	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 08	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 08	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 09	-	-	-	1.4	-	-	-	-	-	-	N/A

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	2.3	2	0.5	0.5	0.4	1		
-05 SP 11	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 12	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 13	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 14	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 15	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 16	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 17	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 18	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 19	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 20	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 21	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 22	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 23	-	-	-	1.4	-	-	-	-	-	-	N/A
-05 SP 24	-	-	-	1.4	-	-	-	-	-	-	N/A
00_Cafe/Food Court	-	-	-	0.8	-	-	-	-	-	-	N/A
01_Collaborative Area	-	-	-	0.8	-	-	-	-	-	-	N/A
01_Departmental Staff Base	-	-	-	0.8	-	-	-	-	-	-	N/A
01_Meeting Room 02	-	-	-	0.8	-	-	-	-	-	-	N/A
01_Seminar Room 09	-	-	-	0.8	-	-	-	-	-	-	N/A
01_Seminar Room 10	-	-	-	0.8	-	-	-	-	-	-	N/A
02_Flexible Seminar Room 05	-	-	-	0.8	-	-	-	-	-	-	N/A
02_Flexible Seminar Room 06	-	-	-	0.8	-	-	-	-	-	-	N/A
02_IT Study Area	-	-	-	-	-	-	-	0.2	-	-	N/A
02_Meeting Room	-	-	-	0.8	-	-	-	-	-	-	N/A
02_Sixth Form Staff Office - UCAS	-	-	-	0.8	-	-	-	-	-	-	N/A
03_Computer Studies	-	-	-	-	-	-	-	0.2	-	-	N/A
03_Departmental Staff Base	-	-	-	0.8	-	-	-	-	-	-	N/A
03_Flexible Seminar Room 03	-	-	-	0.8	-	-	-	-	-	-	N/A
03_Flexible Seminar Room 04	-	-	-	0.8	-	-	-	-	-	-	N/A
03_Meeting Room	-	-	-	0.8	-	-	-	-	-	-	N/A
04_Collaborative Area	-	-	-	0.8	-	-	-	-	-	-	N/A
04_Flexible Seminar Room 01	-	-	-	0.8	-	-	-	-	-	-	N/A
04_Flexible Seminar Room 02	-	-	-	0.8	-	-	-	-	-	-	N/A
04_Meeting Room	-	-	-	0.8	-	-	-	-	-	-	N/A
04_Seminar Room 01	-	-	-	0.8	-	-	-	-	-	-	N/A
04_Seminar Room 02	-	-	-	0.8	-	-	-	-	-	-	N/A
04_Seminar Room 03	-	-	-	0.8	-	-	-	-	-	-	N/A
04_Sixth Form Staff Office - Senior Staff	-	-	-	0.8	-	-	-	-	-	-	N/A
Island_Female WCs	-	-	-	1.4	-	-	-	-	-	-	N/A
Island_Male WCs	-	-	-	1.4	-	-	-	-	-	-	N/A
Island_AWC	-	-	-	1.4	-	-	-	-	-	-	N/A

General lighting and display lighting		General luminaire		Display light source	
Zone name		Efficacy [lm/W]		Efficacy [lm/W]	Power density [W/m²]
	Standard value	95		80	0.3
-01 Auditorium Lobby		95		-	-
-01 Auditorium Plant Room		95		-	-
-01 Control Room		95		-	-
-01 Disabled WC		95		-	-
-01 Female WC		95		-	-
-01 L-01 Circulation		95		-	-
-01 L-01 Stair 01		95		-	-
-01 Male WC		95		-	-
-01 Plant		95		-	-
-01 Storage		95		-	-
-02 Auditorium Storage and Stage Circulation		95		-	-
-02 Electronic library		95		-	-
-02 Existing Auditorium		95		-	-
-02 Existing Recital Room		95		-	-
-02 L-02 Circulation (including bridge link)		95		-	-
-02 L-02 Circulation 2		95		-	-
-02_Stair Circulation		95		-	-
-02_STR 03		95		-	-
-03 Quiet Study Area		95		-	-
-03 Quiet Study area 01		95		-	-
-04_STR		95		-	-
-03_A WC		95		-	-
-03_Circulation 01		95		-	-
-03_Circulation 02		95		-	-
-03_Comms Room		95		-	-
-03_CS		95		-	-
-03_F WC		95		-	-
-03_Lobby 1		95		-	-
-03_Lobby 2		95		-	-
-03_M WC		95		-	-
-03_Seminar room 01		95		-	-
-03_Seminar room 02		95		-	-
-03_Seminar room 03		95		-	-
-03_Seminar room 04		95		-	-
-03_Seminar room 05		95		-	-
-03_Seminar room 06		95		-	-
-03_Seminar room 07		95		-	-
-03_Seminar room 08		95		-	-
-03_Seminar room 09		95		-	-
-03_Seminar room 10		95		-	-
-03_Seminar room 11		95		-	-
-03_Seminar room 12		95		-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
-03_Stair 04		95	-	-
-03_STR 03		95	-	-
-03_WC Lobby		95	-	-
-04_Break Out 01		95	-	-
-04_Break Out 02		95	-	-
-04_Break Out 03		95	-	-
-04_Break Out 04		95	-	-
-04_Break Out Space 01		95	-	-
-04_Break Out Space 02		95	-	-
-04_Circulation		95	-	-
-04_CS		95	-	-
-04_EP 01		95	-	-
-04_EP 02		95	-	-
-04_EP 03		95	-	-
-04_EP 04		95	-	-
-04_EP 05		95	-	-
-04_General Storage		95	-	-
-04_Head Music Office 01		95	-	-
-04_Head Music Office 02		95	-	-
-04_Lobby 01		95	-	-
-04_Lobby 02		95	-	-
-04_Music Director Office		95	-	-
-04_Music Staff Office		95	-	-
-04_Music Teaching		95	-	-
-04_Music Teaching 01		95	-	-
-04_Music Teaching 02		95	-	-
-04_Plant		95	-	-
-04_STR-04		95	-	-
-04_Visiting Staff Base		95	-	-
-04_WC		95	-	-
-05 AWC		95	-	-
-05 Band Practice		95	-	-
-05 Circulation		95	-	-
-05 Circulation 02		95	-	-
-05 Circulation 03		95	-	-
-05 Control Room		95	-	-
-05 CS		95	-	-
-05 Disabled WC		95	-	-
-05 F-WC		95	-	-
-05 General Storage		95	-	-
-05 Keyboard Classroom		95	-	-
-05 Large Practice		95	-	-
-05 Lobby		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
-05 Lobby 01		95	-	-
-05 Lobby 02		95	-	-
-05 Lobby 03		95	-	-
-05 LP Store		95	-	-
-05 M-WC		95	-	-
-05 Music Instrument Store		95	-	-
-05 Music IT		95	-	-
-05 Music Library		95	-	-
-05 Music Recording Studio		95	-	-
-05 Plant		95	-	-
-05 SP 01		95	-	-
-05 SP 02		95	-	-
-05 SP 03		95	-	-
-05 SP 04		95	-	-
-05 SP 05		95	-	-
-05 SP 06		95	-	-
-05 SP 07		95	-	-
-05 SP 08		95	-	-
-05 SP 08		95	-	-
-05 SP 09		95	-	-
-05 SP 11		95	-	-
-05 SP 12		95	-	-
-05 SP 13		95	-	-
-05 SP 14		95	-	-
-05 SP 15		95	-	-
-05 SP 16		95	-	-
-05 SP 17		95	-	-
-05 SP 18		95	-	-
-05 SP 19		95	-	-
-05 SP 20		95	-	-
-05 SP 21		95	-	-
-05 SP 22		95	-	-
-05 SP 23		95	-	-
-05 SP 24		95	-	-
-05 Store		95	-	-
-05 STR-03		95	-	-
-05 STR-04		95	-	-
-05 WC		95	-	-
-05 WC Corridor		95	-	-
00_Cafe/Food Court		95	-	-
00_IT Patch Panel Room		95	-	-
00_L00 Stair 02 Lobby		95	-	-
00_LV Switch Room		95	-	-

General lighting and display lighting		General luminaire		Display light source	
Zone name		Efficacy [lm/W]		Efficacy [lm/W]	Power density [W/m²]
	Standard value	95		80	0.3
00_Sixth Form Common Room		95		-	-
00_ST		95		-	-
00_ST		95		-	-
00_Stair 01 Lobby		95		-	-
00_STR 01		95		-	-
00_STR 02		95		-	-
01_Circulation		95		-	-
01_Collaborative Area		95		-	-
01_Departmental Staff Base		95		-	-
01_Head of Sixth Form Office		95		-	-
01_L01 Stair 02 Lobby		95		-	-
01_L01 Toilet Lobby		95		-	-
01_L01 Toilets		95		-	-
01_Lift Lobby		95		-	-
01_Meeting Room 02		95		-	-
01_Seminar Room 09		95		-	-
01_Seminar Room 10		95		-	-
01_Seminar Room 11		95		-	-
01_Sixth Form Staff Office		95		-	-
01_Stair 01		95		-	-
01_Stair 02		95		-	-
01_Stair Lobby		95		-	-
01_WC		95		-	-
02_Collaborative Area		95		-	-
02_Flexible Seminar Room 05		95		-	-
02_Flexible Seminar Room 06		95		-	-
02_IT Study Area		95		-	-
02_L02 Circulation		95		-	-
02_L02 Stair 01 Lobby		95		-	-
02_L02 Toilets		95		-	-
02_Lift Lobby		95		-	-
02_Meeting Room		95		-	-
02_Seminar Room 07		95		-	-
02_Sixth Form Staff Office - UCAS		95		-	-
02_Stair 02		95		-	-
02_Stair Lobby		95		-	-
02_STR 01		95		-	-
02_WC		95		-	-
02_WC Lobby		95		-	-
03_Computer Studies		95		-	-
03_Departmental Staff Base		95		-	-
03_Flexible Seminar Room 03		95		-	-
03_Flexible Seminar Room 04		95		-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95	80	0.3
03_L03 Circulation		95	-	-
03_L03 Toilets		95	-	-
03_Meeting Room		95	-	-
03_Seminar Room 04		95	-	-
03_Stair Lobby 01		95	-	-
03_Stair Lobby 02		95	-	-
03_Lift Lobby		95	-	-
03_STR 01		95	-	-
03_STR 02		95	-	-
03_WC		95	-	-
03_WC Lobby		95	-	-
04_Collaborative Area		95	-	-
04_Flexible Seminar Room 01		95	-	-
04_Flexible Seminar Room 02		95	-	-
04_L04 Circulation		95	-	-
04_L04 Stair 01 Lobby		95	-	-
04_L04 Toilets		95	-	-
04_Meeting Room		95	-	-
04_Seminar Room 01		95	-	-
04_Seminar Room 02		95	-	-
04_Seminar Room 03		95	-	-
04_Sixth Form Staff Office - Senior Staff		95	-	-
04_Stair Lobby		95	-	-
04_Lift Lobby		95	-	-
04_STR 01		95	-	-
04_STR 02		95	-	-
04_WC		95	-	-
04_WC Lobby		95	-	-
-05 Circulation 01		95	-	-
-01 Informal Assembly Area		95	-	-
Island_Female WCs		95	-	-
Island_Male WCs		95	-	-
Island_AWC		95	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
-01 Control Room	N/A	N/A
-02 Electronic library	NO (-71.4%)	NO
-02 Existing Auditorium	N/A	N/A
-02 Existing Recital Room	N/A	N/A
-03 Quiet Study Area	YES (+340.3%)	NO
-03 Quiet Study area 01	NO (-35.2%)	NO
-03_Comms Room	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
-03_Seminar room 01	NO (-54.5%)	NO
-03_Seminar room 02	NO (-32.7%)	NO
-03_Seminar room 03	NO (-37.6%)	NO
-03_Seminar room 04	NO (-32.1%)	NO
-03_Seminar room 05	NO (-31.3%)	NO
-03_Seminar room 06	NO (-71.3%)	NO
-03_Seminar room 07	NO (-44.7%)	NO
-03_Seminar room 08	NO (-77%)	NO
-03_Seminar room 09	NO (-22%)	NO
-03_Seminar room 10	NO (-11.8%)	NO
-03_Seminar room 11	NO (-18.8%)	NO
-03_Seminar room 12	NO (-34.1%)	NO
-04_Break Out 01	NO (-69.7%)	NO
-04_Break Out 02	N/A	N/A
-04_Break Out 03	NO (-79.8%)	NO
-04_Break Out 04	N/A	N/A
-04_Break Out Space 01	N/A	N/A
-04_Break Out Space 02	N/A	N/A
-04_EP 01	N/A	N/A
-04_EP 02	N/A	N/A
-04_EP 03	N/A	N/A
-04_EP 04	N/A	N/A
-04_EP 05	N/A	N/A
-04_Head Music Office 01	N/A	N/A
-04_Head Music Office 02	N/A	N/A
-04_Music Director Office	NO (-85.2%)	NO
-04_Music Staff Office	NO (-86.5%)	NO
-04_Music Teaching	NO (-92.7%)	NO
-04_Music Teaching 01	NO (-88.3%)	NO
-04_Music Teaching 02	NO (-88.7%)	NO
-04_Visiting Staff Base	NO (-90.3%)	NO
-05 Band Practice	NO (-59.7%)	NO
-05 Control Room	N/A	N/A
-05 Keyboard Classroom	NO (-17.9%)	NO
-05 Large Practice	NO (-50.5%)	NO
-05 Music IT	N/A	N/A
-05 Music Recording Studio	N/A	N/A
-05 SP 01	N/A	N/A
-05 SP 02	N/A	N/A
-05 SP 03	N/A	N/A
-05 SP 04	N/A	N/A
-05 SP 05	N/A	N/A
-05 SP 06	N/A	N/A
-05 SP 07	N/A	N/A
-05 SP 08	N/A	N/A
-05 SP 08	N/A	N/A
-05 SP 09	N/A	N/A
-05 SP 11	N/A	N/A
-05 SP 12	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
-05 SP 13	N/A	N/A
-05 SP 14	N/A	N/A
-05 SP 15	N/A	N/A
-05 SP 16	N/A	N/A
-05 SP 17	N/A	N/A
-05 SP 18	N/A	N/A
-05 SP 19	N/A	N/A
-05 SP 20	N/A	N/A
-05 SP 21	N/A	N/A
-05 SP 22	N/A	N/A
-05 SP 23	N/A	N/A
-05 SP 24	N/A	N/A
00_Cafe/Food Court	N/A	N/A
00_IT Patch Panel Room	N/A	N/A
00_Sixth Form Common Room	NO (-8.4%)	NO
01_Collaborative Area	NO (-31.7%)	NO
01_Departmental Staff Base	NO (-62.8%)	NO
01_Head of Sixth Form Office	NO (-87.4%)	NO
01_Meeting Room 02	NO (-88.3%)	NO
01_Seminar Room 09	NO (-52.1%)	NO
01_Seminar Room 10	NO (-52.1%)	NO
01_Seminar Room 11	NO (-87.3%)	NO
01_Sixth Form Staff Office	NO (-40.7%)	NO
02_Collaborative Area	NO (-27.8%)	NO
02_Flexible Seminar Room 05	NO (-52.5%)	NO
02_Flexible Seminar Room 06	NO (-52.1%)	NO
02_IT Study Area	NO (-5.5%)	NO
02_Meeting Room	NO (-88.5%)	NO
02_Seminar Room 07	NO (-40.9%)	NO
02_Sixth Form Staff Office - UCAS	NO (-64.6%)	NO
03_Computer Studies	NO (-3.2%)	NO
03_Departmental Staff Base	NO (-65.1%)	NO
03_Flexible Seminar Room 03	NO (-52.9%)	NO
03_Flexible Seminar Room 04	NO (-52.1%)	NO
03_Meeting Room	NO (-89.4%)	NO
03_Seminar Room 04	NO (-38%)	NO
04_Collaborative Area	NO (-27.7%)	NO
04_Flexible Seminar Room 01	NO (-53.8%)	NO
04_Flexible Seminar Room 02	NO (-52.3%)	NO
04_Meeting Room	NO (-87.6%)	NO
04_Seminar Room 01	NO (-25.5%)	NO
04_Seminar Room 02	NO (-24.7%)	NO
04_Seminar Room 03	NO (-25.2%)	NO
04_Sixth Form Staff Office - Senior Staff	NO (-64.2%)	NO
-01 Informal Assembly Area	NO (-42.5%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	5796.7	5796.7
External area [m ²]	9778.7	9417
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	3
Average conductance [W/K]	2679.79	2896.92
Average U-value [W/m ² K]	0.27	0.31
Alpha value* [%]	24.22	10

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
12	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
88	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	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	3.12	4.37
Cooling	0.33	0.18
Auxiliary	5.07	4.49
Lighting	6.63	6.61
Hot water	8.25	7.44
Equipment*	30.73	30.73
TOTAL **	23.4	23.08

* 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	2.37	0.02
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>2.37</i>	<i>0.02</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	42.16	46.04
Primary energy [kWh/m ²]	31.34	34.4
Total emissions [kg/m ²]	2.94	3.22

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] GSHP/WSHP, [HFT] Electricity, [CFT] Electricity										
Actual	32.6	65.4	2.7	4	20	3.33	4.5	3.5	5	
Notional	24.2	38.5	2.4	2.3	16.1	2.78	4.63	----	----	
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	26.7	14	2.2	0.9	8.1	3.33	4.5	3.5	5	
Notional	31.5	3.9	3.2	0.4	5	2.78	2.84	----	----	
[ST] Central heating using water: radiators, [HS] GSHP/WSHP, [HFT] Electricity, [CFT] Electricity										
Actual	34.4	0	2.9	0	3.2	3.33	0	3.5	0	
Notional	36.2	0	3.6	0	5.1	2.78	0	----	----	
[ST] Central heating using water: radiators, [HS] GSHP/WSHP, [HFT] Electricity, [CFT] Electricity										
Actual	38.6	0	3.2	0	3.9	3.33	0	3.5	0	
Notional	46.1	0	4.6	0	5.6	2.78	0	----	----	
[ST] Central heating using water: radiators, [HS] GSHP/WSHP, [HFT] Electricity, [CFT] Electricity										
Actual	45.9	0	3.8	0	1.2	3.33	0	3.5	0	
Notional	58.9	0	5.9	0	1.2	2.78	0	----	----	
[ST] Single-duct VAV, [HS] GSHP/WSHP, [HFT] Electricity, [CFT] Electricity										
Actual	28.7	24.1	2.4	1.5	12.6	3.33	4.5	3.5	5	
Notional	51.9	10.6	5.2	0.6	7.8	2.78	4.63	----	----	
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
Actual	23.8	0	6.6	0	7.4	1	0	1	0	
Notional	30.3	0	6	0	1.8	1.41	0	----	----	
[ST] Central heating using water: radiators, [HS] GSHP/WSHP, [HFT] Electricity, [CFT] Electricity										
Actual	33.4	0	2.8	0	14	3.33	0	3.5	0	
Notional	62.4	0	6.2	0	1.5	2.78	0	----	----	
[ST] No Heating or Cooling										
Actual	0	0	0	0	0	0	0	0	0	
Notional	0	0	0	0	0	0	0	----	----	

Key to terms

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

Appendix C Part L2A report

Highgate School Dyne House 3

Part L 2021 report

Project number: 60580302

August 2022

Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position

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Executive Summary

This document details the results of Part L 2021 modelling undertaken during RIBA Stage 2 for Dyne House, as required by the GLA Energy Planning Guidance. This analysis uses the Part L 2021 methodology, as this came into force on 15th June 2022.

The analysis undertaken for the purposes of demonstrating compliance with GLA Energy Planning Guidance includes the Island Site; however, the Island Site is excluded for the purpose of demonstrating compliance with Part L 2021.

1. Introduction

This document details the Part L 2021 modelling undertaken for the Dyne House RIBA Stage 2 design. Dyne House is a secondary school building comprised of teaching space, music facilities and staff areas.

The proposed building was modelled using IES VE version 2022.1.0.0.

1.1 Part L 2021 methodology

Compliance with Part L 2021 for new non-domestic buildings requires that the following requirements are met:

- The building emissions rate (BER) and building primary energy rate (BPER) must be less than the target emissions rate (TER) and target primary energy rate (TPER), respectively.
- Meet limiting standards for design.
- Limit the effects of solar gains in summer.
- Quality of construction and commissioning.
- Providing information.

To carry out Part L 2A assessments, AECOM use the industry standard <Virtual Environment> software from Integrated Environmental Solutions Ltd. The building fabric properties and lighting power densities were added for each zone. All other thermal template settings, such as occupied hours, heating set-points, occupancy densities and small power loads are dictated by the National Calculation Method (NCM). NCM templates must be used for Part L 2 analysis.

A notional building is automatically derived from the actual building by the calculation software, according to rules laid down in the NCM. The notional building standards of construction and system efficiencies are also given by the NCM. The location and geometry of the notional building (with the exception of glazing and door area) are copied from those of the proposed building. Rooms in the notional building are assigned the same NCM activities as their counterparts in the actual building, so that the occupancy, internal gains (apart from lighting power density) and the operating hours in each room conform to the appropriate NCM activity.

If the CO₂ emissions and primary energy rate from the actual building (Building Emissions Rate (BER) and Building Primary Energy Rate (BPER)) are less than or equal to the CO₂ emissions and primary energy rate from the notional building (Target Emissions Rate (TER) and Target Primary Energy Rate (TPER)) then the building meets the CO₂ and primary energy requirements of Part L 2 2021.

1.2 GLA Energy assessment guidance (June 2022)

The proposed building will use a Ground Source Heat Pump (GSHP) to serve the space heating demand, with direct electric point of use domestic hot water heaters.

In order to fulfil the GLA requirements as described in the Energy Assessment Guidance, dated June 2022, baseline and lean options were also created as follows:

- Baseline: the baseline is the TER from the final proposed building specification (i.e. the TER from the “Be Green” stage of the energy hierarchy).
- Be Lean: this model includes the notional building system type and performance values as determined by the final proposed building specification for space heating and hot water. Where there are no “be clean” or “be green” technologies the system type and performance values of the final proposal are used in the Be Lean case.

2. Model inputs

2.1 Model geometry

The model geometry was created based on the following drawings provided by Hopkins Architects Limited.

Table 1. Architectural drawings used to create the thermal model

Drawing number	Description	Revision
A/HS-DH3 2400	Proposed site plan	C (11.07.2019)
A/HS-DH3 2420	Level -05 proposed GA plan	H (11.07.2019)
A/HS-DH3 2421	Level -04 proposed GA plan	H (11.07.2019)
A/HS-DH3 2422	Level -03 proposed GA plan	H (11.07.2019)
A/HS-DH3 2423	Level -02 proposed GA plan	H (11.07.2019)
A/HS-DH3 2424	Level -01 proposed GA plan	H (11.07.2019)
A/HS-DH3 2425	Level 00 proposed GA plan	H (11.07.2019)
A/HS-DH3 2426	Level 01 proposed GA plan	H (11.07.2019)
A/HS-DH3 2427	Level 02 proposed GA plan	H (11.07.2019)
A/HS-DH3 2428	Level 03 proposed GA plan	F (11.07.2019)
A/HS-DH3 2429	Level 04 proposed GA plan	H (11.07.2019)
A/HS-DH3 2430	Roof level proposed GA plan	F (11.07.2019)
A/HS-DH3 2520	GA South and North elevations	F (11.07.2019)
A/HS-DH3 2521	GA East and West elevations	F (11.07.2019)
A/HS-DH3 2620	Cross sections	F (11.07.2019)
A/HS-DH3 2621	Cross sections	F (11.07.2019)
A/HS-DH3 2622	Long sections	F (11.07.2019)
A/HS-DH3 2623	Long sections	E (11.07.2019)

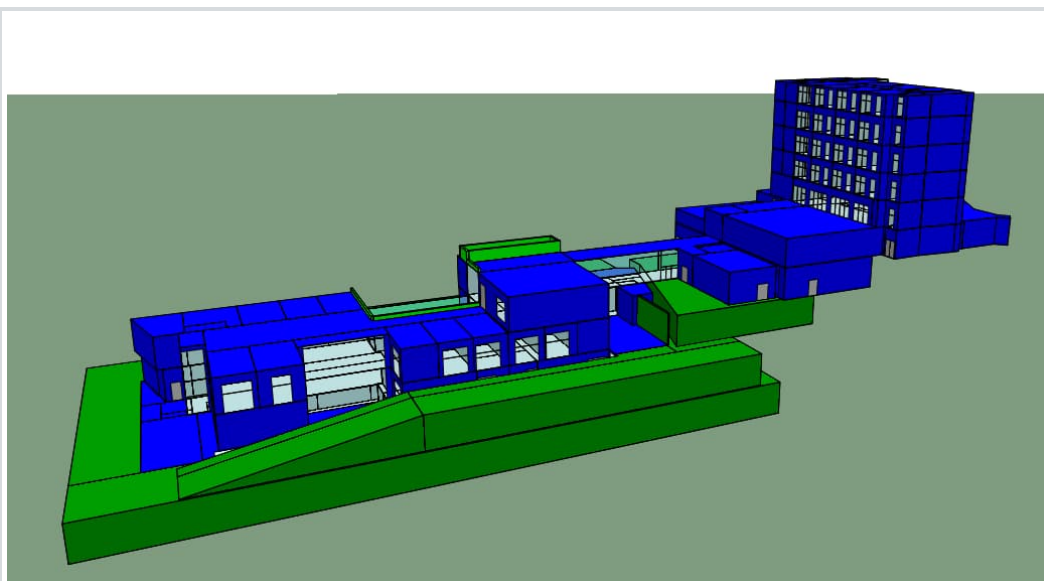


Figure 1. View of model from the North

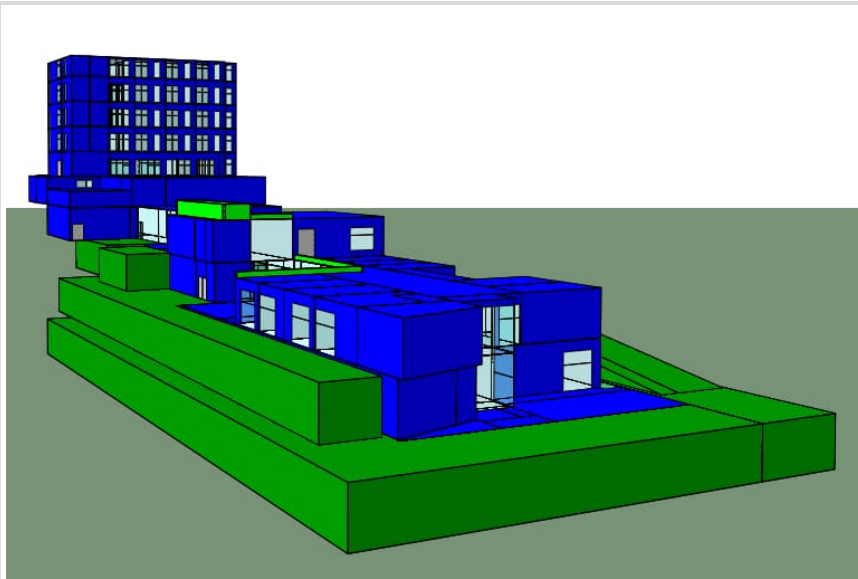


Figure 2. View of model from the East

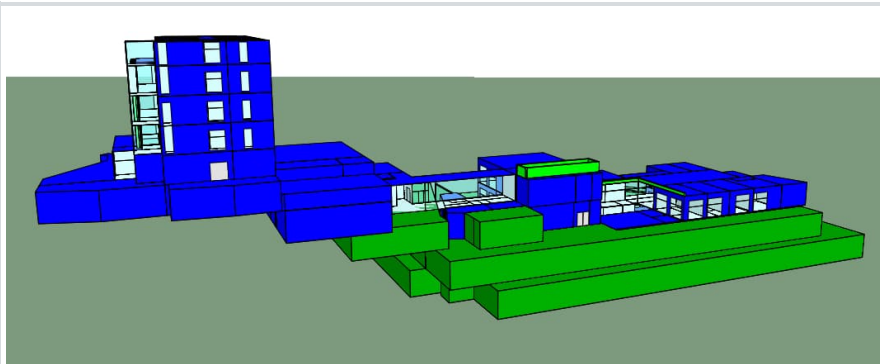


Figure 3. View of model from the South

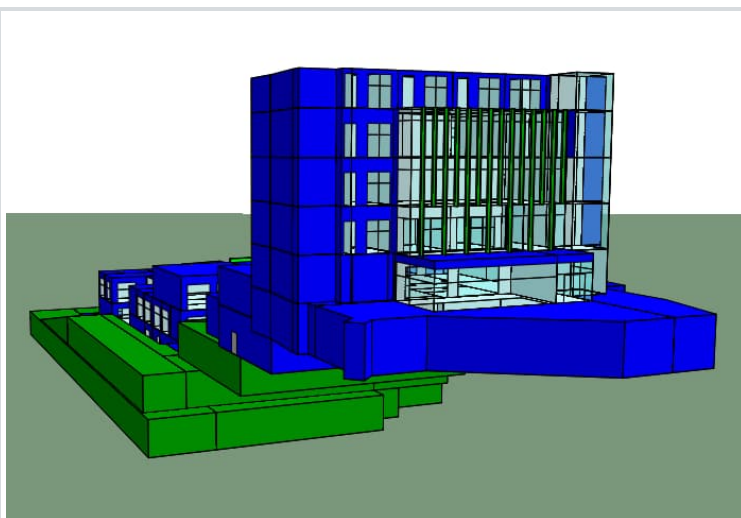


Figure 4. View of model from the West

2.2 Building fabric and air infiltration

The building fabric was assumed to have the following properties, as agreed with Hopkins Architects Ltd.

Table 2. Building fabric

Element	U-value (W/m ² K)	g-value (EN ISO 410)	Visible light transmittance
Roof	0.13	N/A	N/A
Exposed walls	0.15	N/A	N/A
Exposed floors and ground floors	0.13	N/A	N/A
Windows and glazed doors	1.20	0.29	0.60
Rooflights	1.80	0.40	0.71
Opaque vehicle access and similar large doors	1.50	N/A	N/A
Opaque pedestrian doors and high usage entrance doors	2.20	N/A	N/A

An air tightness result of 3m³/m².hr at 50Pa is being targeted for the building.

2.3 NCM activities and HVAC systems and application

The zones in the model have been grouped by activity type and thermal templates applied by these types. The most appropriate NCM activity has been chosen for each template type.

Table 3. NCM activities and systems

Thermal template	NCM Activity (Actual)	HVAC system applied
Auditorium	NCM D1EduS: Hall/lecture theatre/assembly area	VAV - existing areas
Band practice	NCM D1EduS: Teaching areas (SecSchl)	Radiators with S&E (AHU)
Breakout space	NCM D1EduS: Office (SecSchl: Common)	Radiators with MVHR
Cafe / Food court	NCM D1EduS: Eating/drinking area (SecSchl)	Radiators with MVHR
Circulation	NCM D1EduS: Circulation area (SecSchl)	Radiators only
Collaborative area	NCM D1EduS: Teaching areas (SecSchl)	Levels 01 & 04: Radiators with MVHR Level 02: Temperature lopping system
Common room	NCM D1EduS: Office (SecSchl: Common)	Temperature lopping system
Computer room- IT study area	NCM D1EduS: Teaching areas (SecSchl)	FCU
Computer room- sixth form computer studies	NCM D1EduS: Teaching areas (SecSchl)	FCU
Control room - auditorium	NCM D1EduS: High density IT work space	FCU
Control room - music	NCM D1EduS: High density IT work space	FCU
Cleaner store	NCM Office: Cupboard	Radiators with extract
Electronic library	NCM D1EduS: High density IT work space	Radiators with MVHR
Ensemble practice	NCM D1EduS: Teaching areas (SecSchl)	Radiators with MVHR
Flexible seminar room	NCM D1EduS: Teaching areas (SecSchl)	Radiators with MVHR
Informal assembly area	NCM D1EduS: Hall/lecture theatre/assembly area	Temperature lopping system
IT patch room	NCM D1EduS: Office (SecSchl: IT)	Radiators with extract

Thermal template	NCM Activity (Actual)	HVAC system applied
Keyboard classroom	NCM D1EduS: Teaching areas (SecSchl)	Radiators with S&E (AHU)
Large practice room	NCM D1EduS: Teaching areas (SecSchl)	Temperature lopping system
LV switch room	NCM Office: Light plant room	Radiators with extract
Meeting room	NCM D1EduS: Office (SecSchl: Meeting)	Radiators with MVHR
Music IT	NCM D1EduS: Teaching areas (SecSchl)	Temperature lopping system
Music library	NCM Office: Cupboard	Radiators with S&E (AHU)
Music teaching	NCM D1EduS: Teaching areas (SecSchl)	Radiators with MVHR
Plant room	NCM Office: Light plant room	Radiators with extract
Quiet study area	NCM D1EduS: Office (SecSchl: Meeting)	Radiators with MVHR
Recital room	NCM D1EduS: Teaching areas (SecSchl)	Radiators with MVHR
Recording studio	NCM D1EduS: Teaching areas (SecSchl)	Radiators with S&E (AHU)
Seminar room	NCM D1EduS: Teaching areas (SecSchl)	Radiators with MVHR, except for: 01_Seminar Room 11, 02_Seminar Room 07 and 03_Seminar Room 04: Temperature lopping system
Small practice	NCM D1EduS: Teaching areas (SecSchl)	Radiators with S&E (AHU)
Staff Base- music staff	NCM D1EduS: Office (SecSchl: Cellular)	Radiators with MVHR
Staff Base- sixth form	NCM D1EduS: Office (SecSchl: Open)	Radiators with MVHR
Staff office - head music / music director	NCM D1EduS: Office (SecSchl: Cellular)	Radiators with MVHR
Staff office - head sixth form	NCM D1EduS: Office (SecSchl: Cellular)	Temperature lopping system
Staff office - music	NCM D1EduS: Office (SecSchl: Cellular)	Radiators with MVHR
Staff office - sixth form	NCM D1EduS: Office (SecSchl: Cellular)	Radiators with MVHR, except for 01_Sixth Rom Staff Office: Temperature lopping system
Storage	NCM Office: Cupboard	Radiators with extract
Voids	Internal void or warm roof	None
WCs	NCM D1EduS: Toilet (SecSchl)	Dyne House: Radiators with extract Island: Electric panel heaters with MVHR

2.4 HVAC system efficiencies

Table 4. HVAC efficiencies

Item	Value
Ground Source Heat Pump seasonal efficiency	3.5
Heating delivery efficiency	95%
Ventilation heat recovery efficiency	76%
Cooling system SEER (including heat rejection)	5.0
Cooling delivery efficiency	90%
Cooling SSEER	4.5
AHU SFP (used with VAV, FCUs, temperature lopping and Radiators with MVHR where rooms have no external façade)	1.40 W/l/s
MVHR SFP (used with Radiators with MVHR system)	0.75 W/l/s
FCU terminal unit SFP	0.20 W/l/s

Item	Value
Extract fan SFP	0.4W/l/s (fan remote from zone)
Room level extract flow rate	Cleaners store and WCs: 8ach ⁻¹ Plant rooms and stores: 1 ach ⁻¹
Auxiliary pump type	Variable speed multiple pressure sensors
Ductwork leakage classification	CEN Class A
AHU leakage classification	CEN Class L2
HVAC system metering	Yes – with “out of range” warnings
Demand control ventilation	AHU: Yes – damper control based on gas sensors MVHR: Yes – speed control based on gas sensors

2.5 Domestic hot water system

An electric point of use (POU) DHW system is in use throughout the building; this is modelled as described in the following table.

Table 5. DHW system efficiencies

Item	Value
System fuel	Electricity
DHW generator seasonal efficiency	100%
DHW delivery efficiency	95%

2.6 Lighting efficiencies and controls

All lights are assumed to achieve a luminaire efficacy of 95luminaire lumens per circuit Watt, with lux levels applied in accordance with the relevant NCM template type.

PIR controls are included throughout the building, and those areas that benefit from external windows are modelled with photoelectric controls that automatically dim the light when natural daylight levels are sufficient.

The parasitic power for controls has been set as 0.06W/m², based on previous project experience. This is assumed to operate continuously.

Lighting is separately metered, with ‘out of range’ warnings.

Table 6. Lighting inputs and controls

Thermal template	Illuminance level (lux)	Local manual switching?	Occupancy sensing	Daylight controls (rooms with external windows)
Auditorium	300	None	Auto-On-Off	None
Band practice	300	Yes	Man-On-Auto-Off	None
Breakout space	300	Yes	Man-On-Auto-Off	Dimmable
Cafe / Food court	200	None	Auto-On-Off	None
Circulation	100	None	Auto-On-Off	Dimmable
Collaborative area	300	Yes	Man-On-Auto-Off	Dimmable
Common room	300	Yes	Man-On-Auto-Off	Dimmable
Computer room- IT study area	300	Yes	Man-On-Auto-Off	Dimmable
Computer room- sixth form computer studies	300	Yes	Man-On-Auto-Off	Dimmable

Thermal template	Illuminance level (lux)	Local manual switching?	Occupancy sensing	Daylight controls (rooms with external windows)
Control room - auditorium	300	Yes	Man-On-Auto-Off	None
Control room - music	300	Yes	Man-On-Auto-Off	None
Cleaner store	100	No	Auto-On-Off	None
Electronic library	300	No	Auto-On-Off	Dimmable
Ensemble practice	300	Yes	Man-On-Auto-Off	None
Flexible seminar room	300	Yes	Man-On-Auto-Off	Dimmable
Informal assembly area	300	None	Auto-On-Off	None
IT patch room	200	No	Auto-On-Off	None
Keyboard classroom	300	Yes	Man-On-Auto-Off	Dimmable
Large practice room	300	Yes	Man-On-Auto-Off	Dimmable
LV switch room	200	No	Auto-On-Off	None
Meeting room	300	No	Auto-On-Off	Dimmable
Music IT	300	Yes	Man-On-Auto-Off	None
Music library	100	No	Auto-On-Off	None
Music teaching	300	Yes	Man-On-Auto-Off	Dimmable
Plant room	200	No	Auto-On-Off	None
Quiet study area	300	Yes	Man-On-Auto-Off	Dimmable
Recital room	300	Yes	Man-On-Auto-Off	None
Recording studio	300	Yes	Man-On-Auto-Off	None
Seminar room	300	Yes	Man-On-Auto-Off	Dimmable
Small practice	300	Yes	Man-On-Auto-Off	None
Staff Base- music staff	300	No	Auto-On-Off	Dimmable
Staff Base- sixth form	300	No	Auto-On-Off	Dimmable
Staff office - head music / music director	300	No	Auto-On-Off	Dimmable
Staff office - head sixth form	300	No	Auto-On-Off	None
Staff office - music	300	No	Auto-On-Off	Dimmable
Staff office - sixth form	300	No	Auto-On-Off	Dimmable
Storage	100	No	Auto-On-Off	None
Voids	N/A	N/A	N/A	N/A
WCs	100	No	Auto-On-Off	None

2.7 Power factor correction

The whole building power factor correction was set to >0.95.

2.8 Green strategy

In addition to the GSHP serving space heating demands, it is proposed to include a roof mounted PV array. This has the following assumed performance.

Table 7. PV array

Item	Value
PV module nominal efficiency (%)	21
Nominal cell temperature (NOCT) (°C)	45
Reference irradiance for NOCT (W/m ²)	800
Temperature coefficient for module efficiency (1/K)	0.004
Electrical conversion efficiency	0.97
Area of panels (m ²)	76
Azimuth (° clockwise from north)	156
Inclination (° from horizontal)	10

3. Results

The following results are obtained for the Dyne House including Island site.

Table 8. Carbon dioxide emissions after each stage of the Energy Hierarchy

Carbon Dioxide Emissions for non-residential buildings (Tonnes CO ₂ per annum)		
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	18.7	24.2
After energy demand reduction (be lean)	19.3	24.2
After heat network connection (be clean)	19.3	24.2
After renewable energy (be green)	17.1	24.2

For compliance with Building Regulations, Dyne House excluding the Island site achieves the following.

Table 9. Part L 2021 results for Dyne House (excluding Island site)

	Emission rate (kgCO ₂ /m ² .yr)	Primary energy rate (kWh/m ² .yr)
Actual building	2.93	31.19
Notional building	3.22	34.43
Results	Pass (9%)	Pass (9%)

Appendix A Extract from BRUKL for Dyne House

BRUKL Output Document



HM Government

Compliance with England Building Regulations Part L 2021

Project name

Dyne House exc. Island**As designed**

Date: Mon Aug 22 08:47:34 2022

Administrative information

Building Details

Address:

Certifier details

Name: AECOM

Telephone number: 0113 301 8400

Address: 2 City Walk, Leeds, LS11 9AR

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.16

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.16

BRUKL compliance module version: v6.1.c.0

Foundation area [m²]: 575.28

The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	3.22
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	2.93
Target primary energy rate (TPER), kWh/m ² .annum	34.43
Building primary energy rate (BPER), kWh/m ² .annum	31.19
Do the building's emission and primary energy rates exceed the targets?	BER <= TER BPER <= TPER

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

Fabric element	U _a -Limit	U _a -Calc	U _i -Calc	First surface with maximum value
Walls*	0.26	0.15	0.15	01000002:Surf[2]
Floors	0.18	0.13	0.13	01000007:Surf[0]
Pitched roofs	0.16	-	-	No Pitched roofs in building
Flat roofs	0.18	0.13	0.13	01000002:Surf[1]
Windows** and roof windows	1.6	1.2	1.2	01000002:Surf[6]
Rooflights***	2.2	1.8	1.8	03000009:Surf[1]
Personnel doors^	1.6	1.74	2.2	01000000:Surf[7]
Vehicle access & similar large doors	1.3	-	-	No Vehicle access doors in building
High usage entrance doors	3	-	-	No High usage entrance doors in building
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)] U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)] U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)] * 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. *** Values for rooflights refer to the horizontal position. ^ For fire doors, limiting U-value is 1.8 W/m ² K NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	3

Page 1 of 14

aecom.com

Appendix D Correspondence with heat pump manufacturer

Belfitt, Richard

From: Edmondson, John
Sent: 12 September 2022 11:02
To: Belfitt, Richard
Subject: FW: Query: Geothermal borehole array [2]

Highgate efficiencies.

John Edmondson
M +44-(0)-7790-901-342

From: Chris Davidson <cd@geniusenergylab.com>
Sent: 19 July 2022 13:01
To: Edmondson, John <john.edmondson@aeacom.com>; Duncan Rae <dr@geniusenergylab.com>; Gomes, Daniel <Daniel.Gomes@aeacom.com>
Cc: Au, Jake <jake.au@aeacom.com>
Subject: [EXTERNAL] RE: Query: Geothermal borehole array [2]

Hi John,

That's great, thanks for confirming. I'd hope to improve a little on the three numbers below, but they are realistic for now. As ever if you need anything else, don't hesitate to let us know.

Best of luck with the return to Uni Danny!

All the best,

Chris



Chris Davidson
Chief Technical Officer

Email: cd@geniusenergylab.com
Phone: 08458381151
Mobile: 07539640443
Stables End Court, Main Street
Market Bosworth, CV13 0JN
Please see our [Service Agreement](#)
And [Email Policy](#)

From: Edmondson, John <john.edmondson@aeacom.com>
Sent: 19 July 2022 12:45
To: Duncan Rae <dr@geniusenergylab.com>; Gomes, Daniel <Daniel.Gomes@aeacom.com>
Cc: Chris Davidson <cd@geniusenergylab.com>; Au, Jake <jake.au@aeacom.com>
Subject: RE: Query: Geothermal borehole array [2]

We wont have updated loads until we build a proper HGHL model when we pick up design proper again, which is likely to be next year for Dyne House and year after for RMC.

Currently were using the following SCOP's in our Part L model, which is passing, and we have options to improve elsewhere once we get back into design proper and 'make it work', so could simply be advice if these are not beyond the realms of possibility. Personally I'd hope to better though:

- Heating: 3.5
- Cooling: 5
- DHW: 2.86

Let me know what you think.

FYI I'm cc'ing in Jake who will be taking over from Danny as he goes back to uni.

Regards

John Edmondson
M +44-(0)-7790-901-342

From: Duncan Rae <dr@geniusenergylab.com>
Sent: 19 July 2022 12:10
To: Edmondson, John <john.edmondson@aecon.com>; Gomes, Daniel <Daniel.Gomes@aecon.com>
Cc: Chris Davidson <cd@geniusenergylab.com>
Subject: [EXTERNAL] RE: Query: Geothermal borehole array [2]

Hi John,

We can do some performance modelling for you to take it forward. Do you have any update to the loads?

Best regards,
Duncan



Duncan Rae
Business Development
Director

Email: dr@geniusenergylab.com
Phone: 08458381151
Mobile: 07940017712
Stables End Court, Main Street
Market Bosworth, CV13 0JN
Please see our [Service Agreement](#)
And [Email Policy](#)

From: Edmondson, John <john.edmondson@aecon.com>
Sent: 18 July 2022 15:33
To: Duncan Rae <dr@geniusenergylab.com>; Gomes, Daniel <Daniel.Gomes@aecon.com>
Cc: Chris Davidson <cd@geniusenergylab.com>
Subject: RE: Query: Geothermal borehole array [2]

Afternoon Duncan,

Appendix E Overheating Risk Analysis

Highgate School Dyne House 3

Thermal modelling & overheating report

Project number: 60580302

October 2022

Quality information

Prepared by	Checked by	Verified by	Approved by
Elizabeth Ward Associate	Anna Holding Associate Director And Harry Sharples Senior Building Performance Engineer	Ross Bates Regional Director	John Edmondson Associate Director

Revision History

Revision	Revision date	Details	Authorized	Name	Position
0	15/09/2022	Draft	JE	John Edmondson	Associate Director
1	30/09/2022	Amended to incorporate revised openings	JE	John Edmondson	Associate Director
2	01/11/2022	Report title updated	JE	John Edmondson	Associate Director

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Executive Summary

This report outlines the thermal comfort modelling undertaken for the proposed Dyne House building, in accordance with the requirements of Haringey's key overheating planning application requirements. For non-domestic buildings this requires compliance with CIBSE TM52 "The limits of thermal comfort in European buildings" for the 2020 High emissions, 50th percentile scenario DSY1 weather file, with additional assessments undertaken for DSY2 and 3 weather files for the 2020 high emissions, 50th percentile scenario, and DSY1 weather files for the 2050 and 2080 high emissions, 50th percentile scenarios.

It is not mandatory for compliance to be achieved under the additional weather files; however, mitigation and retrofit measures should be identified towards achieving compliance.

In the case of Dyne House, compliance is demonstrated under the 2020 DSY1 weather file; however, there are some non-compliant rooms when assessed against the additional weather files. The following measures are identified as appropriate for future investigation and adoption towards achieving compliance under the future weather conditions:

- Add ceiling fans to increase air movement,
- Retrofit phase-change MVHR units to provide passive temperature lopping,
- Increase the capacity of temperature lopping systems,
- Add further mechanical cooling.

1. Introduction

This report details the thermal comfort modelling of the Dyne House 3 building against the requirements of CIBSE TM52 “The limits of thermal comfort: Avoiding overheating in European buildings” (CIBSE TM52). Dyne House is a secondary school building, comprising teaching spaces, music facilities and staff areas.

This assessment has been completed to demonstrate compliance with the requirements of The London Plan, March 2021, Policy SI4 Managing heat risk and Haringey’s key overheating planning application requirements.

1.1 CIBSE TM52 The limits of thermal comfort: Avoiding overheating in European buildings

This study has been undertaken to assess which areas are most at risk of overheating, by carrying out a CIBSE TM52 assessment. The method acknowledges that the use of a single indoor temperature limit is insufficient. Rather, the maximum acceptable temperature varies based on a running mean of outdoor conditions. A room is deemed to pass if at least two of the criteria are met:

- Criterion 1: Hours of Exceedance
 - The number of hours that the actual operative temperature in the room is one degree (°K) or more above the limiting maximum acceptable temperature shall not be more than 3 percent of occupied hours, for the period 1st May to 30th September.
- Criterion 2: Daily Weighted Exceedance
 - The weighted exceedance shall be less than or equal to 6 in any one day.
- Criterion 3: Upper Limit Temperature
 - To set an absolute maximum value for the indoor operative temperature, the operative temperature shall never be greater than 4°K above the maximum acceptable temperature i.e. ΔT shall not exceed 4°K.

1.2 CIBSE Guide A

Where cooling is applied, the relevant thermal comfort criteria are described in CIBSE Guide A, Table 1.5. For school spaces, compliance is achieved by limiting the operative temperature to less than 25°C.

1.3 The London Plan

The London Plan policy SI4 “Managing heat risk” requires the following:

- *“Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure.*
- *“Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:*
 1. *“reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure,*
 2. *“minimise internal heat generation through energy efficient design,*
 3. *“manage the heat within the building through exposed internal thermal mass and high ceilings,*
 4. *“provide passive ventilation,*
 5. *“provide mechanical ventilation,*
 6. *“provide active cooling systems.”*

1.4 Haringey's key overheating planning application requirements (November 2021)

The general requirements of overheating assessments for planning applications in Haringey include that non-residential spaces are assessed against the requirements of CIBSE TM52.

The requirements for dynamic thermal modelling of non-residential developments are summarised as follows:

- Assessment follows the CIBSE TM52 methodology and uses the CIBSE TM49 weather files for the London Weather Centre under the high emissions 50% percentile scenario.
- The report should include results obtained for the following scenarios:
 - Mandatory compliance with Design Summer Year (DSY) 1 (2020, high emissions, 50 percentile).
 - Mitigation measures to comply as far as feasible with DSY 2 and 3 (2020, high emissions, 50 percentile).
 - Future compliance with DSY1 in 2050s and 2080s (high emissions, 50 percentile) through a retrofit plan with measures that can be implemented within the building design.
- Demonstrate the development has following the London Plan's cooling hierarchy, providing justification where measures have not been found feasible.
- Demonstrate the appropriate and robust inputs into the dynamic model.

2. Model inputs

2.1 Model geometry

The model geometry was created based on the following drawings provided by Hopkins Architects Limited.

Table 1. Architectural drawings used to create the thermal model

Drawing number	Description	Revision
A/HS-DH3 2400	Proposed site plan	C (11.07.2019)
A/HS-DH3 2420	Level -05 proposed GA plan	H (11.07.2019)
A/HS-DH3 2421	Level -04 proposed GA plan	H (11.07.2019)
A/HS-DH3 2422	Level -03 proposed GA plan	H (11.07.2019)
A/HS-DH3 2423	Level -02 proposed GA plan	H (11.07.2019)
A/HS-DH3 2424	Level -01 proposed GA plan	H (11.07.2019)
A/HS-DH3 2425	Level 00 proposed GA plan	H (11.07.2019)
A/HS-DH3 2426	Level 01 proposed GA plan	H (11.07.2019)
A/HS-DH3 2427	Level 02 proposed GA plan	H (11.07.2019)
A/HS-DH3 2428	Level 03 proposed GA plan	F (11.07.2019)
A/HS-DH3 2429	Level 04 proposed GA plan	H (11.07.2019)
A/HS-DH3 2430	Roof level proposed GA plan	F (11.07.2019)
A/HS-DH3 2520	GA South and North elevations	F (11.07.2019)
A/HS-DH3 2521	GA East and West elevations	F (11.07.2019)
A/HS-DH3 2620	Cross sections	F (11.07.2019)
A/HS-DH3 2621	Cross sections	F (11.07.2019)
A/HS-DH3 2622	Long sections	F (11.07.2019)
A/HS-DH3 2623	Long sections	E (11.07.2019)

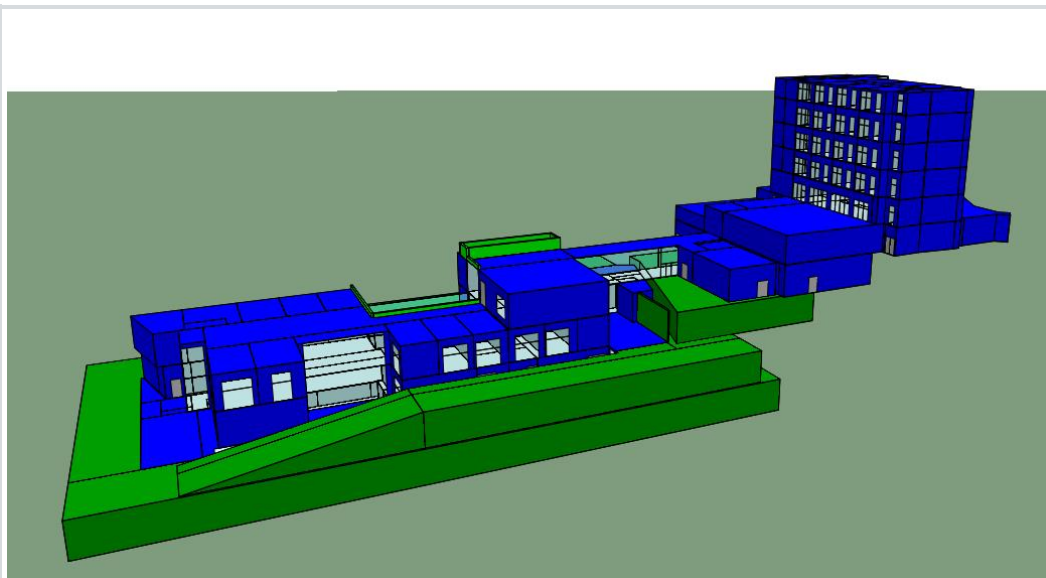


Figure 1. View of model from the North

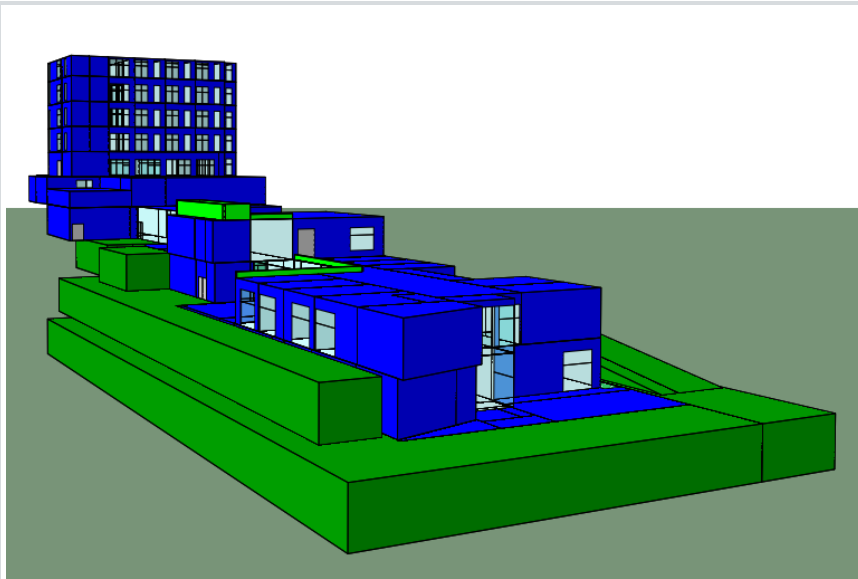


Figure 2. View of model from the East

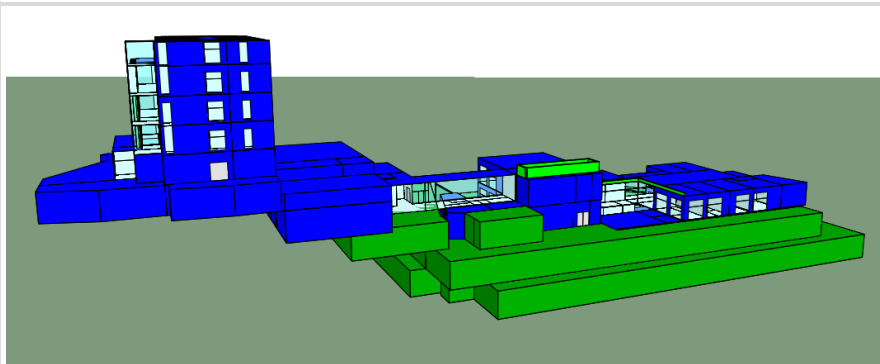


Figure 3. View of model from the South

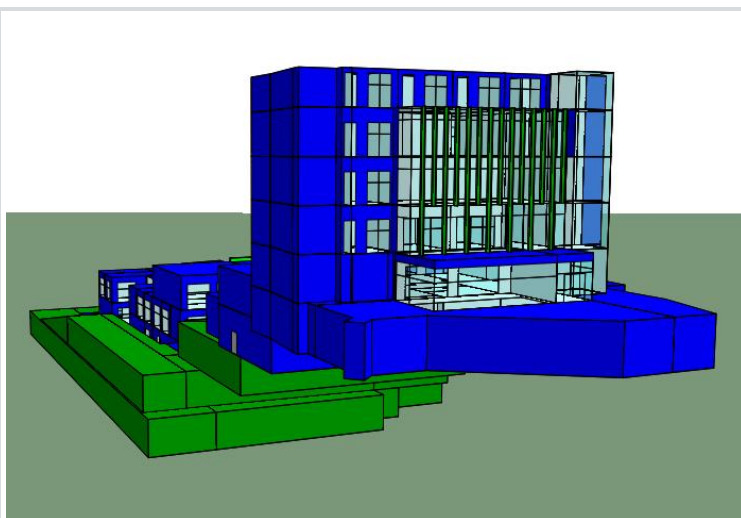


Figure 4. View of model from the West

2.2 Building fabric and air infiltration

The building fabric was assumed to have the following properties, as agreed with Hopkins Architects Ltd.

Table 2. Building fabric

Element	U-value (W/m ² K)	g-value (EN ISO 410)	Visible light transmittance
Roof	0.13	N/A	N/A
Exposed walls	0.15	N/A	N/A
Exposed floors and ground floors	0.13	N/A	N/A
Windows and glazed doors	1.20	0.29	0.60
Rooflights	1.80	0.40	0.71
Opaque vehicle access and similar large doors	1.50	N/A	N/A
Opaque pedestrian doors and high usage entrance doors	2.20	N/A	N/A

An air tightness result of 3m³/m².hr at 50Pa is being targeted for the building, this is equivalent to an infiltration rate of 0.1ach⁻¹.

2.3 Thermal templates

Internal gains in the overheating assessment model are largely input on the basis of room type, although some details, such as number of occupants, are input on a room-by-room basis. The full details of the internal gains are given in Appendix A.

2.3.1 Operation patterns

The CIBSE TM52 overheating assessment considers the period May to September inclusive. A number of profiles are used to model the anticipated usage pattern of each room type, accounting for the school calendar. The school calendar has been input on the basis of a typical academic year, as described below, with the autumn term modelled as starting a week earlier to take account of pre-term use by teachers.

Table 3. Term time dates occupancy/ operation patterns

Term/holiday	Occupied?	First day	Last day
Spring 1	Occupied	08-Jan	09-Feb
Spring half term	Unoccupied	10-Feb	18-Feb
Spring 2	Occupied	19-Feb	23-Mar
Easter	Unoccupied	24-Mar	15-Apr
Summer 1	Occupied	16-Apr	25-May
Summer half term	Unoccupied	26-May	03-Jun
Summer 2	Occupied	04-Jun	06-Jul
Summer holidays	Unoccupied	07-Jul	26-Aug
Autumn 1	Occupied	27-Aug	12-Oct
Autumn half term	Unoccupied	13-Oct	21-Oct
Autumn 2	Occupied	22-Oct	21-Dec
Christmas holiday	Unoccupied	22-Dec	31-Dec

During occupied periods identified in the table above, several different operation profiles are used to model the anticipated usage of the building, as shown below.

Table 4. Occupancy/ operation patterns

Number	Occupancy/operational pattern
1	16:30 – 18:00 Mon -Fri
2	08:30 – 18:00 Monday - Friday
3	07:00 – 18:00 Monday – Friday
4	100% 08:30-13:00, 50% 13:00-14:15, 100% 14:15-16:00, 50% 16:00 - 18:00 Monday – Friday
5	08:30-13:00, 14.15-16:00 Mon - Fri
6	13:00 – 14:15 Mon - Fri
7	50% 07:00-08:30, 100% 08:30-13:00, 50% 13:00-14:15, 100% 14:15-16:00, 50% 16:00-18:00
8	0830-1800, with 81% diversity background gains outside these times

2.4 Weather files

As required by the Haringey overheating assessment requirements for planning applications, the following CIBSE TM49 weather files have been used during this study:

- London weather centre DSY 1 2020, high emissions, 50 percentile (mandatory compliance).
- London weather centre DSY 2 and 3 2020, high emissions, 50 percentile (compliance as far as feasible using mitigation measures).
- London weather centre DSY 1 for 2050 and 2080, high emissions, 50 percentile (future compliance through a retrofit plan with measures that can be implemented).

3. The cooling hierarchy

The cooling hierarchy as defined in Policy SI4 of The London Plan (March 2021) is summarised as follows:

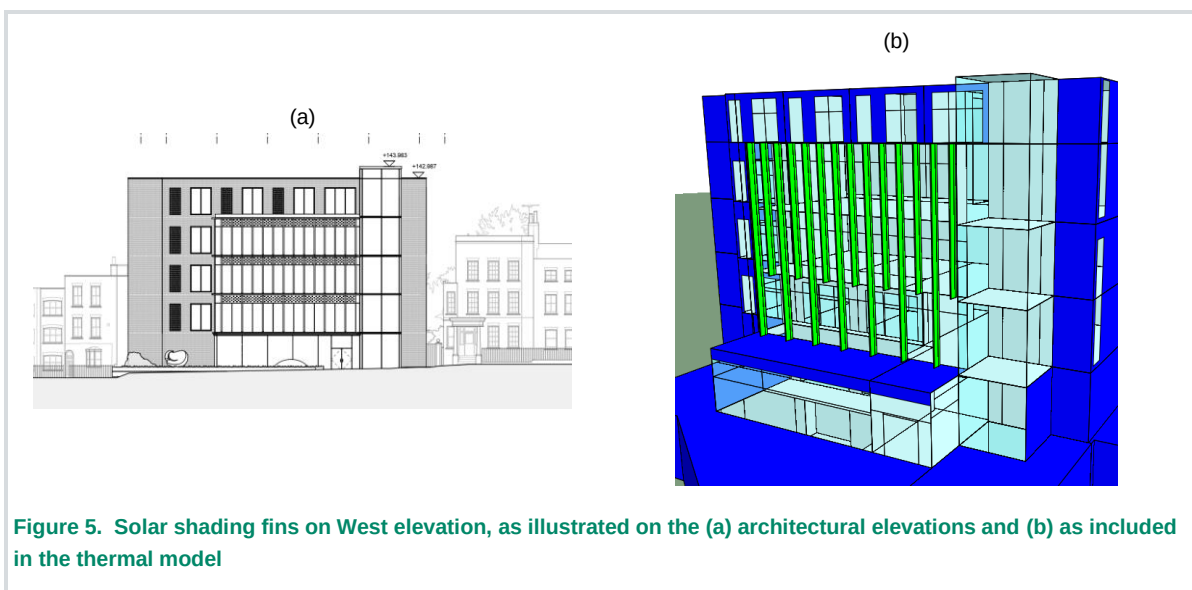
1. Reduce the amount of heat entering the building
2. Minimise internal heat generation
3. Manage the heat within the building
4. Provide passive ventilation
5. Provide mechanical ventilation
6. Provide active cooling systems

The following sections demonstrate how the design of Dyne House 3 has adhered to this hierarchy.

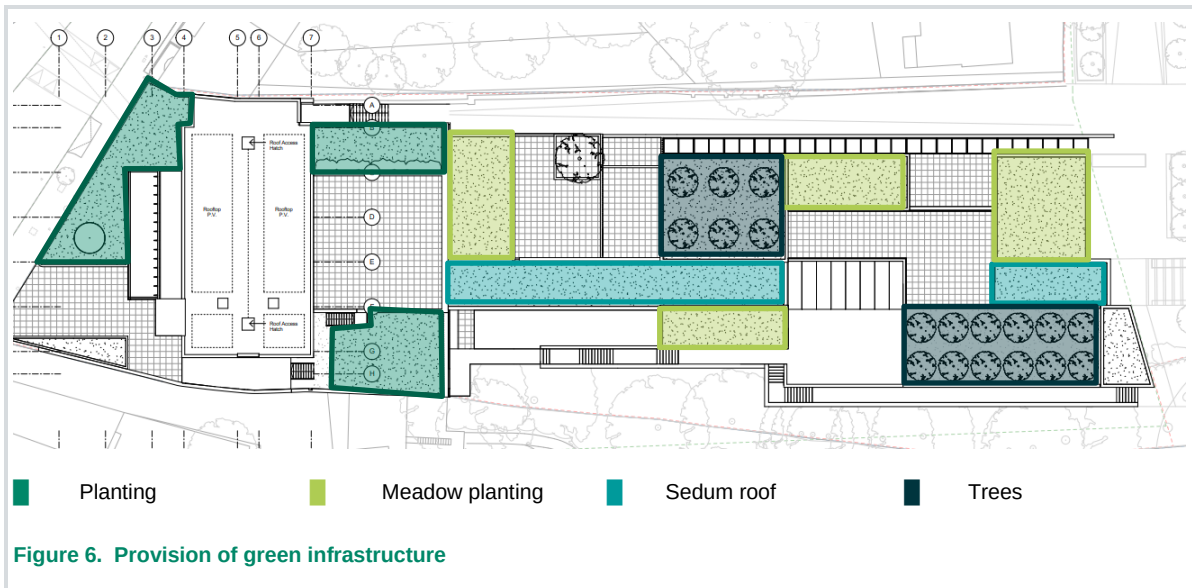
3.1 Reduce the amount of heat entering the building

Several features have been employed to reduce heat gains entering Dyne House 3, these include:

- Use of solar control glazing with a low g-value of 0.29 to reduce solar gains.
- Insulated building fabric (refer to Table 2 for details) to reduce conductive gains.
- Provision of vertical shading fins on the western elevation, as illustrated in Figure 5, to reduce afternoon solar gains.



- Provision of green infrastructure in the form of sedum roofs, meadow planting and sunken gardens, as illustrated in Figure 6.

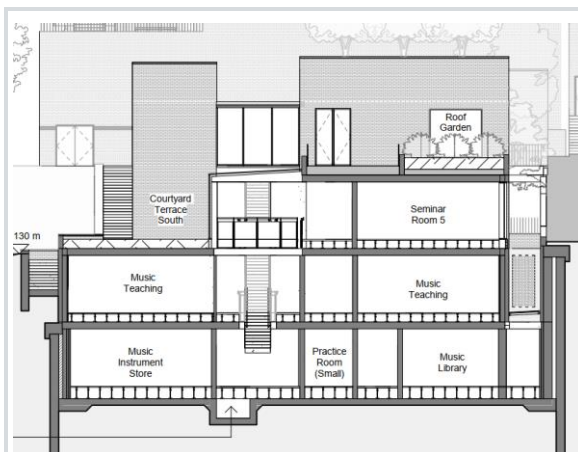


3.2 Minimise internal heat generation

The design will use energy efficient lighting to minimise the internal heat gains. Other sources of internal heat, such as plug-in equipment, will be energy efficient where possible to reduce the heat gains generated from these sources.

3.3 Manage heat within the building

Where possible, considering the space required for plant distribution and acoustics etc., rooms have been provided with exposed soffits, as illustrated in Figure 7. These will help to moderate internal conditions by absorbing and discharging heat over a 24 hour period.



3.4 Use passive ventilation

Where possible, the baseline design is to use natural ventilation in all spaces to meet the overheating requirements. In those rooms where acoustic requirements (e.g. music rooms) or location (i.e. no external walls) means that natural ventilation cannot be used, mechanical ventilation is provided (refer to Section 3.5).

3.5 Use mechanical ventilation

In those rooms where a natural ventilation solution is not feasible, either as a result of the required acoustic conditions or room location, the baseline design is to use mechanical ventilation.

Where it is found that natural ventilation is unable to provide acceptable thermal comfort conditions, the first mitigation measure investigated is to use mechanical ventilation.

3.6 Use active cooling systems

For those spaces where both a natural and mechanical ventilation approach has been unable to meet the thermal comfort conditions, it is proposed to provide active cooling in order to meet the overheating criteria.

4. Baseline scenario

The baseline scenario simulated incorporates the measures designed to mitigate the effects of gains in the spaces (stages 1 to 3 in the cooling hierarchy), and includes:

- Natural ventilation via opening windows in all possible locations (i.e. rooms with windows without acoustic constraints) which is supplemented by un-tempered mechanical ventilation including night-time ventilation.
- Un-tempered mechanical ventilation, including night-time ventilation, in all occupied rooms without windows.

Full details of the ventilation included in the baseline model are described in Appendix B.

4.1 Summary of CIBSE TM52 results for baseline scenario

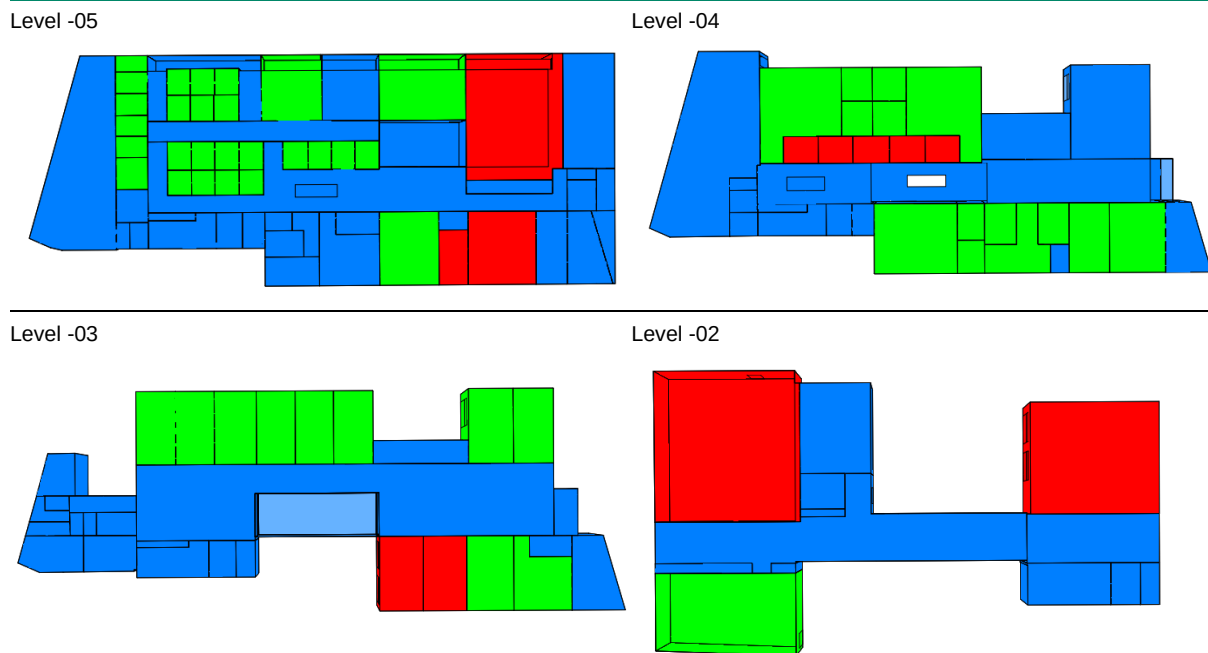
Full results for each of the assessed occupied spaces are provided in Appendix E.1, and summarised below. It is seen that some spaces do not comply with the CIBSE TM52 overheating requirements in the baseline scenario.

Table 5. Summary of CIBSE TM52 results for baseline scenario (DSY1)

	Number of Rooms	% of assessed rooms
Number of rooms assessed	97	-
CIBSE TM52 compliant rooms	55	56.7
CIBSE TM52 non-compliant rooms	42	43.3

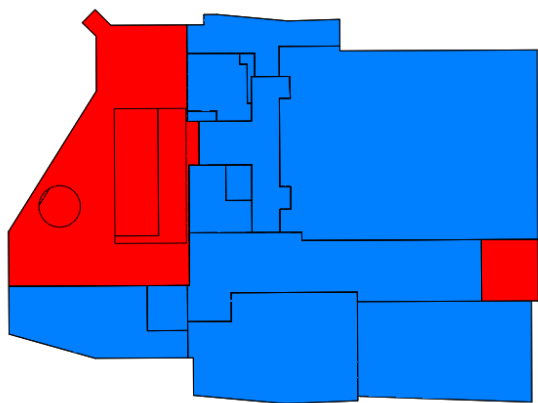
Table 6. Screenshots illustrating baseline (DSY1) CIBSE TM52 results

Baseline CIBSE TM52 results

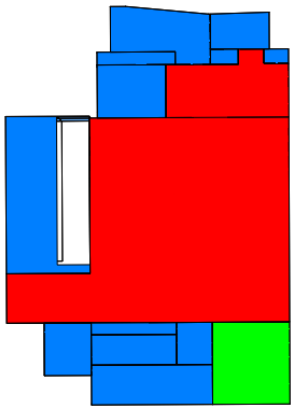


Baseline CIBSE TM52 results

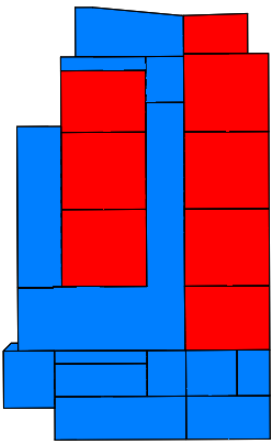
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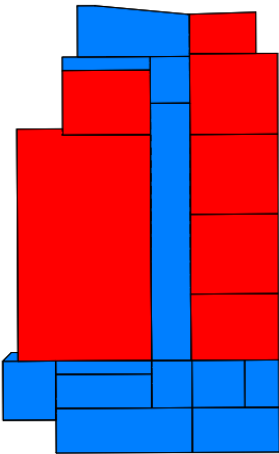
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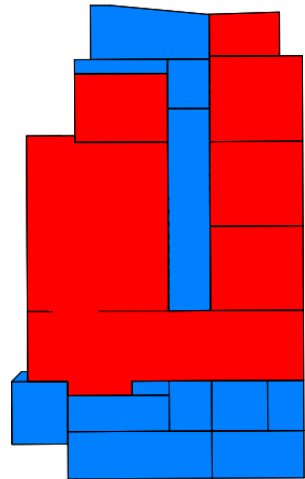
Level 01



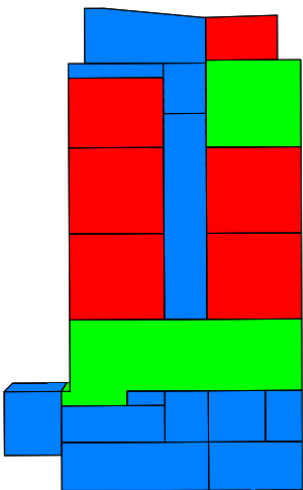
Level 02



Level 03



Level 04



- 00) Fail
- 01) Pass
- 02) N/A

5. Testing mitigation measures

As shown in the previous section, many spaces do not comply with the overheating criteria. The following section describes the mitigation measures investigated to evaluate how CIBSE TM52 compliance can be achieved for all assessed spaces.

The following table summarises the results obtained from the scenarios tested, with full details provided beneath.

Table 7. Summary of CIBSE TM52 results for scenarios tested (DSY1 2020)

Scenario	Description of measures	Number of CIBSE TM52 compliant rooms
Baseline		55 / 97 (56.7%)
1	Increased top-hung window opening distance from 100mm to a maximum of 80°	66 / 97 (68.0%)
2	As per scenario 1 + additional low-level opening windows	69 / 97 (71.1%)
3	As per scenario 2 + additional mechanical ventilation	82 / 97 (84.5%)
4	As per scenario 3 + temperature topping	93 / 97 (95.8%)
5	As per scenario 4 + cooling	97 / 97 (100%)

5.1 Scenario 1: Increased top hung window openings

In Scenario 1, the previously modelled top-hung window opening distance was increased from a maximum of 100mm to a maximum of 80°.

No other changes were made to the model.

5.2 Scenario 2: Increased window openings

In Scenario 2, the high-level top hung windows were modelled as per Scenario 1 (opening to a maximum of 80°). These were supplemented by low level openings, limited to a maximum opening of 100mm, in rooms failing in scenario 1 and that have opening windows. The opening arrangement is described in further detail in Appendix C.2.

5.3 Scenario 3: Increased mechanical ventilation

Scenario 3 retains the opening windows as included in Scenario 2.

In those rooms failing the CIBSE TM52 criteria in the baseline scenario, the mechanical ventilation flow rate was iteratively increased from 10l/s/person (as in the baseline), until compliance was achieved or a maximum of 20l/s/person was reached. The maximum flow rate was defined by the limit that can be supplied by the systems accounting for spatial and acoustic constraints. This scenario includes un-tempered mechanical ventilation air only.

5.4 Scenario 4: Temperature topping

Scenario 4 builds on scenario 3; with temperature topping added to those rooms that did not comply with the TM52 requirements in scenario 3. For those spaces, the mechanical ventilation rate was reduced back to a minimum of 10l/s/person, and iteratively increased until compliance was achieved, or a maximum flow rate of 20l/s/person was reached.

5.5 Scenario 5: Cooling

The final scenario tested added mechanical cooling to the remaining spaces that did not comply with the requirements of CIBSE TM52 under scenario 4.

The relevant thermal comfort criterion for the cooled spaces is described in CIBSE Guide A Table 1.5, and requires that the operative temperature is limited to 25°C or less.

5.6 Scenario 5a: Scenario 5 with revised openings

Subsequently to the modelling described previously, the architects proposed revised opening arrangements to the front block comprising high-level 700mm tall, fully openable (90°), top-hung windows. There are no mid-level openings proposed in this scenario.

The previous solution was re-run to confirm that the proposed servicing strategies still achieved compliance when the revised opening arrangements were applied.

6. Results

The following tables show the results obtained from scenario 5a for the London weather centre DSY1 2020 high emissions scenario 50th percentile, for which the Haringey overheating policy requires mandatory compliance.

Table 8. CIBSE TM52 results for scenario 5a (weather file: London weather centre DSY1 2020 high emissions scenario 50th percentile)

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
-05 Band Practice	0.0	0	0	-	Pass
-05 Control Room	0.0	0	0	-	Pass
-05 Keyboard Classroom	5.9	4	2	1	Pass
-05 Large Practice	0.0	0	0	-	Pass
-05 Music IT	11.2	5	2	1	Pass
-05 Music Recording Studio	2.4	2	1	-	Pass
-05 SP 01	0.0	0	0	-	Pass
-05 SP 02	0.0	0	0	-	Pass
-05 SP 03	0.0	0	0	-	Pass
-05 SP 04	0.0	0	0	-	Pass
-05 SP 05	0.0	0	0	-	Pass
-05 SP 06	0.0	0	0	-	Pass
-05 SP 07	0.1	1	1	-	Pass
-05 SP 08	0.3	2	1	-	Pass
-05 SP 08	0.3	2	1	-	Pass
-05 SP 09	0.1	1	1	-	Pass
-05 SP 11	0.3	2	1	-	Pass
-05 SP 12	0.0	0	0	-	Pass
-05 SP 13	0.1	1	1	-	Pass
-05 SP 14	0.3	2	1	-	Pass
-05 SP 15	0.3	2	1	-	Pass
-05 SP 16	0.1	1	1	-	Pass
-05 SP 17	0.4	3	1	-	Pass
-05 SP 18	0.6	3	1	-	Pass
-05 SP 19	0.6	3	1	-	Pass
-05 SP 20	0.4	3	1	-	Pass
-05 SP 21	0.0	0	0	-	Pass
-05 SP 22	0.1	1	1	-	Pass

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
-05 SP 23	0.1	1	1	-	Pass
-05 SP 24	0.1	1	1	-	Pass
-04_Break Out 01	0.4	3	1	-	Pass
-04_Break Out 02	0.0	0	0	-	Pass
-04_Break Out 03	0.4	3	1	-	Pass
-04_Break Out 04	0.0	0	0	-	Pass
-04_Break Out Space 01	0.0	0	0	-	Pass
-04_Break Out Space 02	0.0	0	0	-	Pass
-04_EP 01	2.8	7	2	2	Pass
-04_EP 02	2.8	7	2	2	Pass
-04_EP 03	2.8	7	2	2	Pass
-04_EP 04	2.8	7	2	2	Pass
-04_EP 05	2.7	7	2	2	Pass
-04_Head Music Office 01	0.0	0	0	-	Pass
-04_Head Music Office 02	0.0	0	0	-	Pass
-04_Music Director Office	0.0	0	0	-	Pass
-04_Music Staff Office	0.1	1	1	-	Pass
-04_Music Teaching	0.4	3	1	-	Pass
-04_Music Teaching 01	0.1	1	1	-	Pass
-04_Music Teaching 02	0.9	3	1	-	Pass
-04_Visiting Staff Base	0.4	3	1	-	Pass
-03_Seminar room 01	1.8	3	2	-	Pass
-03_Seminar room 02	1.5	3	2	-	Pass
-03_Seminar room 03	1.1	3	2	-	Pass
-03_Seminar room 04	1.5	3	2	-	Pass
-03_Seminar room 05	1.5	3	2	-	Pass
-03_Seminar room 06	1.5	3	2	-	Pass
-03_Seminar room 07	1.5	3	2	-	Pass
-03_Seminar room 08	1.3	3	2	-	Pass
-03_Seminar room 09	2.2	6	3	-	Pass
-03_Seminar room 10	2.2	4	2	-	Pass
-03_Seminar room 11	1.8	3	2	-	Pass
-03_Seminar room 12	0.4	1	1	-	Pass
-02 Electronic library	1.8	3	2	-	Pass
-02 Existing Auditorium	0.0	0	0	-	Pass
-02 Existing Recital Room	0.0	0	0	-	Pass
-01 Control Room	0.0	0	0	-	Pass
-01 Informal Assembly Area	0.0	0	0	-	Pass
00_Cafe/Food Court	0.0	0	0	-	Pass
00_Sixth Form Common Room	1.5	3	2	-	Pass

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
01_Collaborative Area	2.6	4	2	-	Pass
01_Departmental Staff Base	1.8	7	2	2	Pass
01_Head of Sixth Form Office	1.8	4	1	-	Pass
01_Meeting Room 02	2.9	9	2	2	Pass
01_Seminar Room 09	2.9	7	3	2	Pass
01_Seminar Room 10	2.9	7	3	2	Pass
01_Seminar Room 11	0.4	1	1	-	Pass
01_Sixth Form Staff Office	0.3	2	1	-	Pass
02_Collaborative Area	0.4	1	1	-	Pass
02_Flexible Seminar Room 05	2.9	7	3	2	Pass
02_Flexible Seminar Room 06	2.6	7	3	2	Pass
02_IT Study Area	13.2	6	2	1	Pass
02_Meeting Room	2.9	9	2	2	Pass
02_Seminar Room 07	0.7	2	1	-	Pass
02_Sixth Form Staff Office - UCAS	1.7	7	2	2	Pass
03_Computer Studies	0.0	0	0	-	Pass
03_Departmental Staff Base	1.7	7	2	2	Pass
03_Flexible Seminar Room 03	2.9	7	3	2	Pass
03_Flexible Seminar Room 04	2.2	5	3	-	Pass
03_Meeting Room	2.9	9	2	2	Pass
03_Seminar Room 04	0.0	0	0	-	Pass
04_Collaborative Area	0.4	1	1	-	Pass
04_Flexible Seminar Room 01	2.0	4	2	-	Pass
04_Flexible Seminar Room 02	2.0	5	3	-	Pass
04_Meeting Room	2.1	7	2	2	Pass
04_Seminar Room 01	4.0	6	3	1	Pass
04_Seminar Room 02	3.7	6	3	1	Pass
04_Seminar Room 03	3.7	6	3	1	Pass
04_Sixth Form Staff Office - Senior Staff	1.0	3	1	-	Pass

Table 9. CIBSE Guide A results for scenario 5a (weather file: London weather centre DSY1 2020 high emissions scenario 50th percentile)

Room name	Number of occupied hours with an operative temperature greater than 25°C	Overall result
-01 Control Room	0	Pass
-02 Existing Auditorium	0	Pass
-05 Control Room	0	Pass
03 Computer Studies	0	Pass

The following table summarises the results obtained for scenario 5 under all weather files assessed. Full results are presented in Appendix F.

Table 10. Summary of results for all weather files assessed

Weather file	Number of CIBSE TM52 compliant rooms	Number of CIBSE Guide A compliant rooms
DSY1 2020	97 / 97 (100%)	4 / 4 (100%)
DSY2 2020	95 / 97 (97.9%)	3 / 4 (75%)
DSY3 2020	19 / 97 (19.5%)	2 / 4 (50%)
DSY1 2050	58 / 97 (59.7%)	3 / 4 (75%)
DSY1 2080	21 / 97 (21.6%)	3 / 4 (75%)

The building is found to comply with the mandatory standard as set out in Haringey's key overheating requirements, i.e. compliance with CIBSE TM52 for the 2020 DSY1 weather file. Under the additional weather files assessed, some spaces continue to comply, although there is a proportion that do not. In these cases, the following measures could be investigated and adopted toward achieving compliance:

- Add ceiling fans to increase air movement,
- Retrofit phase-change MVHR units to provide passive temperature lopping,
- Increase the capacity of temperature lopping systems,
- Add further mechanical cooling.

Appendix A Internal gains

A.1 Lighting gains

Table 11. Lighting gains and profiles

Room type	Lighting gain (W/m ²)	Lighting operation profile
Auditorium	20	3
Band practice	8	3
Break out space	8	2
CS	-	-
Café food court	8	3
Circulation	8	3
Collaborative area	8	5
Common room	8	3
Computer room- Sixth form computer studies	8	5
Computer room- IT Study area	8	5
Control room- Music	8	5
Control room- Auditorium	8	5
Electronic library	8	5
Ensemble Practice	8	3
Flexible seminar room	8	5
IT Patch room	-	-
Informal assembly area	8	3
Internal voids	-	-
Keyboard classroom	8	5
LV switch room	-	-
Large practice room	8	3
Library- Music	-	-
Meeting room	8	3
Music IT	8	5
Music teaching	8	2
Plant room	-	-
Quiet study area	8	3
Recital room	8	3
Recording studio	8	5
Small Practice	8	3
Seminar room- sixth form	8	5
Staff base- Music staff	8	3
Staff base- Sixth form staff	8	3
Staff office- Sixth form staff	8	3
Staff office- Head Sixth form	8	3
Staff office- Music	8	3
Staff office- Head Music / Music Director	8	3
Storage	-	-

Room type	Lighting gain (W/m ²)	Lighting operation profile
WCs	8	3

A.2 Occupancy gains

Table 12. Occupancy gains and profiles

Room type	Occupant gains (sensible/latent) (W/person)	Max. number of occupants (people)	Occupancy profile
Auditorium	75/55	105	7
Band practice	90/160	9	7
Break out space	75/55	3	4
CS	-	0	-
Café food court	75/55	2	3
Circulation	-	0	-
Collaborative area	75/55	13	5
Common room	75/55	200	5
Computer room- Sixth form computer studies	75/55	11	5
Computer room- IT Study area	75/55	51	5
Control room- Music	75/55	3	5
Control room- Auditorium	75/55	2	5
Electronic library	75/55	51	5
Ensemble Practice	90/160	4	7
Flexible seminar room	75/55	11	5
IT Patch room	-	-	-
Informal assembly area	75/55	220	3
Internal voids	-	0	-
Keyboard classroom	75/55	25	5
LV switch room	-	0	-
Large practice room	90/160	159	7
Library- Music	-	-	-
Meeting room	75/55	5	3
Music IT	75/55	25	5
Music teaching	75/55	25	4
Plant room	-	0	-
Quiet study area	-	-	-
Recital room	90/160	10	7
Recording studio	75/55	10	5
Small Practice	90/160	3	7
Seminar room- sixth form	75/55	11	5
Staff base- Music staff	75/55	15	3
Staff base- Sixth form staff	75/55	6	3
Staff office- Sixth form staff	75/55	5	3

Room type	Occupant gains (sensible/latent) (W/person)	Max. number of occupants (people)	Occupancy profile
Staff office- Head Sixth form	75/55	4	3
Staff office- Music	75/55	5	3
Staff office- Head Music / Music Director	75/55	1	3
Storage	-	0	-
WCs	-	0	-

A.3 Equipment gains

Table 13. Equipment gains and profiles

Room type	Equipment gains (units as noted)	Equipment profile	Comments
Auditorium	42000 W	5	From CharcoalBlue report
Band practice	361.7 W	7	3 amps at 100W each, 2 laptops at 27W each and 1 keyboard at 7.7W
Break out space	27 W	5	1 laptop at 27W
CS	-	-	-
Café food court	44.2 W	8	Assumes cooker hood to remove any heat from cooker. Cooking for evening events not included. Adjusted for our occupancy hours: 36W for a fridge on continuously and 8.2W microwave during occupied hours from CIBSE Guide A.
Circulation	-	-	-
Collaborative area	351 W	5	1 laptop at 27W each per occupant
Common room	5400 W	3	1 laptop at 27W each per occupant
Computer room- Sixth form computer studies	2590 W	5	1 PC at 110W each per occupant, 1 Interactive White Board at 380W and 1kW AV
Computer room- IT Study area	6660 W	5	1 PC at 110W each per occupant, 1 Interactive White Board at 380W and 1kW AV
Control room- Music	2000 W	5	From CharcoalBlue report
Control room- Auditorium	2000 W	5	From CharcoalBlue report
Electronic library	2750 W	5	Assumed 25 PCs at 110W
Ensemble Practice	294 W	7	1 amplifier at 240W and 2 laptops at 27W each
Flexible seminar room	539.5 W	7	1 PC at 110W, 1 laptop at 27W, 1 Interactive White Board at 380W and 1 printer at 22.5 W
IT Patch room	TBC	TBC	
Informal assembly area	-	-	-
Internal voids	-	-	
Keyboard classroom	720.5 W	5	1 PC at 110W, 1 laptop at 27W, 1 Interactive White Board at 380W, 25 keyboards at 7.7W and 1 Component stereo at 11W.
LV switch room			
Large practice room	361.7 W	7	3 amps at 100W each, 2 laptops at 27W each and 1 keyboard at 7.7W

Room type	Equipment gains (units as noted)	Equipment profile	Comments
Library- Music	-	-	-
Meeting room	135 W	3	1 laptop at 27W each per occupant
Music IT	4130 W	5	25 desktops at 110W each, 1 Interactive White Board at 380W and 1kW AV
Music teaching	720.5 W	5	1 PC at 110W, 1 Laptop at 27W, 1 Interactive White Board at 380W, 24 Tablets (12.9inch iPad Pro) at 7.7W, 1 Keyboard at 7.7W and 1 Component stereo at 11W.
Plant room	-	-	-
Quiet study area	-	-	-
Recital room	361.7 W	7	3 amps at 100W each, 2 laptops at 27W each and 1 keyboard at 7.7W
Recording studio	2000 W	5	From CharcoalBlue report
Small Practice	27 W	7	1 laptop at 27W
Seminar room- sixth form	539.5 W	5	1 Laptop at 27W, 1 PC at 110W, 1 Interactive White Board at 380W and 1 Printer at 22.5W
Staff base- Music staff	405 W	3	1 laptop at 27W each per occupant
Staff base- Sixth form staff	162 W	3	1 laptop at 27W each per occupant
Staff office- Sixth form staff	135 W	3	Staff offices have 1 laptop at 27W each per occupant.
Staff office- Head Sixth form	25 W/m ²	3	Music Director and 01 Head Office have equipment gains of 25W/m ² assigned
Staff office- Music	135 W	3	Staff offices have 1 laptop at 27W each per occupant.
Staff office- Head Music / Music Director	132.5 W	3	1 desktop PC at 110W and 1 Printer at 22.5W
Storage	-	-	-
WCs	-	-	-

Appendix B Ventilation in the baseline scenario

B.1 Opening windows

In the baseline scenario, it is assumed that the top 1/3rd of the window is a top-hung opening window, limited to a maximum of 100mm opening. Windows behind hit-and-miss brickwork are assumed to be unrestricted side-hung windows (open to a maximum of 90°).

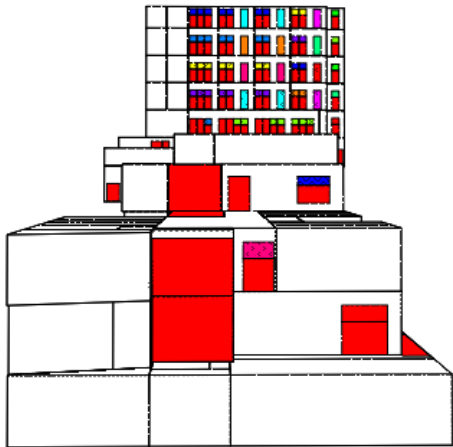
Windows are modelled as opening during occupied hours, between 07:00 and 18:00, when the internal air temperature is greater than 22°C.

NB. There are no opening windows on the western façade of the front building.

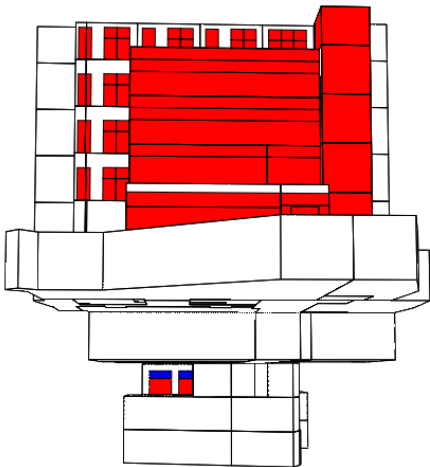
Table 14. Screenshots illustrating position of different opening types

Window openings by elevation

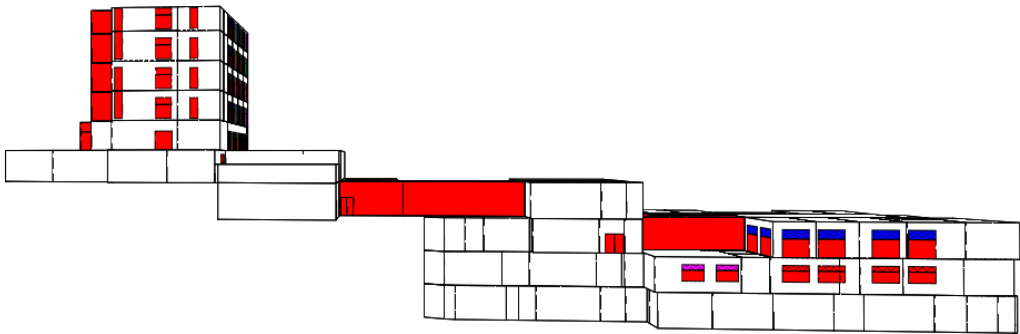
North east elevation



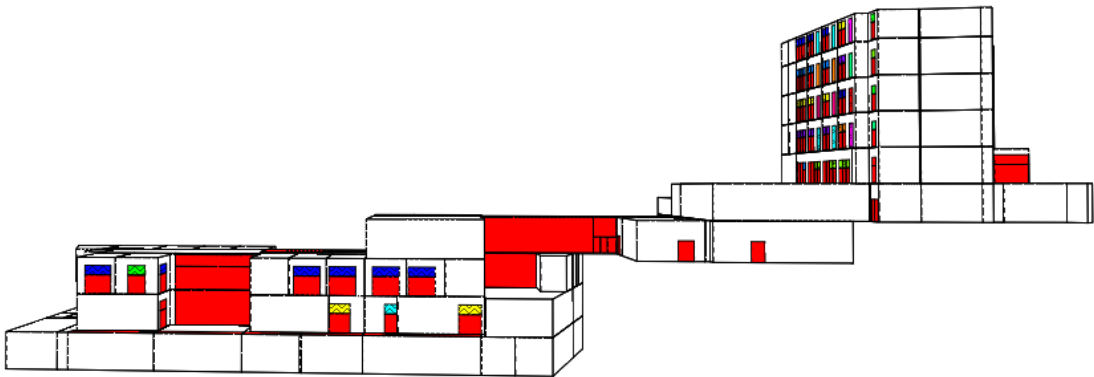
South west elevation



South east elevation



North west elevation



Window openings by elevation

Opening Type

	XTRN0000 (CLOSED)
	XTRN0025 (DH3 TH 100mm_0.771x1.8 [10.16%] _ 5 _ h/H=1.0)
	XTRN0026 (DH3 TH 100mm_0.771x0.9 [18.87%] _ 3 _ h/H=1.0)
	XTRN0027 (DH3 TH 100mm_0.771x1.8 [10.16%] _ 3 _ h/H=1.0)
	XTRN0028 (DH3 Hit&Miss _ 5 _ h/H=1.0)
	XTRN0029 (DH3 Hit&Miss _ 3 _ h/H=1.0)
	XTRN0030 (DH3 Hit&Miss _ 5 _ h/H=0.8)
	XTRN0031 (DH3 Hit&Miss _ 3 _ h/H=0.8)
	XTRN0032 (DH3 TH 100mm_0.771x1.8 [10.16%] _ 3 _ h/H=0.8)
	XTRN0033 (DH3 TH 100mm_0.771x0.9 [18.87%] _ 3 _ h/H=0.8)
	XTRN0034 (DH3 TH 100mm_0.771x1.8 [10.16%] _ 5 _ h/H=0.8)
	XTRN0035 (DH3 Hit&Miss _ 5 _ h/H=0.6)
	XTRN0036 (DH3 Hit&Miss _ 3 _ h/H=0.6)
	XTRN0037 (DH3 TH 100mm_0.771x1.8 [10.16%] _ 3 _ h/H=0.6)
	XTRN0038 (DH3 TH 100mm_0.771x0.9 [18.87%] _ 3 _ h/H=0.6)
	XTRN0039 (DH3 TH 100mm_0.771x1.8 [10.16%] _ 5 _ h/H=0.6)
	XTRN0040 (DH3 Hit&Miss _ 5 _ h/H=0.4)
	XTRN0041 (DH3 Hit&Miss _ 3 _ h/H=0.4)
	XTRN0042 (DH3 TH 100mm_0.771x1.8 [10.16%] _ 3 _ h/H=0.4)
	XTRN0043 (DH3 TH 100mm_0.771x0.9 [18.87%] _ 3 _ h/H=0.4)
	XTRN0044 (DH3 TH 100mm_0.771x1.8 [10.16%] _ 5 _ h/H=0.4)
	XTRN0045 (DH3 TH 100mm_0.771x1.8 [10.16%] _ 5 _ h/H=0.2)
	XTRN0046 (DH3 TH 100mm_0.771x0.9 [18.87%] _ 5 _ h/H=0.2)
	XTRN0048 (DH3 TH 100mm_0.978x2.71 [8.71%] _ 3 _ sheltered)
	XTRN0049 (DH3 TH 100mm_0.577x2.71 [14.52%] _ 3 _ sheltered)
	XTRN0050 (DH3 TH 100mm_0.978x2.71 [8.71%] _ 5 _ sheltered)
	XTRN0051 (DH3 TH 100mm_0.97x1.295 [14.52%] _ 5 _ sheltered)
	XTRN0052 (DH3 TH 100mm_0.978x2.71 [8.71%] _ 4 _ sheltered)
	XTRN0053 (DH3 TH 100mm_0.97x1.295 [14.52%] _ 4 _ sheltered)
	XTRN0054 (DH3 TH 100mm_0.577x2.26 [14.52%] _ 4 _ sheltered)

B.2 Mechanical ventilation

Those rooms that are modelled with mechanical ventilation in the baseline scenario include the minimum fresh air flow rate of 10l/s/person, supplied at the external air temperature.

For all room types, the ventilation has been modelled as:

- Operating at 100% during weekdays 07:00 to 18:00 and,
- Operating at 100% during week nights between 18:00 and 07:00 if the internal temperature is greater than 18°C and the internal temperature is greater than the outside temperature.

Table 15. Baseline mechanical ventilation

Room type [1]	Mechanical ventilation flow rate (l/s/person)	Weekday daytime ventilation hours	Weekday night time ventilation hours
Auditorium	10	07:00 – 18:00	18:00 – 07:00
Band practice	10	07:00 – 18:00	18:00 – 07:00
Break out space	10	07:00 – 18:00	18:00 – 07:00
CS	0		
Café food court	10	07:00 – 18:00	18:00 – 07:00
Circulation	0		

Room type [1]	Mechanical ventilation flow rate (l/s/person)	Weekday daytime ventilation hours	Weekday night time ventilation hours
Collaborative area	10	07:00 – 18:00	18:00 – 07:00
Common room	10	07:00 – 18:00	18:00 – 07:00
Computer room- Sixth form computer studies	10	07:00 – 18:00	18:00 – 07:00
Computer room- IT Study area	10	07:00 – 18:00	18:00 – 07:00
Control room- Music	10	07:00 – 18:00	18:00 – 07:00
Control room- Auditorium	10	07:00 – 18:00	18:00 – 07:00
Electronic library	10	07:00 – 18:00	18:00 – 07:00
Ensemble Practice	10	07:00 – 18:00	18:00 – 07:00
Flexible seminar room	10	07:00 – 18:00	18:00 – 07:00
IT Patch room	0		
Informal assembly area	10	07:00 – 18:00	18:00 – 07:00
Internal voids	0		
Keyboard classroom	10	07:00 – 18:00	18:00 – 07:00
LV switch room	0		
Large practice room	10	07:00 – 18:00	18:00 – 07:00
Library- Music	0		
Meeting room	10	07:00 – 18:00	18:00 – 07:00
Music IT	10	07:00 – 18:00	18:00 – 07:00
Music teaching	10	07:00 – 18:00	18:00 – 07:00
Plant room	0		
Quiet study area	0		
Recital room	10	07:00 – 18:00	18:00 – 07:00
Recording studio	10	07:00 – 18:00	18:00 – 07:00
Small Practice	10	07:00 – 18:00	18:00 – 07:00
Seminar room- sixth form	10	07:00 – 18:00	18:00 – 07:00
Staff base- Music staff	10	07:00 – 18:00	18:00 – 07:00
Staff base- Sixth form staff	10	07:00 – 18:00	18:00 – 07:00
Staff office- Sixth form staff	10	07:00 – 18:00	18:00 – 07:00
Staff office- Head Sixth form	10	07:00 – 18:00	18:00 – 07:00
Staff office- Music	10	07:00 – 18:00	18:00 – 07:00
Staff office- Head Music / Music Director	10	07:00 – 18:00	18:00 – 07:00
Storage	0		
WCs	0		

Appendix C Modelled scenarios

C.1 Scenario 1: Increased top hung window opening

The high-level top hung windows in this scenario are assumed to open to a maximum of 80°. There are no changes to the windows behind the hit-and-miss brickwork.

C.2 Scenario 2: Increased window openings

The high-level top-hung windows are modelled as per Scenario 1 (opening to a maximum of 80°). There are no changes to the windows behind the hit-and-miss brickwork.

In addition to those openings, additional low-level openings have been modelled in rooms failing in scenario 1 that have opening windows. The opening arrangement in scenario 2 is illustrated in Figure 8. The sill level is 1100mm above the floor and the additional low level opening is limited to a maximum opening distance of 100mm. These open on the same basis as the high-level openings, i.e. during occupied hours when the internal air temperature is above 22°C.

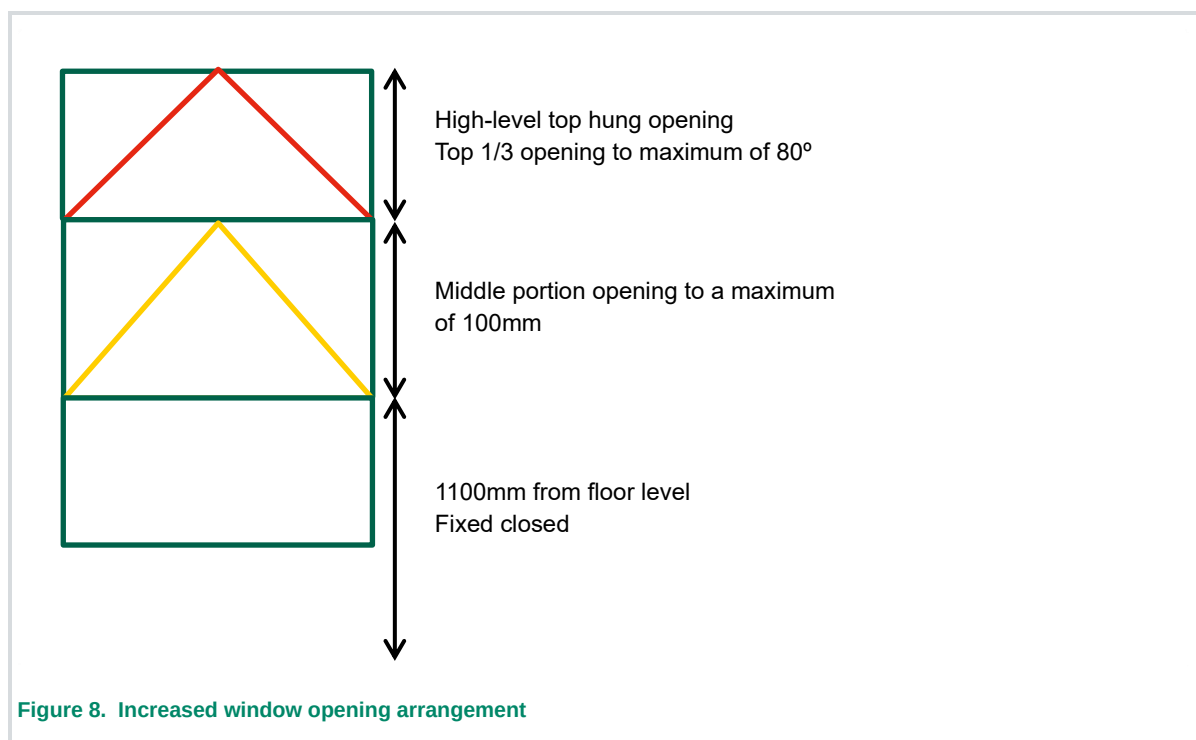


Table 16. Rooms with additional opening windows in scenario 2

Rooms with additional opening windows in scenario 2

00_Sixth Form Common Room

01_Collaborative Area

01_Meeting Room 02

01_Seminar Room 09

01_Seminar Room 10

02_Collaborative Area

02_Flexible Seminar Room 05

02_Flexible Seminar Room 06

03_Computer Studies

Rooms with additional opening windows in scenario 2

03_Flexible Seminar Room 03

03_Flexible Seminar Room 04

C.3 Scenario 3: Increased mechanical ventilation

The following table outlines the mechanical ventilation rates applied to rooms in scenario 3. As described in the main body of the report, the flow rate was iteratively increased from 10l/s/person to a maximum of 20l/s/person, until compliance was achieved or the maximum flow rate was reached.

Table 17. Mechanical ventilation flow rates included in Scenario 3 model

Space Name	Mechanical ventilation flow rate (l/s/person)	Total mechanical ventilation flow rate (l/s)
00_Cafe/Food Court	10	20
00_Sixth Form Common Room	20	4,000
-01 Control Room	20	40
-01 Informal Assembly Area	20	4,400
01_Collaborative Area	12	156
01_Departmental Staff Base	10	60
01_Head of Sixth Form Office	20	80
01_Meeting Room 02	10	50
01_Seminar Room 09	10	110
01_Seminar Room 10	12	132
01_Seminar Room 11	20	220
01_Sixth Form Staff Office	20	100
-02 Electronic library	10	510
-02 Existing Auditorium	20	2,100
-02 Existing Recital Room	10	100
02_Collaborative Area	20	260
02_Flexible Seminar Room 05	12	132
02_Flexible Seminar Room 06	14	154
02_IT Study Area	20	1,020
02_Meeting Room	10	50
02_Seminar Room 07	20	220
02_Sixth Form Staff Office - UCAS	10	50
03_Computer Studies	20	220
03_Departmental Staff Base	10	60
03_Flexible Seminar Room 03	10	110
03_Flexible Seminar Room 04	14	154
03_Meeting Room	10	50
-03_Seminar room 01	10	110
-03_Seminar room 02	10	110
-03_Seminar room 03	10	110
03_Seminar Room 04	20	220
-03_Seminar room 04	10	110

Space Name	Mechanical ventilation flow rate (l/s/person)	Total mechanical ventilation flow rate (l/s)
-03_Seminar room 05	10	110
-03_Seminar room 06	10	110
-03_Seminar room 07	10	110
-03_Seminar room 08	10	110
-03_Seminar room 09	10	110
-03_Seminar room 10	10	110
-03_Seminar room 11	10	110
-03_Seminar room 12	10	110
-04_Break Out 01	10	30
-04_Break Out 02	10	30
-04_Break Out 03	10	30
-04_Break Out 04	10	30
-04_Break Out Space 01	10	30
-04_Break Out Space 02	10	30
04_Collaborative Area	10	130
-04_EP 01	18	72
-04_EP 02	20	80
-04_EP 03	20	80
-04_EP 04	20	80
-04_EP 05	20	80
04_Flexible Seminar Room 01	10	110
04_Flexible Seminar Room 02	10	110
-04_Head Music Office 01	10	10
-04_Head Music Office 02	10	10
04_Meeting Room	10	50
-04_Music Director Office	10	10
-04_Music Staff Office	10	50
-04_Music Teaching	10	250
-04_Music Teaching 01	10	250
-04_Music Teaching 02	10	250
04_Seminar Room 01	20	220
04_Seminar Room 02	20	220
04_Seminar Room 03	20	220
04_Sixth Form Staff Office - Senior Staff	10	50
-04_Visiting Staff Base	10	150
-05 Band Practice	10	90
-05 Control Room	20	60
-05 Keyboard Classroom	10	250
-05 Large Practice	20	3,180
-05 Music IT	20	500
-05 Music Recording Studio	10	100
-05 SP 01	10	30

Space Name	Mechanical ventilation flow rate (l/s/person)	Total mechanical ventilation flow rate (l/s)
-05 SP 02	10	30
-05 SP 03	10	30
-05 SP 04	10	30
-05 SP 05	10	30
-05 SP 06	10	30
-05 SP 07	10	30
-05 SP 08	10	30
-05 SP 08	10	30
-05 SP 09	10	30
-05 SP 11	10	30
-05 SP 12	10	30
-05 SP 13	10	30
-05 SP 14	10	30
-05 SP 15	10	30
-05 SP 16	10	30
-05 SP 17	10	30
-05 SP 18	10	30
-05 SP 19	10	30
-05 SP 20	10	30
-05 SP 21	10	30
-05 SP 22	10	30
-05 SP 23	10	30
-05 SP 24	10	30

C.4 Scenario 4: Temperature lopping

Temperature lopping is modelled by controlling the supply air condition in the relevant spaces, following the logic described in the below table.

Table 18. Temperature lopping profile

External air temperature	Supply air temperature
Less than 18°C	18°C
Between 18°C and 22°C	External air temperature
Between 22°C and 27°C	18°C
Greater than 27°C	9°C less than the external air temperature

Table 19. Mechanical ventilation in scenario 4

Space Name	Mechanical ventilation flow rate (l/s/person)	Total mechanical ventilation flow rate (l/s)	Supply air condition
00_Cafe/Food Court	10	20	Un-tempered air
00_Sixth Form Common Room	10	2,000	Temperature lopping

Space Name	Mechanical ventilation flow rate (l/s/person)	Total mechanical ventilation flow rate (l/s)	Supply air condition
-01 Control Room	16	32	Temperature lopping
-01 Informal Assembly Area	10	2,200	Temperature lopping
01_Collaborative Area	12	156	Un-tempered air
01_Departmental Staff Base	10	60	Un-tempered air
01_Head of Sixth Form Office	16	64	Temperature lopping
01_Meeting Room 02	10	50	Un-tempered air
01_Seminar Room 09	10	110	Un-tempered air
01_Seminar Room 10	12	132	Un-tempered air
01_Seminar Room 11	10	110	Temperature lopping
01_Sixth Form Staff Office	10	50	Temperature lopping
-02 Electronic library	10	510	Un-tempered air
-02 Existing Auditorium	16	1,680	Temperature lopping
-02 Existing Recital Room	10	100	Un-tempered air
02_Collaborative Area	12	156	Temperature lopping
02_Flexible Seminar Room 05	12	132	Un-tempered air
02_Flexible Seminar Room 06	14	154	Un-tempered air
02_IT Study Area	16	816	Temperature lopping
02_Meeting Room	10	50	Un-tempered air
02_Seminar Room 07	10	110	Temperature lopping
02_Sixth Form Staff Office - UCAS	10	50	Un-tempered air
03_Computer Studies	20	220	Temperature lopping
03_Departmental Staff Base	10	60	Un-tempered air
03_Flexible Seminar Room 03	10	110	Un-tempered air
03_Flexible Seminar Room 04	14	154	Un-tempered air
03_Meeting Room	10	50	Un-tempered air
-03_Seminar room 01	10	110	Un-tempered air
-03_Seminar room 02	10	110	Un-tempered air
-03_Seminar room 03	10	110	Un-tempered air
03_Seminar Room 04	10	110	Temperature lopping
-03_Seminar room 04	10	110	Un-tempered air
-03_Seminar room 05	10	110	Un-tempered air
-03_Seminar room 06	10	110	Un-tempered air
-03_Seminar room 07	10	110	Un-tempered air
-03_Seminar room 08	10	110	Un-tempered air
-03_Seminar room 09	10	110	Un-tempered air
-03_Seminar room 10	10	110	Un-tempered air
-03_Seminar room 11	10	110	Un-tempered air
-03_Seminar room 12	10	110	Un-tempered air
-04_Break Out 01	10	30	Un-tempered air
-04_Break Out 02	10	30	Un-tempered air
-04_Break Out 03	10	30	Un-tempered air
-04_Break Out 04	10	30	Un-tempered air

Space Name	Mechanical ventilation flow rate (l/s/person)	Total mechanical ventilation flow rate (l/s)	Supply air condition
-04_Break Out Space 01	10	30	Un-tempered air
-04_Break Out Space 02	10	30	Un-tempered air
04_Collaborative Area	10	130	Un-tempered air
-04_EP 01	18	72	Un-tempered air
-04_EP 02	20	80	Un-tempered air
-04_EP 03	20	80	Un-tempered air
-04_EP 04	20	80	Un-tempered air
-04_EP 05	20	80	Un-tempered air
04_Flexible Seminar Room 01	10	110	Un-tempered air
04_Flexible Seminar Room 02	10	110	Un-tempered air
-04_Head Music Office 01	10	10	Un-tempered air
-04_Head Music Office 02	10	10	Un-tempered air
04_Meeting Room	10	50	Un-tempered air
-04_Music Director Office	10	10	Un-tempered air
-04_Music Staff Office	10	50	Un-tempered air
-04_Music Teaching	10	250	Un-tempered air
-04_Music Teaching 01	10	250	Un-tempered air
-04_Music Teaching 02	10	250	Un-tempered air
04_Seminar Room 01	20	220	Un-tempered air
04_Seminar Room 02	20	220	Un-tempered air
04_Seminar Room 03	20	220	Un-tempered air
04_Sixth Form Staff Office - Senior Staff	10	50	Un-tempered air
-04_Visiting Staff Base	10	150	Un-tempered air
-05 Band Practice	10	90	Un-tempered air
-05 Control Room	16	48	Temperature lopping
-05 Keyboard Classroom	10	250	Un-tempered air
-05 Large Practice	10	1,590	Temperature lopping
-05 Music IT	10	250	Temperature lopping
-05 Music Recording Studio	10	100	Un-tempered air
-05 SP 01	10	30	Un-tempered air
-05 SP 02	10	30	Un-tempered air
-05 SP 03	10	30	Un-tempered air
-05 SP 04	10	30	Un-tempered air
-05 SP 05	10	30	Un-tempered air
-05 SP 06	10	30	Un-tempered air
-05 SP 07	10	30	Un-tempered air
-05 SP 08	10	30	Un-tempered air
-05 SP 08	10	30	Un-tempered air
-05 SP 09	10	30	Un-tempered air
-05 SP 11	10	30	Un-tempered air
-05 SP 12	10	30	Un-tempered air
-05 SP 13	10	30	Un-tempered air

Space Name	Mechanical ventilation flow rate (l/s/person)	Total mechanical ventilation flow rate (l/s)	Supply air condition
-05 SP 14	10	30	Un-tempered air
-05 SP 15	10	30	Un-tempered air
-05 SP 16	10	30	Un-tempered air
-05 SP 17	10	30	Un-tempered air
-05 SP 18	10	30	Un-tempered air
-05 SP 19	10	30	Un-tempered air
-05 SP 20	10	30	Un-tempered air
-05 SP 21	10	30	Un-tempered air
-05 SP 22	10	30	Un-tempered air
-05 SP 23	10	30	Un-tempered air
-05 SP 24	10	30	Un-tempered air
00_Cafe/Food Court	10	20	Un-tempered air

C.5 Scenario 5: Cooling

Mechanical cooling to meet a cooling set point of 23°C is applied to the following spaces:

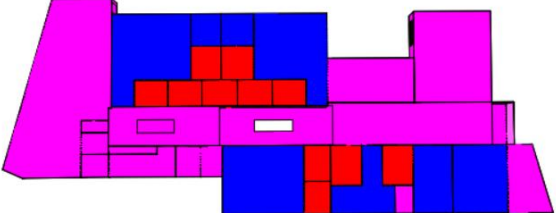
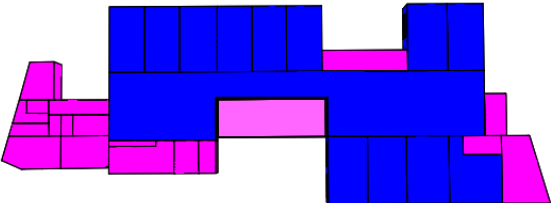
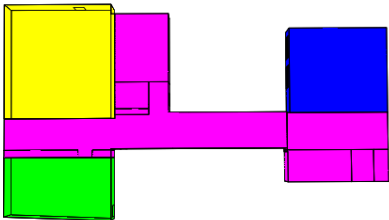
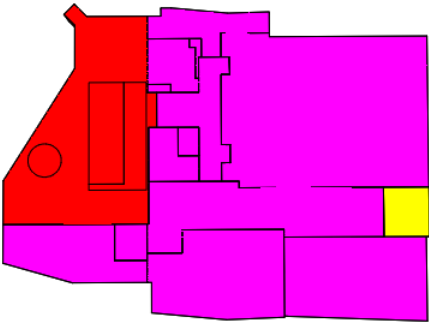
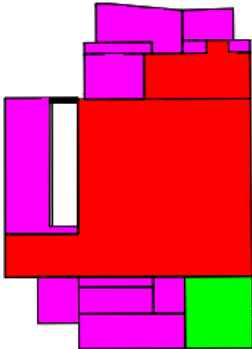
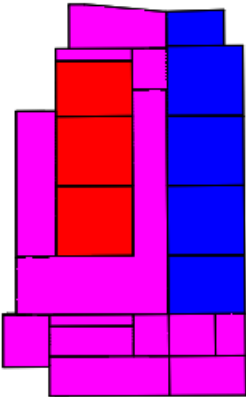
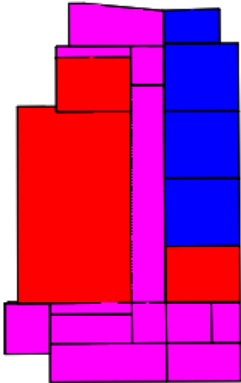
- -01 Control Room
- -02 Existing Auditorium
- -05 Control Room
- 03 Computer Studies

Appendix D Final proposed ventilation and cooling strategies

The following screenshots illustrate the proposed ventilation and cooling strategies used in Scenario 5(a).

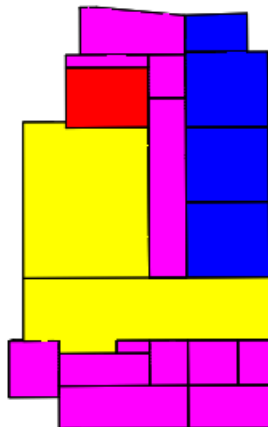
Table 20. Screenshots illustrating proposed ventilation and cooling strategies by floor

Ventilation and cooling strategies

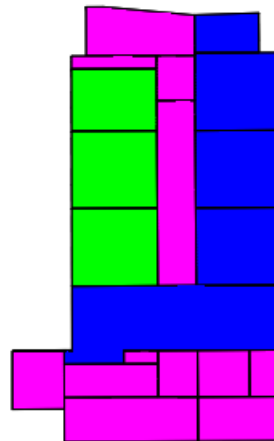
Level -05	Level -04
	
Level -03	Level -02
	
Level -01	Level 00
	
Level 01	Level 02
	

Ventilation and cooling strategies

Level 03



Level 04



Room Group

- 00) Natural ventilation + un-tempered mechanical ventilation
- 01) Un-tempered mechanical ventilation only
- 02) Temperature lopping
- 03) Mechanical cooling
- 04) Not occupied

Appendix E CIBSE TM52 results

E.1 Baseline scenario

Table 21. CIBSE TM52 results for baseline option (weather file: London weather centre DSY1 2020 high emissions scenario 50th percentile)

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
-05 Band Practice	0.3	1	1	-	Pass
-05 Control Room	76.9	32	7	1 & 2 & 3	Fail
-05 Keyboard Classroom	7.0	5	3	1	Pass
-05 Large Practice	10.9	18	4	1 & 2	Fail
-05 Music IT	31.4	16	5	1 & 2 & 3	Fail
-05 Music Recording Studio	10.1	6	3	1	Pass
-05 SP 01	0.0	0	0	-	Pass
-05 SP 02	0.0	0	0	-	Pass
-05 SP 03	0.0	0	0	-	Pass
-05 SP 04	0.0	0	0	-	Pass
-05 SP 05	0.0	0	0	-	Pass
-05 SP 06	0.0	0	0	-	Pass
-05 SP 07	0.4	3	1	-	Pass
-05 SP 08	0.4	3	1	-	Pass
-05 SP 08	0.4	3	1	-	Pass
-05 SP 09	0.4	3	1	-	Pass
-05 SP 11	0.4	3	1	-	Pass
-05 SP 12	0.3	2	1	-	Pass
-05 SP 13	0.4	3	1	-	Pass
-05 SP 14	0.6	3	1	-	Pass
-05 SP 15	0.6	3	1	-	Pass
-05 SP 16	0.4	3	1	-	Pass
-05 SP 17	0.6	3	1	-	Pass
-05 SP 18	0.8	5	2	-	Pass
-05 SP 19	0.8	4	1	-	Pass
-05 SP 20	0.6	3	1	-	Pass
-05 SP 21	0.4	3	1	-	Pass
-05 SP 22	0.4	3	1	-	Pass
-05 SP 23	0.4	3	1	-	Pass
-05 SP 24	0.4	3	1	-	Pass
-04_Break Out 01	0.0	0	0	-	Pass
-04_Break Out 02	0.0	0	0	-	Pass
-04_Break Out 03	0.0	0	0	-	Pass
-04_Break Out 04	0.0	0	0	-	Pass
-04_Break Out Space 01	0.0	0	0	-	Pass
-04_Break Out Space 02	0.3	2	1	-	Pass

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
-04_EP 01	11.7	14	3	1 & 2	Fail
-04_EP 02	12.9	15	3	1 & 2	Fail
-04_EP 03	13.0	15	3	1 & 2	Fail
-04_EP 04	13.1	16	3	1 & 2	Fail
-04_EP 05	12.4	15	3	1 & 2	Fail
-04_Head Music Office 01	0.8	2	1	-	Pass
-04_Head Music Office 02	1.1	3	1	-	Pass
-04_Music Director Office	0.0	0	0	-	Pass
-04_Music Staff Office	0.4	3	1	-	Pass
-04_Music Teaching	0.9	3	1	-	Pass
-04_Music Teaching 01	0.6	2	1	-	Pass
-04_Music Teaching 02	1.5	5	2	-	Pass
-04_Visiting Staff Base	1.8	6	2	-	Pass
-03_Seminar room 01	5.5	6	3	1	Pass
-03_Seminar room 02	3.7	6	2	1	Pass
-03_Seminar room 03	3.1	6	2	1	Pass
-03_Seminar room 04	3.3	6	3	1	Pass
-03_Seminar room 05	3.5	6	3	1	Pass
-03_Seminar room 06	3.3	6	2	1	Pass
-03_Seminar room 07	4.0	6	3	1	Pass
-03_Seminar room 08	3.1	6	2	1	Pass
-03_Seminar room 09	10.3	11	4	1 & 2	Fail
-03_Seminar room 10	8.8	8	3	1 & 2	Fail
-03_Seminar room 11	6.6	6	2	1	Pass
-03_Seminar room 12	4.0	4	2	1	Pass
-02 Electronic library	4.8	8	3	1 & 2	Fail
-02 Existing Auditorium	78.0	95	15	1 & 2 & 3	Fail
-02 Existing Recital Room	0.0	0	0	-	Pass
-01 Control Room	87.9	53	10	1 & 2 & 3	Fail
-01 Informal Assembly Area	12.9	19	4	1 & 2	Fail
00_Cafe/Food Court	0.3	2	1	-	Pass
00_Sixth Form Common Room	19.1	21	7	1 & 2 & 3	Fail
01_Collaborative Area	8.4	10	3	1 & 2	Fail
01_Departmental Staff Base	4.1	11	3	1 & 2	Fail
01_Head of Sixth Form Office	27.8	31	5	1 & 2 & 3	Fail
01_Meeting Room 02	6.9	13	3	1 & 2	Fail
01_Seminar Room 09	4.0	10	4	1 & 2	Fail
01_Seminar Room 10	4.4	10	4	1 & 2	Fail
01_Seminar Room 11	13.8	16	5	1 & 2 & 3	Fail
01_Sixth Form Staff Office	12.7	14	4	1 & 2	Fail

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
02_Collaborative Area	25.3	25	7	1 & 2 & 3	Fail
02_Flexible Seminar Room 05	5.7	11	4	1 & 2	Fail
02_Flexible Seminar Room 06	6.6	11	4	1 & 2	Fail
02_IT Study Area	45.5	33	9	1 & 2 & 3	Fail
02_Meeting Room	6.2	13	3	1 & 2	Fail
02_Seminar Room 07	14.9	18	5	1 & 2 & 3	Fail
02_Sixth Form Staff Office - UCAS	3.5	10	3	1 & 2	Fail
03_Computer Studies	23.3	17	5	1 & 2 & 3	Fail
03_Departmental Staff Base	4.1	10	3	1 & 2	Fail
03_Flexible Seminar Room 03	4.8	11	4	1 & 2	Fail
03_Flexible Seminar Room 04	6.4	11	4	1 & 2	Fail
03_Meeting Room	6.2	13	3	1 & 2	Fail
03_Seminar Room 04	14.3	15	5	1 & 2 & 3	Fail
04_Collaborative Area	3.7	4	2	1	Pass
04_Flexible Seminar Room 01	3.1	7	3	1 & 2	Fail
04_Flexible Seminar Room 02	3.1	7	3	1 & 2	Fail
04_Meeting Room	4.9	11	3	1 & 2	Fail
04_Seminar Room 01	10.8	11	4	1 & 2	Fail
04_Seminar Room 02	11.2	13	4	1 & 2	Fail
04_Seminar Room 03	11.2	12	4	1 & 2	Fail
04_Sixth Form Staff Office - Senior Staff	1.5	6	2	-	Pass

E.2 Scenario 1

Table 22. CIBSE TM52 results for scenario 1 (weather file: London weather centre DSY1 2020 high emissions scenario 50th percentile)

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
-05 Band Practice	0.1	1	1	-	Pass
-05 Control Room	76.3	31	7	1 & 2 & 3	Fail
-05 Keyboard Classroom	6.8	4	2	1	Pass
-05 Large Practice	9.9	16	4	1 & 2	Fail
-05 Music IT	27.7	15	5	1 & 2 & 3	Fail
-05 Music Recording Studio	8.6	4	2	1	Pass
-05 SP 01	0.0	0	0	-	Pass
-05 SP 02	0.0	0	0	-	Pass
-05 SP 03	0.0	0	0	-	Pass
-05 SP 04	0.0	0	0	-	Pass
-05 SP 05	0.0	0	0	-	Pass
-05 SP 06	0.0	0	0	-	Pass

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
-05 SP 07	0.3	2	1	-	Pass
-05 SP 08	0.3	2	1	-	Pass
-05 SP 08	0.3	2	1	-	Pass
-05 SP 09	0.1	1	1	-	Pass
-05 SP 11	0.4	3	1	-	Pass
-05 SP 12	0.1	1	1	-	Pass
-05 SP 13	0.4	3	1	-	Pass
-05 SP 14	0.6	3	1	-	Pass
-05 SP 15	0.4	3	1	-	Pass
-05 SP 16	0.4	3	1	-	Pass
-05 SP 17	0.6	3	1	-	Pass
-05 SP 18	0.7	3	1	-	Pass
-05 SP 19	0.7	3	1	-	Pass
-05 SP 20	0.6	3	1	-	Pass
-05 SP 21	0.1	1	1	-	Pass
-05 SP 22	0.4	3	1	-	Pass
-05 SP 23	0.4	3	1	-	Pass
-05 SP 24	0.3	2	1	-	Pass
-04_Break Out 01	0.4	3	1	-	Pass
-04_Break Out 02	0.0	0	0	-	Pass
-04_Break Out 03	0.4	3	1	-	Pass
-04_Break Out 04	0.0	0	0	-	Pass
-04_Break Out Space 01	0.0	0	0	-	Pass
-04_Break Out Space 02	0.0	0	0	-	Pass
-04_EP 01	9.0	11	3	1 & 2	Fail
-04_EP 02	10.9	13	3	1 & 2	Fail
-04_EP 03	11.5	13	3	1 & 2	Fail
-04_EP 04	11.5	13	3	1 & 2	Fail
-04_EP 05	9.7	12	3	1 & 2	Fail
-04_Head Music Office 01	0.0	0	0	-	Pass
-04_Head Music Office 02	0.0	0	0	-	Pass
-04_Music Director Office	0.0	0	0	-	Pass
-04_Music Staff Office	0.3	2	1	-	Pass
-04_Music Teaching	0.7	3	1	-	Pass
-04_Music Teaching 01	0.3	2	1	-	Pass
-04_Music Teaching 02	1.0	3	1	-	Pass
-04_Visiting Staff Base	0.7	4	1	-	Pass
-03_Seminar room 01	1.8	3	2	-	Pass
-03_Seminar room 02	1.5	3	2	-	Pass
-03_Seminar room 03	1.1	3	2	-	Pass

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
-03_Seminar room 04	1.5	3	2	-	Pass
-03_Seminar room 05	1.5	3	2	-	Pass
-03_Seminar room 06	1.5	3	2	-	Pass
-03_Seminar room 07	1.5	3	2	-	Pass
-03_Seminar room 08	1.5	3	2	-	Pass
-03_Seminar room 09	2.2	6	3	-	Pass
-03_Seminar room 10	2.2	4	2	-	Pass
-03_Seminar room 11	1.8	3	2	-	Pass
-03_Seminar room 12	1.1	2	2	-	Pass
-02 Electronic library	1.8	3	2	-	Pass
-02 Existing Auditorium	78.0	94	15	1 & 2 & 3	Fail
-02 Existing Recital Room	0.0	0	0	-	Pass
-01 Control Room	87.5	53	10	1 & 2 & 3	Fail
-01 Informal Assembly Area	12.9	19	4	1 & 2	Fail
00_Cafe/Food Court	0.0	0	0	-	Pass
00_Sixth Form Common Room	13.0	18	6	1 & 2 & 3	Fail
01_Collaborative Area	3.1	7	3	1 & 2	Fail
01_Departmental Staff Base	2.1	8	2	2	Pass
01_Head of Sixth Form Office	23.9	29	5	1 & 2 & 3	Fail
01_Meeting Room 02	3.2	9	3	1 & 2	Fail
01_Seminar Room 09	3.1	7	3	1 & 2	Fail
01_Seminar Room 10	3.1	7	3	1 & 2	Fail
01_Seminar Room 11	13.0	15	5	1 & 2 & 3	Fail
01_Sixth Form Staff Office	12.2	14	3	1 & 2	Fail
02_Collaborative Area	14.5	18	6	1 & 2 & 3	Fail
02_Flexible Seminar Room 05	3.1	8	4	1 & 2	Fail
02_Flexible Seminar Room 06	3.1	8	4	1 & 2	Fail
02_IT Study Area	34.3	31	8	1 & 2 & 3	Fail
02_Meeting Room	2.9	9	2	2	Pass
02_Seminar Room 07	13.8	15	5	1 & 2 & 3	Fail
02_Sixth Form Staff Office - UCAS	1.8	7	2	2	Pass
03_Computer Studies	9.2	10	4	1 & 2	Fail
03_Departmental Staff Base	1.8	8	2	2	Pass
03_Flexible Seminar Room 03	3.1	7	3	1 & 2	Fail
03_Flexible Seminar Room 04	3.1	8	4	1 & 2	Fail
03_Meeting Room	2.9	9	2	2	Pass
03_Seminar Room 04	12.7	15	5	1 & 2 & 3	Fail
04_Collaborative Area	1.1	3	1	-	Pass
04_Flexible Seminar Room 01	2.2	5	3	-	Pass
04_Flexible Seminar Room 02	2.6	5	3	-	Pass

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
04_Meeting Room	2.1	7	2	2	Pass
04_Seminar Room 01	10.1	11	4	1 & 2	Fail
04_Seminar Room 02	10.3	11	4	1 & 2	Fail
04_Seminar Room 03	9.2	11	4	1 & 2	Fail
04_Sixth Form Staff Office - Senior Staff	1.1	4	1	-	Pass

E.3 Scenario 2

Table 23. CIBSE TM52 results for scenario 2 (weather file: London weather centre DSY1 2020 high emissions scenario 50th percentile)

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
-05 Band Practice	0.1	1	1	-	Pass
-05 Control Room	76.3	31	7	1 & 2 & 3	Fail
-05 Keyboard Classroom	6.8	4	2	1	Pass
-05 Large Practice	9.9	16	4	1 & 2	Fail
-05 Music IT	27.7	15	5	1 & 2 & 3	Fail
-05 Music Recording Studio	8.6	4	2	1	Pass
-05 SP 01	0.0	0	0	-	Pass
-05 SP 02	0.0	0	0	-	Pass
-05 SP 03	0.0	0	0	-	Pass
-05 SP 04	0.0	0	0	-	Pass
-05 SP 05	0.0	0	0	-	Pass
-05 SP 06	0.0	0	0	-	Pass
-05 SP 07	0.3	2	1	-	Pass
-05 SP 08	0.3	2	1	-	Pass
-05 SP 08	0.3	2	1	-	Pass
-05 SP 09	0.1	1	1	-	Pass
-05 SP 11	0.4	3	1	-	Pass
-05 SP 12	0.1	1	1	-	Pass
-05 SP 13	0.4	3	1	-	Pass
-05 SP 14	0.6	3	1	-	Pass
-05 SP 15	0.4	3	1	-	Pass
-05 SP 16	0.4	3	1	-	Pass
-05 SP 17	0.6	3	1	-	Pass
-05 SP 18	0.7	3	1	-	Pass
-05 SP 19	0.7	3	1	-	Pass
-05 SP 20	0.6	3	1	-	Pass
-05 SP 21	0.1	1	1	-	Pass

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
-05 SP 22	0.4	3	1	-	Pass
-05 SP 23	0.4	3	1	-	Pass
-05 SP 24	0.3	2	1	-	Pass
-04_Break Out 01	0.4	3	1	-	Pass
-04_Break Out 02	0.0	0	0	-	Pass
-04_Break Out 03	0.4	3	1	-	Pass
-04_Break Out 04	0.0	0	0	-	Pass
-04_Break Out Space 01	0.0	0	0	-	Pass
-04_Break Out Space 02	0.0	0	0	-	Pass
-04_EP 01	9.0	11	3	1 & 2	Fail
-04_EP 02	10.9	13	3	1 & 2	Fail
-04_EP 03	11.5	13	3	1 & 2	Fail
-04_EP 04	11.5	13	3	1 & 2	Fail
-04_EP 05	9.7	12	3	1 & 2	Fail
-04_Head Music Office 01	0.0	0	0	-	Pass
-04_Head Music Office 02	0.0	0	0	-	Pass
-04_Music Director Office	0.0	0	0	-	Pass
-04_Music Staff Office	0.3	2	1	-	Pass
-04_Music Teaching	0.7	3	1	-	Pass
-04_Music Teaching 01	0.3	2	1	-	Pass
-04_Music Teaching 02	1.0	3	1	-	Pass
-04_Visiting Staff Base	0.7	4	1	-	Pass
-03_Seminar room 01	1.8	3	2	-	Pass
-03_Seminar room 02	1.5	3	2	-	Pass
-03_Seminar room 03	1.1	3	2	-	Pass
-03_Seminar room 04	1.5	3	2	-	Pass
-03_Seminar room 05	1.5	3	2	-	Pass
-03_Seminar room 06	1.5	3	2	-	Pass
-03_Seminar room 07	1.5	3	2	-	Pass
-03_Seminar room 08	1.5	3	2	-	Pass
-03_Seminar room 09	2.2	6	3	-	Pass
-03_Seminar room 10	2.2	4	2	-	Pass
-03_Seminar room 11	1.8	3	2	-	Pass
-03_Seminar room 12	1.1	2	2	-	Pass
-02 Electronic library	1.8	3	2	-	Pass
-02 Existing Auditorium	78.0	94	15	1 & 2 & 3	Fail
-02 Existing Recital Room	0.0	0	0	-	Pass
-01 Control Room	87.5	53	10	1 & 2 & 3	Fail
-01 Informal Assembly Area	12.7	19	4	1 & 2	Fail
00_Cafe/Food Court	0.0	0	0	-	Pass

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
00_Sixth Form Common Room	12.1	17	6	1 & 2 & 3	Fail
01_Collaborative Area	3.1	7	3	1 & 2	Fail
01_Departmental Staff Base	1.8	8	2	2	Pass
01_Head of Sixth Form Office	23.4	29	5	1 & 2 & 3	Fail
01_Meeting Room 02	2.8	9	2	2	Pass
01_Seminar Room 09	2.9	7	3	2	Pass
01_Seminar Room 10	3.1	7	3	1 & 2	Fail
01_Seminar Room 11	13.0	15	5	1 & 2 & 3	Fail
01_Sixth Form Staff Office	11.9	14	3	1 & 2	Fail
02_Collaborative Area	12.3	18	6	1 & 2 & 3	Fail
02_Flexible Seminar Room 05	3.1	7	4	1 & 2	Fail
02_Flexible Seminar Room 06	3.1	8	4	1 & 2	Fail
02_IT Study Area	33.2	30	8	1 & 2 & 3	Fail
02_Meeting Room	2.9	9	2	2	Pass
02_Seminar Room 07	13.8	15	5	1 & 2 & 3	Fail
02_Sixth Form Staff Office - UCAS	1.8	7	2	2	Pass
03_Computer Studies	8.8	10	4	1 & 2	Fail
03_Departmental Staff Base	1.8	8	2	2	Pass
03_Flexible Seminar Room 03	2.9	7	3	2	Pass
03_Flexible Seminar Room 04	3.1	7	3	1 & 2	Fail
03_Meeting Room	2.9	9	2	2	Pass
03_Seminar Room 04	12.7	15	5	1 & 2 & 3	Fail
04_Collaborative Area	1.1	3	1	-	Pass
04_Flexible Seminar Room 01	2.2	5	3	-	Pass
04_Flexible Seminar Room 02	2.6	5	3	-	Pass
04_Meeting Room	2.1	7	2	2	Pass
04_Seminar Room 01	10.1	11	4	1 & 2	Fail
04_Seminar Room 02	10.1	11	4	1 & 2	Fail
04_Seminar Room 03	9.2	11	4	1 & 2	Fail
04_Sixth Form Staff Office - Senior Staff	1.1	4	1	-	Pass

E.4 Scenario 3

Table 24. CIBSE TM52 results for scenario 3 (weather file: London weather centre DSY1 2020 high emissions scenario 50th percentile)

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
-05 Band Practice	0.0	0	0	-	Pass
-05 Control Room	42.6	17	5	1 & 2 & 3	Fail

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
-05 Keyboard Classroom	5.9	4	2	1	Pass
-05 Large Practice	3.6	9	3	1 & 2	Fail
-05 Music IT	5.7	7	4	1 & 2	Fail
-05 Music Recording Studio	5.3	3	2	1	Pass
-05 SP 01	0.0	0	0	-	Pass
-05 SP 02	0.0	0	0	-	Pass
-05 SP 03	0.0	0	0	-	Pass
-05 SP 04	0.0	0	0	-	Pass
-05 SP 05	0.0	0	0	-	Pass
-05 SP 06	0.0	0	0	-	Pass
-05 SP 07	0.1	1	1	-	Pass
-05 SP 08	0.1	1	1	-	Pass
-05 SP 08	0.1	1	1	-	Pass
-05 SP 09	0.0	0	0	-	Pass
-05 SP 11	0.3	2	1	-	Pass
-05 SP 12	0.0	0	0	-	Pass
-05 SP 13	0.1	1	1	-	Pass
-05 SP 14	0.3	2	1	-	Pass
-05 SP 15	0.3	2	1	-	Pass
-05 SP 16	0.1	1	1	-	Pass
-05 SP 17	0.4	3	1	-	Pass
-05 SP 18	0.6	3	1	-	Pass
-05 SP 19	0.6	3	1	-	Pass
-05 SP 20	0.4	3	1	-	Pass
-05 SP 21	0.0	0	0	-	Pass
-05 SP 22	0.1	1	1	-	Pass
-05 SP 23	0.1	1	1	-	Pass
-05 SP 24	0.0	0	0	-	Pass
-04_Break Out 01	0.4	3	1	-	Pass
-04_Break Out 02	0.0	0	0	-	Pass
-04_Break Out 03	0.4	3	1	-	Pass
-04_Break Out 04	0.0	0	0	-	Pass
-04_Break Out Space 01	0.0	0	0	-	Pass
-04_Break Out Space 02	0.0	0	0	-	Pass
-04_EP 01	2.8	7	2	2	Pass
-04_EP 02	2.8	7	2	2	Pass
-04_EP 03	2.8	7	2	2	Pass
-04_EP 04	2.8	7	2	2	Pass
-04_EP 05	2.7	7	2	2	Pass
-04_Head Music Office 01	0.0	0	0	-	Pass

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
-04_Head Music Office 02	0.0	0	0	-	Pass
-04_Music Director Office	0.0	0	0	-	Pass
-04_Music Staff Office	0.1	1	1	-	Pass
-04_Music Teaching	0.4	3	1	-	Pass
-04_Music Teaching 01	0.1	1	1	-	Pass
-04_Music Teaching 02	0.9	3	1	-	Pass
-04_Visiting Staff Base	0.4	3	1	-	Pass
-03_Seminar room 01	1.8	3	2	-	Pass
-03_Seminar room 02	1.5	3	2	-	Pass
-03_Seminar room 03	1.1	3	2	-	Pass
-03_Seminar room 04	1.5	3	2	-	Pass
-03_Seminar room 05	1.5	3	2	-	Pass
-03_Seminar room 06	1.5	3	2	-	Pass
-03_Seminar room 07	1.5	3	2	-	Pass
-03_Seminar room 08	1.3	3	2	-	Pass
-03_Seminar room 09	2.2	6	3	-	Pass
-03_Seminar room 10	2.2	4	2	-	Pass
-03_Seminar room 11	1.8	3	2	-	Pass
-03_Seminar room 12	0.4	1	1	-	Pass
-02 Electronic library	1.8	3	2	-	Pass
-02 Existing Auditorium	57.3	54	11	1 & 2 & 3	Fail
-02 Existing Recital Room	0.0	0	0	-	Pass
-01 Control Room	74.9	32	7	1 & 2 & 3	Fail
-01 Informal Assembly Area	4.1	12	3	1 & 2	Fail
00_Cafe/Food Court	0.0	0	0	-	Pass
00_Sixth Form Common Room	4.6	10	4	1 & 2	Fail
01_Collaborative Area	2.6	4	2	-	Pass
01_Departmental Staff Base	1.8	7	2	2	Pass
01_Head of Sixth Form Office	10.8	17	4	1 & 2	Fail
01_Meeting Room 02	2.1	7	2	2	Pass
01_Seminar Room 09	2.9	7	3	2	Pass
01_Seminar Room 10	2.9	7	3	2	Pass
01_Seminar Room 11	3.7	8	4	1 & 2	Fail
01_Sixth Form Staff Office	5.2	8	2	1 & 2	Fail
02_Collaborative Area	4.8	10	4	1 & 2	Fail
02_Flexible Seminar Room 05	2.9	7	3	2	Pass
02_Flexible Seminar Room 06	2.9	7	3	2	Pass
02_IT Study Area	13.6	17	6	1 & 2 & 3	Fail
02_Meeting Room	2.2	9	2	2	Pass
02_Seminar Room 07	4.6	8	4	1 & 2	Fail

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
02_Sixth Form Staff Office - UCAS	1.7	7	2	2	Pass
03_Computer Studies	5.5	7	3	1 & 2	Fail
03_Departmental Staff Base	1.8	7	2	2	Pass
03_Flexible Seminar Room 03	2.9	7	3	2	Pass
03_Flexible Seminar Room 04	2.9	7	3	2	Pass
03_Meeting Room	2.4	9	2	2	Pass
03_Seminar Room 04	4.6	7	3	1 & 2	Fail
04_Collaborative Area	0.4	1	1	-	Pass
04_Flexible Seminar Room 01	2.0	4	2	-	Pass
04_Flexible Seminar Room 02	2.0	4	2	-	Pass
04_Meeting Room	2.0	7	2	2	Pass
04_Seminar Room 01	3.7	6	3	1	Pass
04_Seminar Room 02	3.7	6	3	1	Pass
04_Seminar Room 03	3.7	6	3	1	Pass
04_Sixth Form Staff Office - Senior Staff	1.0	3	1	-	Pass

E.5 Scenario 4

Table 25. CIBSE TM52 results for scenario 4 (weather file: London weather centre DSY1 2020 high emissions scenario 50th percentile)

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
-05 Band Practice	0.0	0	0	-	Pass
-05 Control Room	66.6	18	4	1 & 2	Fail
-05 Keyboard Classroom	5.9	4	2	1	Pass
-05 Large Practice	0.0	0	0	-	Pass
-05 Music IT	23.3	6	2	1	Pass
-05 Music Recording Studio	5.5	3	2	1	Pass
-05 SP 01	0.0	0	0	-	Pass
-05 SP 02	0.0	0	0	-	Pass
-05 SP 03	0.0	0	0	-	Pass
-05 SP 04	0.0	0	0	-	Pass
-05 SP 05	0.0	0	0	-	Pass
-05 SP 06	0.0	0	0	-	Pass
-05 SP 07	0.1	1	1	-	Pass
-05 SP 08	0.3	2	1	-	Pass
-05 SP 08	0.3	2	1	-	Pass
-05 SP 09	0.1	1	1	-	Pass
-05 SP 11	0.3	2	1	-	Pass
-05 SP 12	0.0	0	0	-	Pass

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
-05 SP 13	0.1	1	1	-	Pass
-05 SP 14	0.4	3	1	-	Pass
-05 SP 15	0.3	2	1	-	Pass
-05 SP 16	0.1	1	1	-	Pass
-05 SP 17	0.4	3	1	-	Pass
-05 SP 18	0.6	3	1	-	Pass
-05 SP 19	0.6	3	1	-	Pass
-05 SP 20	0.4	3	1	-	Pass
-05 SP 21	0.0	0	0	-	Pass
-05 SP 22	0.1	1	1	-	Pass
-05 SP 23	0.1	1	1	-	Pass
-05 SP 24	0.1	1	1	-	Pass
-04_Break Out 01	0.4	3	1	-	Pass
-04_Break Out 02	0.0	0	0	-	Pass
-04_Break Out 03	0.4	3	1	-	Pass
-04_Break Out 04	0.0	0	0	-	Pass
-04_Break Out Space 01	0.0	0	0	-	Pass
-04_Break Out Space 02	0.0	0	0	-	Pass
-04_EP 01	2.8	7	2	2	Pass
-04_EP 02	2.8	7	2	2	Pass
-04_EP 03	2.8	7	2	2	Pass
-04_EP 04	2.8	7	2	2	Pass
-04_EP 05	2.7	7	2	2	Pass
-04_Head Music Office 01	0.0	0	0	-	Pass
-04_Head Music Office 02	0.0	0	0	-	Pass
-04_Music Director Office	0.0	0	0	-	Pass
-04_Music Staff Office	0.3	2	1	-	Pass
-04_Music Teaching	0.4	3	1	-	Pass
-04_Music Teaching 01	0.1	1	1	-	Pass
-04_Music Teaching 02	0.9	3	1	-	Pass
-04_Visiting Staff Base	0.4	3	1	-	Pass
-03_Seminar room 01	1.8	3	2	-	Pass
-03_Seminar room 02	1.5	3	2	-	Pass
-03_Seminar room 03	1.1	3	2	-	Pass
-03_Seminar room 04	1.5	3	2	-	Pass
-03_Seminar room 05	1.5	3	2	-	Pass
-03_Seminar room 06	1.5	3	2	-	Pass
-03_Seminar room 07	1.5	3	2	-	Pass
-03_Seminar room 08	1.3	3	2	-	Pass
-03_Seminar room 09	2.2	6	3	-	Pass

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
-03_Seminar room 10	2.2	4	2	-	Pass
-03_Seminar room 11	1.8	3	2	-	Pass
-03_Seminar room 12	0.9	1	1	-	Pass
-02 Electronic library	1.8	3	2	-	Pass
-02 Existing Auditorium	56.4	44	9	1 & 2 & 3	Fail
-02 Existing Recital Room	0.0	0	0	-	Pass
-01 Control Room	84.6	35	7	1 & 2 & 3	Fail
-01 Informal Assembly Area	0.0	0	0	-	Pass
00_Cafe/Food Court	0.0	0	0	-	Pass
00_Sixth Form Common Room	2.2	3	2	-	Pass
01_Collaborative Area	2.6	4	2	-	Pass
01_Departmental Staff Base	1.8	7	2	2	Pass
01_Head of Sixth Form Office	2.2	4	1	-	Pass
01_Meeting Room 02	2.7	9	2	2	Pass
01_Seminar Room 09	2.9	7	3	2	Pass
01_Seminar Room 10	2.9	7	3	2	Pass
01_Seminar Room 11	0.4	1	1	-	Pass
01_Sixth Form Staff Office	0.3	2	1	-	Pass
02_Collaborative Area	0.7	1	1	-	Pass
02_Flexible Seminar Room 05	2.9	7	3	2	Pass
02_Flexible Seminar Room 06	2.6	6	3	-	Pass
02_IT Study Area	13.8	6	2	1	Pass
02_Meeting Room	2.8	9	2	2	Pass
02_Seminar Room 07	1.1	2	1	-	Pass
02_Sixth Form Staff Office - UCAS	1.7	7	2	2	Pass
03_Computer Studies	3.7	3	2	1	Pass
03_Departmental Staff Base	1.8	7	2	2	Pass
03_Flexible Seminar Room 03	2.9	7	3	2	Pass
03_Flexible Seminar Room 04	2.9	7	3	2	Pass
03_Meeting Room	2.8	9	2	2	Pass
03_Seminar Room 04	0.7	1	1	-	Pass
04_Collaborative Area	0.4	1	1	-	Pass
04_Flexible Seminar Room 01	2.0	4	2	-	Pass
04_Flexible Seminar Room 02	2.0	5	3	-	Pass
04_Meeting Room	2.0	7	2	2	Pass
04_Seminar Room 01	4.2	7	3	1 & 2	Fail
04_Seminar Room 02	4.2	6	3	1	Pass
04_Seminar Room 03	4.0	6	3	1	Pass
04_Sixth Form Staff Office - Senior Staff	1.0	3	1	-	Pass

E.6 Scenario 5a

Table 26. CIBSE TM52 results for scenario 5a (weather file: London weather centre DSY1 2020 high emissions scenario 50th percentile)

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
-05 Band Practice	0.0	0	0	-	Pass
-05 Control Room	0.0	0	0	-	Pass
-05 Keyboard Classroom	5.9	4	2	1	Pass
-05 Large Practice	0.0	0	0	-	Pass
-05 Music IT	11.2	5	2	1	Pass
-05 Music Recording Studio	2.4	2	1	-	Pass
-05 SP 01	0.0	0	0	-	Pass
-05 SP 02	0.0	0	0	-	Pass
-05 SP 03	0.0	0	0	-	Pass
-05 SP 04	0.0	0	0	-	Pass
-05 SP 05	0.0	0	0	-	Pass
-05 SP 06	0.0	0	0	-	Pass
-05 SP 07	0.1	1	1	-	Pass
-05 SP 08	0.3	2	1	-	Pass
-05 SP 08	0.3	2	1	-	Pass
-05 SP 09	0.1	1	1	-	Pass
-05 SP 11	0.3	2	1	-	Pass
-05 SP 12	0.0	0	0	-	Pass
-05 SP 13	0.1	1	1	-	Pass
-05 SP 14	0.3	2	1	-	Pass
-05 SP 15	0.3	2	1	-	Pass
-05 SP 16	0.1	1	1	-	Pass
-05 SP 17	0.4	3	1	-	Pass
-05 SP 18	0.6	3	1	-	Pass
-05 SP 19	0.6	3	1	-	Pass
-05 SP 20	0.4	3	1	-	Pass
-05 SP 21	0.0	0	0	-	Pass
-05 SP 22	0.1	1	1	-	Pass
-05 SP 23	0.1	1	1	-	Pass
-05 SP 24	0.1	1	1	-	Pass
-04_Break Out 01	0.4	3	1	-	Pass
-04_Break Out 02	0.0	0	0	-	Pass
-04_Break Out 03	0.4	3	1	-	Pass
-04_Break Out 04	0.0	0	0	-	Pass
-04_Break Out Space 01	0.0	0	0	-	Pass
-04_Break Out Space 02	0.0	0	0	-	Pass
-04_EP 01	2.8	7	2	2	Pass

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
-04_EP 02	2.8	7	2	2	Pass
-04_EP 03	2.8	7	2	2	Pass
-04_EP 04	2.8	7	2	2	Pass
-04_EP 05	2.7	7	2	2	Pass
-04_Head Music Office 01	0.0	0	0	-	Pass
-04_Head Music Office 02	0.0	0	0	-	Pass
-04_Music Director Office	0.0	0	0	-	Pass
-04_Music Staff Office	0.1	1	1	-	Pass
-04_Music Teaching	0.4	3	1	-	Pass
-04_Music Teaching 01	0.1	1	1	-	Pass
-04_Music Teaching 02	0.9	3	1	-	Pass
-04_Visiting Staff Base	0.4	3	1	-	Pass
-03_Seminar room 01	1.8	3	2	-	Pass
-03_Seminar room 02	1.5	3	2	-	Pass
-03_Seminar room 03	1.1	3	2	-	Pass
-03_Seminar room 04	1.5	3	2	-	Pass
-03_Seminar room 05	1.5	3	2	-	Pass
-03_Seminar room 06	1.5	3	2	-	Pass
-03_Seminar room 07	1.5	3	2	-	Pass
-03_Seminar room 08	1.3	3	2	-	Pass
-03_Seminar room 09	2.2	6	3	-	Pass
-03_Seminar room 10	2.2	4	2	-	Pass
-03_Seminar room 11	1.8	3	2	-	Pass
-03_Seminar room 12	0.4	1	1	-	Pass
-02 Electronic library	1.8	3	2	-	Pass
-02 Existing Auditorium	0.0	0	0	-	Pass
-02 Existing Recital Room	0.0	0	0	-	Pass
-01 Control Room	0.0	0	0	-	Pass
-01 Informal Assembly Area	0.0	0	0	-	Pass
00_Cafe/Food Court	0.0	0	0	-	Pass
00_Sixth Form Common Room	1.5	3	2	-	Pass
01_Collaborative Area	2.6	4	2	-	Pass
01_Departmental Staff Base	1.8	7	2	2	Pass
01_Head of Sixth Form Office	1.7	3	1	-	Pass
01_Meeting Room 02	2.5	9	2	2	Pass
01_Seminar Room 09	2.9	7	3	2	Pass
01_Seminar Room 10	2.9	7	3	2	Pass
01_Seminar Room 11	0.4	1	1	-	Pass
01_Sixth Form Staff Office	0.1	1	1	-	Pass
02_Collaborative Area	0.4	1	1	-	Pass

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
02_Flexible Seminar Room 05	2.9	7	3	2	Pass
02_Flexible Seminar Room 06	2.6	6	3	-	Pass
02_IT Study Area	13.0	6	2	1	Pass
02_Meeting Room	2.8	9	2	2	Pass
02_Seminar Room 07	0.7	2	1	-	Pass
02_Sixth Form Staff Office - UCAS	1.7	7	2	2	Pass
03_Computer Studies	0.0	0	0	-	Pass
03_Departmental Staff Base	1.7	7	2	2	Pass
03_Flexible Seminar Room 03	2.9	6	3	-	Pass
03_Flexible Seminar Room 04	2.2	5	3	-	Pass
03_Meeting Room	2.7	9	2	2	Pass
03_Seminar Room 04	0.0	0	0	-	Pass
04_Collaborative Area	0.4	1	1	-	Pass
04_Flexible Seminar Room 01	2.0	4	2	-	Pass
04_Flexible Seminar Room 02	2.0	4	2	-	Pass
04_Meeting Room	2.0	7	2	2	Pass
04_Seminar Room 01	4.0	6	3	1	Pass
04_Seminar Room 02	3.7	6	3	1	Pass
04_Seminar Room 03	3.7	6	3	1	Pass
04_Sixth Form Staff Office - Senior Staff	1.0	3	1	-	Pass

Appendix F Additional results for final scenario

Table 27. CIBSE TM52 results for scenario 5a (weather file: London weather centre DSY2 2020 high emissions scenario 50th percentile)

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
-05 Band Practice	0.4	3	1	-	Pass
-05 Control Room	0.0	0	0	-	Pass
-05 Keyboard Classroom	3.1	8	3	1 & 2	Fail
-05 Large Practice	0.0	0	0	-	Pass
-05 Music IT	16.9	8	2	1 & 2	Fail
-05 Music Recording Studio	2.6	5	2	-	Pass
-05 SP 01	0.0	0	0	-	Pass
-05 SP 02	0.0	0	0	-	Pass
-05 SP 03	0.0	0	0	-	Pass
-05 SP 04	0.0	0	0	-	Pass
-05 SP 05	0.0	0	0	-	Pass
-05 SP 06	0.0	0	0	-	Pass
-05 SP 07	0.1	1	1	-	Pass
-05 SP 08	0.1	1	1	-	Pass
-05 SP 08	0.1	1	1	-	Pass
-05 SP 09	0.0	0	0	-	Pass
-05 SP 11	0.1	1	1	-	Pass
-05 SP 12	0.0	0	0	-	Pass
-05 SP 13	0.1	1	1	-	Pass
-05 SP 14	0.1	1	1	-	Pass
-05 SP 15	0.1	1	1	-	Pass
-05 SP 16	0.0	0	0	-	Pass
-05 SP 17	0.3	2	1	-	Pass
-05 SP 18	0.4	3	1	-	Pass
-05 SP 19	0.4	3	1	-	Pass
-05 SP 20	0.3	2	1	-	Pass
-05 SP 21	0.0	0	0	-	Pass
-05 SP 22	0.1	1	1	-	Pass
-05 SP 23	0.1	1	1	-	Pass
-05 SP 24	0.1	1	1	-	Pass
-04_Break Out 01	0.0	0	0	-	Pass
-04_Break Out 02	0.0	0	0	-	Pass
-04_Break Out 03	0.0	0	0	-	Pass
-04_Break Out 04	0.0	0	0	-	Pass
-04_Break Out Space 01	0.0	0	0	-	Pass
-04_Break Out Space 02	0.0	0	0	-	Pass

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
-04_EP 01	1.5	8	2	2	Pass
-04_EP 02	1.4	8	2	2	Pass
-04_EP 03	1.4	8	2	2	Pass
-04_EP 04	1.4	8	2	2	Pass
-04_EP 05	1.3	8	2	2	Pass
-04_Head Music Office 01	0.0	0	0	-	Pass
-04_Head Music Office 02	0.0	0	0	-	Pass
-04_Music Director Office	0.0	0	0	-	Pass
-04_Music Staff Office	0.0	0	0	-	Pass
-04_Music Teaching	0.1	1	1	-	Pass
-04_Music Teaching 01	0.1	1	1	-	Pass
-04_Music Teaching 02	0.1	1	1	-	Pass
-04_Visiting Staff Base	0.4	3	1	-	Pass
-03_Seminar room 01	0.9	3	2	-	Pass
-03_Seminar room 02	0.2	1	1	-	Pass
-03_Seminar room 03	0.2	1	1	-	Pass
-03_Seminar room 04	0.2	1	1	-	Pass
-03_Seminar room 05	0.2	2	2	-	Pass
-03_Seminar room 06	0.2	1	1	-	Pass
-03_Seminar room 07	0.2	1	1	-	Pass
-03_Seminar room 08	0.2	1	1	-	Pass
-03_Seminar room 09	0.9	3	2	-	Pass
-03_Seminar room 10	1.1	4	2	-	Pass
-03_Seminar room 11	0.7	2	1	-	Pass
-03_Seminar room 12	0.4	1	1	-	Pass
-02 Electronic library	0.4	3	2	-	Pass
-02 Existing Auditorium	0.0	0	0	-	Pass
-02 Existing Recital Room	0.0	0	0	-	Pass
-01 Control Room	0.0	0	0	-	Pass
-01 Informal Assembly Area	0.0	0	0	-	Pass
00_Cafe/Food Court	0.0	0	0	-	Pass
00_Sixth Form Common Room	0.2	1	1	-	Pass
01_Collaborative Area	1.3	4	2	-	Pass
01_Departmental Staff Base	0.8	4	1	-	Pass
01_Head of Sixth Form Office	2.2	4	2	-	Pass
01_Meeting Room 02	1.8	8	2	2	Pass
01_Seminar Room 09	1.1	4	2	-	Pass
01_Seminar Room 10	1.1	4	2	-	Pass
01_Seminar Room 11	0.2	1	1	-	Pass
01_Sixth Form Staff Office	0.3	2	1	-	Pass

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
02_Collaborative Area	0.2	1	1	-	Pass
02_Flexible Seminar Room 05	1.1	4	2	-	Pass
02_Flexible Seminar Room 06	0.9	4	2	-	Pass
02_IT Study Area	9.5	5	2	1	Pass
02_Meeting Room	1.5	8	2	2	Pass
02_Seminar Room 07	0.4	2	1	-	Pass
02_Sixth Form Staff Office - UCAS	0.6	4	1	-	Pass
03_Computer Studies	0.0	0	0	-	Pass
03_Departmental Staff Base	0.7	4	1	-	Pass
03_Flexible Seminar Room 03	0.9	4	2	-	Pass
03_Flexible Seminar Room 04	0.7	3	2	-	Pass
03_Meeting Room	1.5	8	2	2	Pass
03_Seminar Room 04	0.0	0	0	-	Pass
04_Collaborative Area	0.2	1	1	-	Pass
04_Flexible Seminar Room 01	0.7	3	2	-	Pass
04_Flexible Seminar Room 02	0.7	3	2	-	Pass
04_Meeting Room	1.1	8	2	2	Pass
04_Seminar Room 01	2.2	5	3	-	Pass
04_Seminar Room 02	2.0	5	3	-	Pass
04_Seminar Room 03	2.0	5	3	-	Pass
04_Sixth Form Staff Office - Senior Staff	0.4	3	1	-	Pass

Table 28. CIBSE TM52 results for scenario 5a (weather file: London weather centre DSY3 2020 high emissions scenario 50th percentile)

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
-05 Band Practice	7.7	17	3	1 & 2	Fail
-05 Control Room	0.0	0	0	-	Pass
-05 Keyboard Classroom	13.0	23	6	1 & 2 & 3	Fail
-05 Large Practice	1.4	6	3	-	Pass
-05 Music IT	16.0	7	3	1 & 2	Fail
-05 Music Recording Studio	11.9	13	4	1 & 2	Fail
-05 SP 01	1.5	4	1	-	Pass
-05 SP 02	2.4	6	2	-	Pass
-05 SP 03	2.4	6	2	-	Pass
-05 SP 04	2.5	7	2	2	Pass
-05 SP 05	2.4	7	2	2	Pass
-05 SP 06	0.8	3	1	-	Pass
-05 SP 07	7.3	16	3	1 & 2	Fail

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
-05 SP 08	7.3	16	3	1 & 2	Fail
-05 SP 08	7.3	16	3	1 & 2	Fail
-05 SP 09	6.9	16	3	1 & 2	Fail
-05 SP 11	7.4	17	3	1 & 2	Fail
-05 SP 12	6.7	16	3	1 & 2	Fail
-05 SP 13	7.3	16	3	1 & 2	Fail
-05 SP 14	7.6	17	3	1 & 2	Fail
-05 SP 15	7.6	17	3	1 & 2	Fail
-05 SP 16	7.1	16	3	1 & 2	Fail
-05 SP 17	8.5	18	3	1 & 2	Fail
-05 SP 18	8.8	20	4	1 & 2	Fail
-05 SP 19	8.8	19	4	1 & 2	Fail
-05 SP 20	8.5	18	3	1 & 2	Fail
-05 SP 21	6.9	14	3	1 & 2	Fail
-05 SP 22	7.3	16	3	1 & 2	Fail
-05 SP 23	7.3	16	3	1 & 2	Fail
-05 SP 24	7.4	15	3	1 & 2	Fail
-04_Break Out 01	5.2	16	4	1 & 2	Fail
-04_Break Out 02	5.4	16	3	1 & 2	Fail
-04_Break Out 03	4.9	14	3	1 & 2	Fail
-04_Break Out 04	5.1	16	3	1 & 2	Fail
-04_Break Out Space 01	4.2	11	2	1 & 2	Fail
-04_Break Out Space 02	6.9	16	3	1 & 2	Fail
-04_EP 01	12.2	32	5	1 & 2 & 3	Fail
-04_EP 02	11.9	31	5	1 & 2 & 3	Fail
-04_EP 03	11.7	31	5	1 & 2 & 3	Fail
-04_EP 04	11.9	32	5	1 & 2 & 3	Fail
-04_EP 05	11.7	31	5	1 & 2 & 3	Fail
-04_Head Music Office 01	8.4	19	3	1 & 2	Fail
-04_Head Music Office 02	7.3	16	3	1 & 2	Fail
-04_Music Director Office	4.2	14	3	1 & 2	Fail
-04_Music Staff Office	5.3	16	3	1 & 2	Fail
-04_Music Teaching	6.1	18	4	1 & 2	Fail
-04_Music Teaching 01	5.8	16	3	1 & 2	Fail
-04_Music Teaching 02	7.2	21	4	1 & 2	Fail
-04_Visiting Staff Base	7.8	21	4	1 & 2	Fail
-03_Seminar room 01	6.4	13	6	1 & 2 & 3	Fail
-03_Seminar room 02	5.9	15	5	1 & 2 & 3	Fail
-03_Seminar room 03	5.7	14	5	1 & 2 & 3	Fail
-03_Seminar room 04	5.9	15	5	1 & 2 & 3	Fail

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
-03_Seminar room 05	6.4	15	5	1 & 2 & 3	Fail
-03_Seminar room 06	6.8	15	5	1 & 2 & 3	Fail
-03_Seminar room 07	5.5	11	5	1 & 2 & 3	Fail
-03_Seminar room 08	5.9	15	5	1 & 2 & 3	Fail
-03_Seminar room 09	6.4	15	5	1 & 2 & 3	Fail
-03_Seminar room 10	7.3	17	5	1 & 2 & 3	Fail
-03_Seminar room 11	7.0	15	5	1 & 2 & 3	Fail
-03_Seminar room 12	6.8	13	4	1 & 2	Fail
-02 Electronic library	5.9	15	6	1 & 2 & 3	Fail
-02 Existing Auditorium	0.0	0	0	-	Pass
-02 Existing Recital Room	1.0	4	1	-	Pass
-01 Control Room	0.0	0	0	-	Pass
-01 Informal Assembly Area	0.8	6	2	-	Pass
00_Cafe/Food Court	2.4	5	1	-	Pass
00_Sixth Form Common Room	2.6	4	3	-	Pass
01_Collaborative Area	7.7	15	5	1 & 2 & 3	Fail
01_Departmental Staff Base	7.6	25	5	1 & 2 & 3	Fail
01_Head of Sixth Form Office	7.7	19	5	1 & 2 & 3	Fail
01_Meeting Room 02	9.7	29	5	1 & 2 & 3	Fail
01_Seminar Room 09	7.7	17	6	1 & 2 & 3	Fail
01_Seminar Room 10	7.7	16	6	1 & 2 & 3	Fail
01_Seminar Room 11	2.9	5	3	-	Pass
01_Sixth Form Staff Office	5.0	13	4	1 & 2	Fail
02_Collaborative Area	2.9	6	4	-	Pass
02_Flexible Seminar Room 05	7.5	16	6	1 & 2 & 3	Fail
02_Flexible Seminar Room 06	6.8	15	6	1 & 2 & 3	Fail
02_IT Study Area	12.7	10	5	1 & 2 & 3	Fail
02_Meeting Room	9.4	30	6	1 & 2 & 3	Fail
02_Seminar Room 07	3.5	6	4	1	Pass
02_Sixth Form Staff Office - UCAS	7.1	24	5	1 & 2 & 3	Fail
03_Computer Studies	0.0	0	0	-	Pass
03_Departmental Staff Base	7.3	24	5	1 & 2 & 3	Fail
03_Flexible Seminar Room 03	7.0	15	6	1 & 2 & 3	Fail
03_Flexible Seminar Room 04	6.2	14	5	1 & 2 & 3	Fail
03_Meeting Room	9.2	30	6	1 & 2 & 3	Fail
03_Seminar Room 04	1.5	4	3	-	Pass
04_Collaborative Area	6.4	13	4	1 & 2	Fail
04_Flexible Seminar Room 01	7.0	16	6	1 & 2 & 3	Fail
04_Flexible Seminar Room 02	7.0	16	6	1 & 2 & 3	Fail
04_Meeting Room	9.2	31	5	1 & 2 & 3	Fail

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
04_Seminar Room 01	9.2	17	7	1 & 2 & 3	Fail
04_Seminar Room 02	9.0	17	7	1 & 2 & 3	Fail
04_Seminar Room 03	9.0	16	6	1 & 2 & 3	Fail
04_Sixth Form Staff Office - Senior Staff	6.6	23	5	1 & 2 & 3	Fail

Table 29. CIBSE TM52 results for scenario 5a (weather file: London weather centre DSY1 2050 high emissions scenario 50th percentile)

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
-05 Band Practice	2.5	4	1	-	Pass
-05 Control Room	0.0	0	0	-	Pass
-05 Keyboard Classroom	10.8	8	3	1 & 2	Fail
-05 Large Practice	0.1	1	1	-	Pass
-05 Music IT	21.1	8	2	1 & 2	Fail
-05 Music Recording Studio	10.3	5	2	1	Pass
-05 SP 01	0.1	1	1	-	Pass
-05 SP 02	0.4	3	1	-	Pass
-05 SP 03	0.4	3	1	-	Pass
-05 SP 04	0.4	3	1	-	Pass
-05 SP 05	0.4	3	1	-	Pass
-05 SP 06	0.0	0	0	-	Pass
-05 SP 07	1.4	6	2	-	Pass
-05 SP 08	1.5	6	2	-	Pass
-05 SP 08	1.5	6	2	-	Pass
-05 SP 09	1.3	5	2	-	Pass
-05 SP 11	1.4	6	2	-	Pass
-05 SP 12	1.1	5	2	-	Pass
-05 SP 13	1.3	5	2	-	Pass
-05 SP 14	1.7	7	2	2	Pass
-05 SP 15	1.4	7	2	2	Pass
-05 SP 16	1.3	5	2	-	Pass
-05 SP 17	2.5	7	2	2	Pass
-05 SP 18	3.8	7	2	1 & 2	Fail
-05 SP 19	3.8	7	2	1 & 2	Fail
-05 SP 20	2.5	7	2	2	Pass
-05 SP 21	0.7	4	1	-	Pass
-05 SP 22	1.4	5	2	-	Pass
-05 SP 23	1.4	5	2	-	Pass

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
-05 SP 24	1.3	5	2	-	Pass
-04_Break Out 01	1.5	7	2	2	Pass
-04_Break Out 02	0.7	3	1	-	Pass
-04_Break Out 03	1.0	7	2	2	Pass
-04_Break Out 04	0.7	3	1	-	Pass
-04_Break Out Space 01	0.4	3	1	-	Pass
-04_Break Out Space 02	0.7	3	1	-	Pass
-04_EP 01	9.1	15	4	1 & 2	Fail
-04_EP 02	9.0	15	4	1 & 2	Fail
-04_EP 03	9.0	13	3	1 & 2	Fail
-04_EP 04	9.1	15	4	1 & 2	Fail
-04_EP 05	8.8	15	4	1 & 2	Fail
-04_Head Music Office 01	0.7	3	1	-	Pass
-04_Head Music Office 02	0.4	2	1	-	Pass
-04_Music Director Office	0.4	3	1	-	Pass
-04_Music Staff Office	0.7	6	2	-	Pass
-04_Music Teaching	2.1	7	2	2	Pass
-04_Music Teaching 01	1.6	6	2	-	Pass
-04_Music Teaching 02	2.7	7	2	2	Pass
-04_Visiting Staff Base	3.5	8	2	1 & 2	Fail
-03_Seminar room 01	4.2	6	3	1	Pass
-03_Seminar room 02	3.1	7	3	1 & 2	Fail
-03_Seminar room 03	3.1	6	3	1	Pass
-03_Seminar room 04	3.1	7	3	1 & 2	Fail
-03_Seminar room 05	3.1	7	3	1 & 2	Fail
-03_Seminar room 06	3.1	7	3	1 & 2	Fail
-03_Seminar room 07	3.3	6	3	1	Pass
-03_Seminar room 08	3.1	7	3	1 & 2	Fail
-03_Seminar room 09	3.7	9	4	1 & 2	Fail
-03_Seminar room 10	4.4	7	3	1 & 2	Fail
-03_Seminar room 11	3.3	7	3	1 & 2	Fail
-03_Seminar room 12	3.1	4	3	1	Pass
-02 Electronic library	3.1	7	3	1 & 2	Fail
-02 Existing Auditorium	0.0	0	0	-	Pass
-02 Existing Recital Room	0.0	0	0	-	Pass
-01 Control Room	0.0	0	0	-	Pass
-01 Informal Assembly Area	0.0	0	0	-	Pass
00_Cafe/Food Court	0.0	0	0	-	Pass
00_Sixth Form Common Room	1.1	1	1	-	Pass
01_Collaborative Area	4.6	7	3	1 & 2	Fail

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
01_Departmental Staff Base	4.8	14	3	1 & 2	Fail
01_Head of Sixth Form Office	4.5	8	2	1 & 2	Fail
01_Meeting Room 02	6.3	15	4	1 & 2	Fail
01_Seminar Room 09	5.1	11	4	1 & 2	Fail
01_Seminar Room 10	5.1	11	4	1 & 2	Fail
01_Seminar Room 11	0.7	1	1	-	Pass
01_Sixth Form Staff Office	1.1	3	1	-	Pass
02_Collaborative Area	0.9	2	2	-	Pass
02_Flexible Seminar Room 05	4.8	11	4	1 & 2	Fail
02_Flexible Seminar Room 06	4.4	10	4	1 & 2	Fail
02_IT Study Area	11.2	5	3	1	Pass
02_Meeting Room	5.9	15	3	1 & 2	Fail
02_Seminar Room 07	1.1	1	1	-	Pass
02_Sixth Form Staff Office - UCAS	3.9	13	3	1 & 2	Fail
03_Computer Studies	0.0	0	0	-	Pass
03_Departmental Staff Base	3.9	13	3	1 & 2	Fail
03_Flexible Seminar Room 03	4.6	10	4	1 & 2	Fail
03_Flexible Seminar Room 04	3.3	8	4	1 & 2	Fail
03_Meeting Room	5.9	15	3	1 & 2	Fail
03_Seminar Room 04	0.4	1	1	-	Pass
04_Collaborative Area	2.9	4	2	-	Pass
04_Flexible Seminar Room 01	3.7	8	4	1 & 2	Fail
04_Flexible Seminar Room 02	3.5	8	4	1 & 2	Fail
04_Meeting Room	5.2	14	3	1 & 2	Fail
04_Seminar Room 01	7.0	10	4	1 & 2	Fail
04_Seminar Room 02	6.6	10	4	1 & 2	Fail
04_Seminar Room 03	6.4	10	4	1 & 2	Fail
04_Sixth Form Staff Office - Senior Staff	2.8	9	2	2	Pass

Table 30. Table 31. CIBSE TM52 results for scenario 5a (weather file: London weather centre DSY1 2080 high emissions scenario 50th percentile)

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
-05 Band Practice	8.1	12	3	1 & 2	Fail
-05 Control Room	0.0	0	0	-	Pass
-05 Keyboard Classroom	14.9	14	5	1 & 2 & 3	Fail
-05 Large Practice	0.6	3	2	-	Pass
-05 Music IT	36.0	12	3	1 & 2	Fail

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
-05 Music Recording Studio	26.4	13	3	1 & 2	Fail
-05 SP 01	1.3	5	2	-	Pass
-05 SP 02	2.4	8	2	2	Pass
-05 SP 03	2.4	8	2	2	Pass
-05 SP 04	2.8	9	2	2	Pass
-05 SP 05	2.7	9	2	2	Pass
-05 SP 06	1.4	4	1	-	Pass
-05 SP 07	7.7	13	3	1 & 2	Fail
-05 SP 08	7.8	13	3	1 & 2	Fail
-05 SP 08	7.8	13	3	1 & 2	Fail
-05 SP 09	7.3	13	3	1 & 2	Fail
-05 SP 11	8.0	13	3	1 & 2	Fail
-05 SP 12	7.3	12	3	1 & 2	Fail
-05 SP 13	8.3	13	3	1 & 2	Fail
-05 SP 14	9.1	13	3	1 & 2	Fail
-05 SP 15	9.0	13	3	1 & 2	Fail
-05 SP 16	8.3	13	3	1 & 2	Fail
-05 SP 17	10.9	15	3	1 & 2	Fail
-05 SP 18	10.9	18	4	1 & 2	Fail
-05 SP 19	10.9	17	3	1 & 2	Fail
-05 SP 20	10.6	15	3	1 & 2	Fail
-05 SP 21	7.6	11	3	1 & 2	Fail
-05 SP 22	8.3	13	3	1 & 2	Fail
-05 SP 23	8.4	13	3	1 & 2	Fail
-05 SP 24	9.0	13	3	1 & 2	Fail
-04_Break Out 01	3.9	13	3	1 & 2	Fail
-04_Break Out 02	4.5	8	2	1 & 2	Fail
-04_Break Out 03	3.6	12	3	1 & 2	Fail
-04_Break Out 04	4.6	8	2	1 & 2	Fail
-04_Break Out Space 01	2.8	7	2	2	Pass
-04_Break Out Space 02	6.4	10	2	1 & 2	Fail
-04_EP 01	16.1	26	5	1 & 2 & 3	Fail
-04_EP 02	15.8	26	5	1 & 2 & 3	Fail
-04_EP 03	15.7	26	5	1 & 2 & 3	Fail
-04_EP 04	15.9	26	5	1 & 2 & 3	Fail
-04_EP 05	15.7	26	5	1 & 2 & 3	Fail
-04_Head Music Office 01	9.0	10	2	1 & 2	Fail
-04_Head Music Office 02	7.0	8	2	1 & 2	Fail
-04_Music Director Office	2.8	11	3	2	Pass
-04_Music Staff Office	4.8	12	3	1 & 2	Fail

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
-04_Music Teaching	6.6	15	4	1 & 2	Fail
-04_Music Teaching 01	5.8	13	3	1 & 2	Fail
-04_Music Teaching 02	7.6	16	4	1 & 2	Fail
-04_Visiting Staff Base	9.5	17	4	1 & 2	Fail
-03_Seminar room 01	7.3	10	4	1 & 2	Fail
-03_Seminar room 02	6.8	11	4	1 & 2	Fail
-03_Seminar room 03	6.4	10	4	1 & 2	Fail
-03_Seminar room 04	6.4	11	4	1 & 2	Fail
-03_Seminar room 05	6.8	11	5	1 & 2 & 3	Fail
-03_Seminar room 06	6.8	12	4	1 & 2	Fail
-03_Seminar room 07	5.7	10	4	1 & 2	Fail
-03_Seminar room 08	6.2	10	4	1 & 2	Fail
-03_Seminar room 09	8.6	13	5	1 & 2 & 3	Fail
-03_Seminar room 10	9.2	12	5	1 & 2 & 3	Fail
-03_Seminar room 11	8.6	11	4	1 & 2	Fail
-03_Seminar room 12	7.9	10	4	1 & 2	Fail
-02 Electronic library	7.0	12	4	1 & 2	Fail
-02 Existing Auditorium	0.0	0	0	-	Pass
-02 Existing Recital Room	0.0	0	0	-	Pass
-01 Control Room	0.0	0	0	-	Pass
-01 Informal Assembly Area	0.4	3	1	-	Pass
00_Cafe/Food Court	2.8	8	1	2	Pass
00_Sixth Form Common Room	2.0	3	2	-	Pass
01_Collaborative Area	8.4	12	4	1 & 2	Fail
01_Departmental Staff Base	9.1	21	5	1 & 2 & 3	Fail
01_Head of Sixth Form Office	8.5	13	3	1 & 2	Fail
01_Meeting Room 02	11.9	25	5	1 & 2 & 3	Fail
01_Seminar Room 09	9.5	15	6	1 & 2 & 3	Fail
01_Seminar Room 10	9.2	15	6	1 & 2 & 3	Fail
01_Seminar Room 11	2.2	3	2	-	Pass
01_Sixth Form Staff Office	5.0	7	3	1 & 2	Fail
02_Collaborative Area	2.4	4	3	-	Pass
02_Flexible Seminar Room 05	9.2	16	6	1 & 2 & 3	Fail
02_Flexible Seminar Room 06	8.6	14	5	1 & 2 & 3	Fail
02_IT Study Area	12.5	8	4	1 & 2	Fail
02_Meeting Room	11.9	25	5	1 & 2 & 3	Fail
02_Seminar Room 07	3.5	3	2	1	Pass
02_Sixth Form Staff Office - UCAS	7.1	19	4	1 & 2	Fail
03_Computer Studies	0.0	0	0	-	Pass
03_Departmental Staff Base	7.7	19	4	1 & 2	Fail

Room Name	Criterion 1 result	Criterion 2 result	Criterion 3 result	Which criteria are failed?	Overall result
<i>CIBSE TM52 criteria</i>	<i>3</i>	<i>6</i>	<i>4</i>		
03_Flexible Seminar Room 03	8.8	14	5	1 & 2 & 3	Fail
03_Flexible Seminar Room 04	7.3	12	5	1 & 2 & 3	Fail
03_Meeting Room	11.9	25	5	1 & 2 & 3	Fail
03_Seminar Room 04	0.9	1	1	-	Pass
04_Collaborative Area	5.7	8	3	1 & 2	Fail
04_Flexible Seminar Room 01	7.9	12	5	1 & 2 & 3	Fail
04_Flexible Seminar Room 02	7.9	12	5	1 & 2 & 3	Fail
04_Meeting Room	11.2	24	5	1 & 2 & 3	Fail
04_Seminar Room 01	11.4	14	5	1 & 2 & 3	Fail
04_Seminar Room 02	11.4	14	5	1 & 2 & 3	Fail
04_Seminar Room 03	10.8	14	5	1 & 2 & 3	Fail
04_Sixth Form Staff Office - Senior Staff	6.2	18	4	1 & 2	Fail

Table 32. CIBSE Guide A results for scenario 5 for additional weather files

Room name	Number of occupied hours with an operative temperature greater than 25°C			
	DSY2 2020	DSY3 2020	DSY1 2050	DSY1 2080
-01 Control Room	0	0	0	0
-02 Existing Auditorium	4	28	8	37
-05 Control Room	0	0	0	0
03_Computer Studies	0	2	0	0
Number of compliant rooms	3 / 4 (75%)	2 / 4 (50%)	3 / 4 (75%)	3 / 4 (75%)

Appendix F Correspondence with LBH

Belfitt, Richard

From: Suzanne Kimman <Suzanne.Kimman@haringey.gov.uk>
Sent: 08 September 2022 15:50
To: Belfitt, Richard
Cc: John McRory; Tania Skelli; James Mead
Subject: [EXTERNAL] RE: Planning Services - General Enquiry - Ref: HC-17706047

This Message Is From an External Sender

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Report Suspicious

Hi Richard,

Can you please clarify whether this relates to the Highgate Schools sites? If so, it's best these discussions go through our planning colleagues (copied in).

The site is not close enough to a planned Decentralised Energy Network, that is correct. In accordance with planning policy, the proposals should however demonstrate how site-wide opportunities for using waste heat and sharing heat loads have been integrated/considered. In this case, this would apply across the whole campus (and any adjacent uses potentially). I hope that helps.

Kind regards,
Suzanne

Suzanne Kimman
Climate Change Officer

Carbon Management Team, Placemaking and Housing, Haringey Council
T. 020 8489 8235 (redirects to mobile)

NB: I work 4 days a week – my typical working week is Tuesday to Friday.

You can visit our [Going Green pages](#) to read Haringey's Climate Change Action Plan to get to a net zero carbon borough by 2041.

From: Belfitt, Richard <Richard.Belfitt@aecom.com>
Sent: 08 September 2022 12:28
To: Suzanne Kimman <Suzanne.Kimman@haringey.gov.uk>
Subject: RE: Planning Services - General Enquiry - Ref: HC-17706047

Hi Suzanne,

Please see below. Please could you confirm there are no heat networks near to the proposed development that we should be aware of?

Kind regards,

Richard.

Richard Belfitt MEng (Hons), PGDip, BREEAM AP, PIEMA
Principal Consultant, Infrastructure and Sustainability, Buildings & Places
M +44 (0)7917 902 623
Richard.Belfitt@aeacom.com

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From: Kwaku Bossman-Gyamera <Kwaku.Bossman-Gyamera@haringey.gov.uk> On Behalf Of Planning DTO
Sent: 08 September 2022 12:26
To: Belfitt, Richard <Richard.Belfitt@aeacom.com>
Subject: [EXTERNAL] RE: Planning Services - General Enquiry - Ref: HC-17706047

Dear, Richard Belfitt

Thank you for your email. Unfortunately, the planning department does not have these type of information. I will advise you to drop an email to the council's climate change officers. I have attached their email address below for your attention.

(Suzanne.kimman@haringey.gov.uk)

I am certain that Suzanne should be in a position to answer your query.

Regards

Kwaku Bossman-Gyamera

Principal Planning Officer - Development Management
Haringey Council
River Park House, 255 High Road, Wood Green, London N22 8HQ
T. 020 8489 5627
M.07989134742
E. kwaku.bossman-gyamera@haringey.gov.uk
www.haringey.gov.uk
[twitter@haringeycouncil](https://twitter.com/haringeycouncil)
facebook.com/haringeycouncil

Please note the above opinion represents informal officer observation only, offered without prejudice to all future formal Council decisions and accompanying procedures

From: NoReply PlanningCustomerCareTeamCF <NoReply.PlanningCustomerCareTeamCF@haringey.gov.uk>
Sent: 07 September 2022 16:09
To: Planning DTO <PlanningDTO@haringey.gov.uk>
Subject: FW: Planning Services - General Enquiry - Ref: HC-17706047

Good Afternoon,

Please see email

Could you please advise?

Many thanks

Kind regards,

Carol Coriah

Haringey Customer Services Team

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[Contact Planning](#)

Here you can get instant answers to questions and access to self-service portals which give an immediate result.

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Please note the above opinion represents informal officer observation only, offered without prejudice to all future formal Council decisions and accompanying procedures



From: noreply@haringey.gov.uk <noreply@haringey.gov.uk>

Sent: 06 September 2022 18:43

To: NoReply PlanningCustomerCareTeamCF <NoReply.PlanningCustomerCareTeamCF@haringey.gov.uk>

Subject: Planning Services - General Enquiry - Ref: HC-17706047

Web reference number	HC-17706047
The nature of your enquire	Any other query
First name	Richard
Second name	Belfitt
Building/house number	Dyne House
Building/house name	
Street name	Southwood Lane

Town	Hornsey
Postcode	N6 5EE
Contact number	07917902623
Email address	richard.belfitt@aeecom.com
What's your query?	I would like to contact your planning department or surveyor's office. I am working on the energy statement for a planning application for a development near the south end of Southwood Lane. As part of the work, we have been investigating whether there are any nearby heat networks which could serve the proposed development. We have consulted the London Heat Map and this shows no existing or proposed networks and we are not aware of other networks nearby. Please could you confirm that there are no other heat networks we should be considering as a heat source for the development?
File(s) uploaded:	

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Appendix G Planning Policy Review

Policy Review

National Legislation and Policy Drivers

UK Climate Change Act

The Climate Change Act (2008) sets a legally binding target to reduce UK carbon emissions by 100% by 2050, against a 1990 baseline. The Committee on Climate Change advises the Government on the setting of binding 5-year carbon budgets on a pathway to achieving the 2050 target. The first six carbon budgets covering the period up to 2037 have been set in law. The current (third) budget requires a 37% emissions reduction by 2022, while future budgets require reductions of 51% by 2025, 57% by 2030 and 78% by 2035.

The Act is the driver behind a framework of national strategy and policy documents such as the UK Low Carbon Transition Plan (2009) and previously anticipated zero carbon homes policy. These in turn have informed the development of local planning policy and updates to the Building Regulations.

National Planning Policy Framework

The National Planning Policy Framework (NPPF) prescribes government planning policy and outlines the way in which this is to be applied. The document sets out a framework for local plan development and illustrates national-scale policy aims. The NPPF includes requirements for new development which assist in supporting the transition to a low carbon future.

Building Regulations and Future Buildings Standard

Part L of the Building Regulations in England is the key mechanism that prescribes standards for the energy performance of new and the refurbishment of existing buildings in the UK, based on metrics such as the estimated level of primary energy demand and CO₂ emissions. Approved Documents set out the measures required to comply with Building Regulations.

In October 2019, UK Government consulted on the introduction of a Future Buildings Standard and on an interim update to Part L of Building Regulations for non-domestic, originally planned for 2020 but later proposed for 2021.

In January 2021 the Government published its response to the consultation, including its proposals for an interim update to Part L of the Building Regulations in 2021 ahead of the introduction of the Future Buildings Standard in 2025.

The final version of the new Part L 2021 Approved Documents was published in December 2021 and was adopted in June 2022.

The Approved Documents set out the performance of the notional building against which the 2021 targets are to be set. For new buildings this is estimated to deliver a 31% carbon saving on average compared to the previous 2013 standards.

A transitional arrangement period for Part L 2013 applies only where both:

- a) The developer has submitted a building/initial notice or deposited plans by June 2022; and
- b) Commenced work on each individual building by June 2023.

Development on Dyne House and the Island Suite Tunnel Building is outside the window for transitional arrangements for Part L 2013. Therefore, the development will be required to be built in line with Part L 2021 standards and as such these standards are an important consideration in developing the energy strategy for the proposed development.

The building is required to meet the Part L 2021 standards, and has been modelled using the new Part L 2021 compliant software.

The Government's consultation response also sets out initial timescales for the adoption of the Future Buildings Standard. The consultation for this will commence in 2023 to allow the introduction of necessary legislation in 2024, ahead of implementation in 2025.

Regional Policy Drivers

Greater London Authority (GLA)

Local planning policy is set within the context of London-wide policy and guidance. The following are identified as potentially relevant to the application:

- The London Plan, March 2021.
- Sustainable Design and Construction Supplementary Planning Guidance, April 2014.
- GLA Energy Assessment Guidance, June 2022.

For energy purposes, the regional policy requires that developments reduce their CO₂ emissions in accordance with the Energy Hierarchy and make the fullest contribution to London's adaptation to climate change. In order to meet the 'zero-carbon target', a minimum on-site reduction in regulated CO₂ emissions of at least 35% beyond Building Regulations is required for a major development. Residential developments should achieve a 10% reduction through energy efficiency measures, and non-residential a 15% reduction. Where the zero-carbon target cannot be met, the remaining carbon emissions should be offset to the 100% target.

The regional policy also seeks:

- Minimisation of the overheating risk and the demand for cooling;
- On-site renewable energy generation;
- Commitment to site wide networks with a single energy centre, where feasible; and
- Allowance for connection to existing or planned district heating networks identified in the area.

This energy statement aims to follow GLA guidance on preparing energy assessments, which sets out "how to prepare an energy assessment to accompany strategic planning applications... [and] demonstrate that climate change mitigation measures comply with London Plan energy policies". The 2022 guidance on preparing energy statements is focussed on responding to the updates to Building Regulations.

The following excerpts and summaries provide an outline of planning policy expectations with regard to energy and CO₂ emissions from the building development.

London Plan (2021) Policy SI 2 Minimising Greenhouse Gas Emissions

A Major development should be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy:

- 1. Be lean: use less energy and manage demand during operation*
- 2. Be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly*
- 3. Be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site*
- 4. Be seen: monitor, verify and report on energy performance*

Part C of Policy SI 2 adds to the "be lean" stage of the energy hierarchy a goal for residential buildings to achieve an improvement of 10% and non-residential developments to achieve an improvement of 15% in carbon emissions over the Building Regulations baseline through energy efficiency measures alone. This target is included in the GLA Energy Assessment Guidance (April 2020), which expects applicants to increase the reductions from the "be lean" stage.

Any shortfall in on-site carbon savings relative to the 35% target should be made up through offsetting, in agreement with the borough. Arrangements for offsetting are the responsibility of the

Local Planning Authority. GLA Energy Planning Guidance states that Boroughs should use a carbon offset price of £95/tonne or set their own price based on local viability evidence.

GLA Energy Assessment Guidance (June 2022) states that developments should use Part L 2021 of the Building Regulations when calculating emissions and demonstrating compliance with GLA energy planning policies.

Part E of Policy SI 2 details that major developments should calculate and minimise unregulated carbon emissions.

London Plan (2021) Policy SI 3 Energy Infrastructure

Part A of Policy SI 3 states that development plans should:

- 1) identify the need for, and suitable sites for, any necessary energy infrastructure requirements including energy centres, energy storage and upgrades to existing infrastructure*
- 2) identify existing heating and cooling networks, identify proposed locations for future heating and cooling networks and identify opportunities for expanding and inter-connecting existing networks as well as establishing new networks.*

Part D specifies that communal low-temperature heating systems should be used in major development proposals within the Heat Network Priority Areas. It proposes the following heating hierarchy for selection of the heat source of the communal heating system:

- a) connect to local existing or planned heat networks*
- b) use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)*
- c) use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network)*
- d) use ultra-low NOx gas boilers.*

Additionally, where CHP and ultra-low NOx gas boiler communal or district heating systems are included in a design, they should meet the air quality requirements of Policy SI 1 Part B. Developments should be designed to allow for later connection to a planned heat network that is not yet in existence.

London Plan (2021) Policy SI 4 Managing Heat Risk

Part A: *Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure.*

Part B: *Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:*

- 1) reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure*
- 2) minimise internal heat generation through energy efficient design*
- 3) manage the heat within the building through exposed internal thermal mass and high ceilings*
- 4) provide passive ventilation*
- 5) provide mechanical ventilation*
- 6) provide active cooling systems.*

GLA Energy Assessment Guidance (April 2020) provides further guidance regarding the cooling hierarchy in line with Policy SI 4.

Energy Assessment Guidance (June 2022)

An updated guidance document for the production of Energy Assessments was published by GLA in June 2022⁵ to reflect the national policy updates and how these relate to the London Plan. The document includes updates to guidance, including:

- How London Plan policies apply now that Part L 2021 has taken effect;
- How to demonstrate carbon improvements from the 'be lean' stage of the hierarchy; and
- Requirement to report the Energy Use Intensity (EUI) and space heating demand of the development and explains how to report them;

The most significant elements of this update is the confirmation that the GLA expects developments to achieve the overall 35% onsite reduction and the 'be lean' reductions of 10% for residential and 15% for non-residential uses, against the new Part L 2021, which includes more stringent fabric standards, and as such an overall greater savings compared to previous guidance.

Be Seen Energy Monitoring Guidance (September 2021)

The GLA has published 'Be Seen' energy monitoring guidance document⁶ which sets out the requirements of London Plan Policy SI 2, including the expectations on planning applicants throughout the monitoring period. The final version was published for adoption in September 2021.

The Be Seen policy requires energy monitoring information to be reported to the GLA through the 'Be Seen' spreadsheet and webform.

Whole Life-Cycle Carbon Assessments Guidance (March 2022)

The GLA has published a Whole Life-Cycle Carbon Assessments guidance document⁷ which sets out the requirements of London Plan Policy SI 2, including the calculation methodology for whole-life cycle emissions and the information which is required to be submitted by the planning applicant for compliance.

The Whole Life-Cycle Carbon Assessment guidance requires a separate report to be submitted to the GLA which considers both the embodied carbon and operational carbon expected to arise as a result of the Proposed Development.

The London Plan March 2021 Improving Air Quality

The London Plan requires proposals to address air quality risks as per Policy SI 1 Improving air quality. Alternatively, where an air quality assessment has been undertaken, this can be referenced.

Policy SI 1 outlines plans to seek opportunities to deliver improvements to air quality and ensure developments do not reduce air quality benefits that result from the Mayor's or boroughs' activities to improve air quality (Part A).

Part B details that development proposals must be Air Quality Neutral, address air pollution and air quality within the design rather than post-design or with retro-fitted mitigation measures, major developments must be submitted with an Air Quality Assessment, and developments in Air Quality Focus Areas or those intended for use by people vulnerable to air quality should demonstrate that design measured minimise exposure.

Large-scale development proposals should consider how local air quality can be improved across the area as part of an air quality positive approach. Additionally, development proposals must comply with the Non-Road Mobile Machinery Low Emissions Zone and follow best practice guidance on reducing emissions from demolition and construction of buildings.

Where emissions cannot be reduced to the required level through on-site measures, offsite measures to improve local air quality may be acceptable.

⁵ GLA, June 2022; Energy Assessment Guidance. Available at: https://www.london.gov.uk/sites/default/files/gla_energy_assessment_guidance_june_2022_0.pdf

⁶ GLA, September 2021; 'Be Seen' energy monitoring guidance. Available at: ['Be seen' energy monitoring guidance | London City Hall](#)

⁷ GLA, March 2022; Whole Life-Cycle Carbon Assessments. Available at: [Whole Life-Cycle Carbon Assessments guidance | London City Hall](#)

Local policy drivers

London Borough of Haringey (LBH) Strategic Policies

The Haringey Strategic Policies 2013 – 2016 document (March 2013, consolidated with alterations since 2017) policies in terms of energy largely refer to the London Plan.

Policy SP4 Working towards a low carbon Haringey requires that all new residential developments should be zero carbon from 2016 onwards and all non-residential developments should be zero carbon from 2019. It also states:

The Council will promote low- and zero-carbon energy generation through the following measures:

- 5. Requiring all developments to assess, identify and implement, where viable, site-wide and area-wide decentralised energy facilities including the potential to link into a wider network;*
- 6. Establishing local networks of decentralised heat and energy facilities by requiring developers to prioritise connection to existing or planned networks where feasible;*
- 7. Working with neighbouring boroughs and other partners to explore ways of implementing sub-regional decentralised energy networks including the potential in the Upper Lee Valley Opportunity Area; and*
- 8. All new developments are required, where viable, to achieve a reduction in predicted carbon dioxide emissions of 20% from on site renewable energy regeneration, which can include connections to local sources of decentralised renewable energy.*

LBH Development Management DPD

The Development Management DPD (adopted July 2017) policy DM22 covers decentralised energy. It confirms that *subject to other policy requirements, proposals that contribute to the provision and use of Decentralised Energy network infrastructure will be supported*. In addition, the policy states that:

- D. All development proposals should prioritise connection to existing or planned future DE networks.*
- E. All major development located within 500 metres of an existing DE Network, and minor new-build development located within 25 metres, will be expected to secure connection to that network subject to demonstration of technical feasibility and financial viability.*
- F. All major development located within 500 metres of a planned future DE Network, which is considered by the Council likely to be operational within 3 years of a grant of planning permission, will be expected to secure connection to that network subject to demonstration of technical feasibility and financial viability.*

In addition, policy DM21 outlines that new developments are expected to take measures to reduce carbon emissions and overheating in line with the energy and overheating hierarchies. It also confirms that where emissions targets cannot be fully met on site, offset payments may be considered.

Highgate School SPD

The Highgate School Supplementary Planning Document (March 2021) was developed “to help give more certainty to the local community about future development in the School’s estate”.

Paragraph 4.27 acknowledges that the mechanical and electrical systems of the school are in need of modernisation to make them more sustainable and energy efficient. It states that “*Whilst it would be desirable to establish a school-wide decentralised heat and energy facility, including the potential link into a wider network should one come forward, the fragmented nature of the School’s estate makes this unviable. The Council will assess the approach to energy and carbon conservation against policy on a site-by-site basis in the detailed planning application stage looking to make each building as energy efficient as possible.*”

Paragraph 5.26 confirms that the Council will support development which reduces energy demand and carbon emissions.

