BURO HAPPOLD

Haringey Civic Centre

Thermal Comfort Report

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P01	Issued for information – Planning	KB	08/03/2023	IS
P02	Updated detailing the cooling Hierarchy	KB	02/09/2023	DRK

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Glossary

Term	Definition
BCO	British Council for Offices
BREEAM	Building Research Establishment Environmental Assessment Method
CIBSE	Chartered Institute for Building Services Engineers
DSY	Design Summer Year – a weather file representing a warm summer published by CIBSE that is used for assessing overheating risk in buildings
GLA	Greater London Authority
LED	Light Emitting Diode
LETI	London Energy Transformation Initiative
MEP	Mechanical, Electrical & Plumbing
PMV	Predicted Mean Vote
PPD	Percentage of Persons Dissatisfied
RIBA	Royal Institute of British Architects
TRY	Test Reference Year – a weather file representing an average year published by CIBSE that is used for assessing the response of a building to typical weather conditions
WWR	Window Wall Ratio

1 Executive Summary

The purpose of this document is to assess thermal comfort for the Haringey Civic Centre and Annexe building based on the RIBA Stage 3+ design, in accordance with BREEAM credits Hea04 -Thermal modelling, and Hea04 - Design for Future Thermal Comfort. This document also demonstrates how the building design incorporates the GLA London Plan Cooling Hierarchy.

The following design features have been incorporated following the GLA Cooling Hierarchy. Further detail can be found in section 4.

Table 1—1 Application of the GLA Cooling Hierarchy

London Plan: Policy 5.9–Cooling hierarchy	Haringey Civic Centre Strategies
1. Reduce the amount of heat entering a building in summer through passives measures including balconies, louvres, internal or external blinds, shutters, trees, and vegetation.	• Reduce the window to wall ratio WWR to below 40% as recommended by LETI guidance. • External shading elements have been included into the design of the façade. This includes vertical fins and overhangs around the glazing in the development. This contributes to the reduction of solar heat gains during the summer.
2. Minimise internal heat generation through energy efficient design.	• Using LED lighting and minimise the impact using daylighting and occupancy sensors. • Separation of areas to use different small power allowance for office using (BCO) guidance.
3. Manage the heat within the building through exposed internal thermal mass and high ceilings.	• The New Annexe building utilises exposed ceilings which absorb internal heat gains during the day and released at night in conjunction with either secure opening windows or mechanical ventilation.
4. Passive ventilation using openable windows, shallow floorplates, dual aspect units designing in the 'stack effect'.	• There are openable windows in both the Civic Centre and New Annexe extension. This provides the opportunity to utilise a mixed mode ventilation strategy.
5. Mechanical ventilation can be used to make use of 'free cooling' where the outside temperature is below that in the building during summer months	• Highly efficient mechanical ventilation with heat recovery is proposed for fresh air supply when required that can provide free cooling when external temperatures are below the cooling room setpoint.
6. Active cooling systems	• All previous measures contribute to reduce the peak cooling demand and decrease the size of fan coil units for thermal comfort as well as using efficient heat pumps.

The proposed building cooling demand in accordance with the building regulations part L indicates a 30% % reduction in cooling demand compared to the Civic Centre and New Annexe baselines.

Table 1—2 Cooling demand

	Area weighted cooling demand (MJ/m^2)	Total cooling demand (MJ/year)
Civic Centre Actual	93.8	305,807
Civic Centre Notional	134.9	439,662
New Annexe Actual	82.1	296,669
New Annexe Notional	123.7	446,846
Site-Wide Actual	87.7	602,476
Site-Wide Notional	129	886,508

The thermal comfort model showed that comfort was maintained in all occupied spaces with the proposed comfort cooling system operational with the current and future CIBSE TM49 weather files applied. The detailed results for each space can be found in Appendix A.

2 Introduction

The purpose of this document is to assess thermal comfort for the Haringey Civic Centre and Annexe extension based on the RIBA Stage 3+ design. The report demonstrate compliance with the GLA London Plan Cooling Hierarchy. It also highlights the awarded credits on Health and Wellbeing (Hea 04) credit under BREEAM New Construction 2018 for non-domestic buildings scheme. The study has also been conducted in accordance with BREEAM credit Hea04 - Design for future thermal comfort.

2.1 BREEAM Hea04 - Thermal Modelling Credit Criteria

The BREEAM credit criteria for Hea04 - Thermal Modelling are set out below:

One credit – Thermal modelling

1. Thermal modelling has been carried out using software in accordance with CIBSE AM11 Building Energy and Environmental Modelling.
2. The software used to carry out the simulation at the detailed design stage provides full dynamic thermal analysis. For smaller and more basic building designs with less complex heating or cooling systems, an alternative less complex means of analysis may be appropriate (such methodologies must still be in accordance with CIBSE AM11).
3. The modelling demonstrates that:
    a. For air conditioned buildings, summer and winter operative temperature ranges in occupied spaces are in accordance with the criteria set out in CIBSE Guide A Environmental design, Table 1.5; or other appropriate industry standard (where this sets a higher or more appropriate requirement/level for the building type),
    b. For naturally ventilated/free running buildings:
        i. Winter operative temperature ranges in occupied spaces are in accordance with the criteria set out in CIBSE Guide A Environmental design, Table 1.5; or other appropriate industry standard (where this sets a higher or more appropriate requirement/level for the building type),
        ii. The building is designed to limit the risk of overheating, in accordance with the adaptive comfort methodology outlined in CIBSE TM52: The limits of thermal comfort: avoiding overheating in European buildings.
4. For air-conditioned buildings, the PMV (predicted mean vote) and PPD (predicted percentage of dissatisfied) indices based on the above modelling are reported via the BREEAM assessment scoring and reporting tool.

BREEAM Hea04 – Design for Future Thermal Comfort

The BREEAM credit criteria for Hea04 - Design for Future Thermal Comfort are set out below:

One credit – Design for future thermal comfort

5. Criteria 1 to 4 are achieved.
6. The thermal modelling demonstrates that the relevant requirements set out in criterion 3 are achieved for a projected climate change environment (see Hea 04 Thermal comfort).
7. Where thermal comfort criteria are not met for the projected climate change environment, the project team demonstrates how the building has been adapted or designed to be easily adapted in future using passive design solutions in order to subsequently meet the requirements under criterion 6.
8. For air-conditioned buildings, the PMV and PPD indices based on the above modelling are reported via the BREEAM assessment scoring and reporting tool.

2.2 GLA London Plan Cooling Hierarchy

The Greater London authority GLA Guidance on Preparing Energy Assessments (June 2022) requires that major development proposals should reduce potential overheating and reliance on air-conditioning systems and demonstrate this in accordance with the cooling hierarchy outlined as follows:

Figure 2-1 GLA Cooling Hierarchy

Table 2—1 Cooling hierarchy, mitigation measures based on GLA guidance

London Plan: Policy 5.9–Cooling hierarchy
1. Reduce the amount of heat entering a building in summer through passives measures including balconies, louvres, internal or external blinds, shutters, trees, and vegetation.
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. Passive ventilation using openable windows, shallow floorplates, dual aspect units designing in the ‘stack effect’.
5. Mechanical ventilation can be used to make use of ‘free cooling’ where the outside temperature is below that in the building during summer months
6. Active cooling systems

3 Methodology & Assumptions

3.1 Methodology

A dynamic thermal model of the buildings has been generated in IES Virtual Environment 2022 in accordance with CIBSE AM11. The model has been developed based on the Stage 3 architectural and engineering design proposals.

The model has been attributed with the proposed building envelope performance and the internal environmental design criteria. Ventilation flowrates have been aligned with the design proposals, and the capacity of heating and cooling emitters in each space have been capped at their design outputs in the thermal model. The building was then simulated against current and future weather sets, and the predicted internal operative temperatures in each room were checked for compliance with the criteria set out in CIBSE Guide A Environmental design, Table 1.5.

3.2 Key assumptions

Key assumptions used in the model were as follows:

3.2.1 Architectural Model

The thermal model was developed based on the Stage 3+ drawings, reports, and specifications provided by the project architect Hawkins Brown.

3.2.2 Building Envelope Performance

Refer to the energy statement for building envelope specifications.

Infiltration for the building overall has been set at the design value of 0.25ACH for both the existing Civic Centre and the Annexe extension.

3.2.3 MEP Systems

The principal MEP systems in the building that serve occupied spaces are fan coil units, perimeter trench heaters, and radiators. All occupied spaces in the development are mechanically ventilated. For the purposes of attributing the thermal model, radiant fractions for these principal systems were estimated as follows:

Table 3—1 Heating and cooling system radiant fractions

	Heating Radiant Fraction	Cooling Radiant Fraction
Trench Heater	0	0
Fan Coil Unit System	0	0
Radiators	0.2	0

3.2.4 External Environmental Design Criteria

The MEP systems were sized based on the external design criteria defined in the MEP & Building Physics Report HCC-BHE-XX-XX-RP-M-000002.

3.2.5 Internal Environmental Design Criteria

The MEP systems were sized based on the internal design criteria defined in the MEP & Building Physics Report HCC-BHE-XX-XX-RP-M-000002. Space air temperature set points and internal heat gains were applied in line with this document.

Different profiles have been applied to the internal heat gains of the building. The regular hours of operation are 08:00 to 18:00 during the week with reduced occupancy during the weekend. As such internal heat gains such as lighting in open plan office spaces are maintained throughout the building's hours of operation. Internal heats in rooms with variable usage have been adjusted accordingly. This includes internal heat gains such as lighting in the Civic Chamber and occupancy in meeting rooms.

3.2.6 Plant Scheduling & Building Setback

For modelling purposes, the heating and cooling plant is scheduled to enable at 06:30 to bring the spaces to their target setpoints ahead of the occupied period at 08:00 (noting that in the real-world situation the BMS will optimise start up). The plant switches to setback mode at 18:30. Setback temperatures of 16°C and 28°C have been defined in the model for heating and cooling respectively.

3.2.7 Simulation Weather Data

The thermal model was simulated using the following weather files:

3.2.7.1 BREEAM Hea04 - Thermal Modelling

Summertime comfort was assessed using the CIBSE TM49 weather files for London. They are as follows:

- CIBSE London Weather Station DSY1, 2020, high emissions scenario, 50th percentile
- CIBSE London Weather Station DSY2, 2020, high emissions scenario, 50th percentile
- CIBSE London Weather Station DSY3, 2020, high emissions scenario, 50th percentile

Winter comfort was assessed against the winter external design condition as defined in the MEP & Building Physics Report HCC-BHE-XX-XX-RP-M-000002 (which is -3°C dry bulb). For this a simulation weather file with a flat external -3°C dry bulb and zero solar radiation was generated, replicating the steady state external design condition. This allowed thermal comfort to be assessed at the project external design condition using the dynamic thermal model.

3.2.7.2 BREEAM Hea04 – Design for future thermal comfort

The building has also been assessed for thermal comfort in a future climate scenario, focussing specifically on summertime comfort in extreme hot weather conditions. In line with the requirements of BREEAM Hea04, the following future weather files have been used in the modelling:

- CIBSE London Weather Station DSY1, 2050, high emissions scenario, 50th percentile
- CIBSE London Weather Station DSY1, 2080, high emissions scenario, 50th percentile

3.2.9 Internal gains

Thermal templates have been set up for the following space types and applied to all occupied rooms within the building:

- Office space
- Meeting rooms

Internal heat gains have been modelled to follow the RFI schedules of occupancy and equipment present in each space.

Table 3—2 Modelled Internal loads

	Lighting Power Density (W/m^2)		Equipment Power Density (W/m^2)		Occupancy Density (m^2/person)	
	Cooling/vent Sizing	Operation at 100% on profile*	Cooling/vent Sizing	Operation at 100% on profile**	Cooling/vent Sizing	Operation at 100% on profile
Office	10	4.50	25	12.50	8	10
Meeting Rooms	10	4.50	25	12.50	8	10
Reception	10	4.50	5	5	10	10
WCs	-	4.50	-	5	-	-
Corridors	-	4.50	-	5	-	-
Stairs	-	4.50	-	5	-	-
Plant rooms	-	4.50	-	5	-	-

3.2.9.1 Occupancy gains

For plant-sizing an occupancy density of 1 person per $8m^2$ has been used for the offices and meeting spaces. Heat gains from occupants has assumed to have a sensible heat gain of 75W/person and latent heat gain of 55W/person.

3.2.9.2 Lighting

Average lighting power density for each space type was calculated from the RIBA Stage 3+ lighting calculations and applied to the relevant templates as it will have impact of the cooling and heating demand.

The energy used by tenant office lighting has not been included in this estimate as it focuses only on base build energy.

3.2.9.3 Equipment

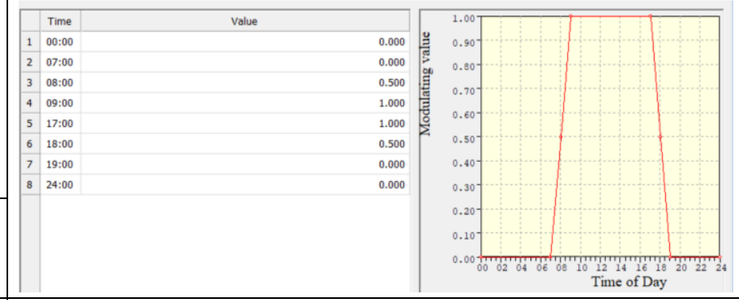
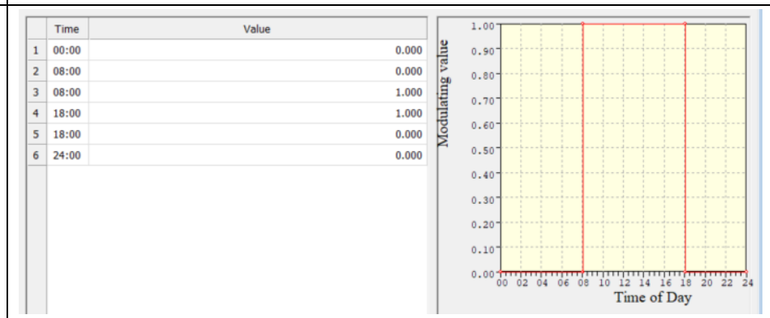
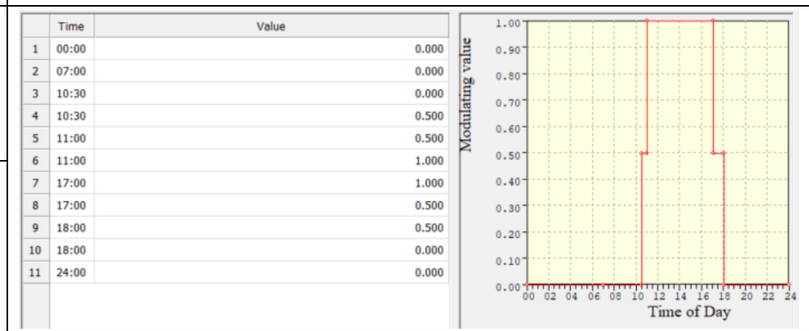
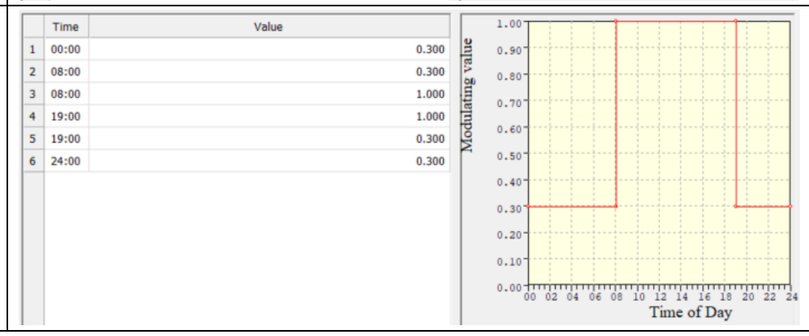
The MEP design uses $25W/m^2$ for sizing of office cooling and electrical services. Office equipment was set at $25W/m^2$ for 100% on the profile in the operational energy model with a 50% diversification factor.

A blanket equipment power density of $5W/m^2$ has been applied to all WCs, circulation and stairs operating on the same profile as the office space. The energy use for this equipment has been included in the energy rating calculation to cover various pieces of electrical equipment throughout the building.

3.2.9.4 Schedules

The following presents the occupancy, lighting, equipment operation for the primary occupied spaces studied for this thermal comfort assessment. This is primarily the office and meeting room spaces.

Table 3—3 Internal gains profiles

Space Type	Profile Category	Profile
Office	Occupancy	
	Equipment	
	Lighting	
Meeting Rooms	Occupancy	
	Equipment	
	Lighting	

4 GLA London Plan Cooling Hierarchy Approach

4.1 Reduce the amount of heat entering a building

Glazing strategy in the development has the primary goals of both limiting excessive solar heat gains in the summer while maintaining adequate levels of daylighting. As such, significant efforts were made in the façade design toward achieving these targets. This led to both the informed developed of adequate window to wall glazing ratios as well as improved glazing construction properties. Following LETI recommendations, the window to wall ratio is targeted to be below 40%.

The use of external shading is one of the primary strategies for solar control in the development. This is especially the case in the New Annexe building with the inclusion of vertical fins and horizontal stringers. Although the existing Civic Centre keeps its current overall glazing design, improvements to the quality of glazing as well the inclusion of certain external shading elements helps to improve its summer performance.

Table 4—1 Glazing thermal performance properties

Element	Civic Centre	New Annexe
Windows (U-Value)	1.30 W/m²K	1.80 W/m²K
Windows and rooflights (G-Value)	0.29	0.40

The projecting elements utilised in the New Annexe building respond to each façade's solar orientation. Furthermore the window sill is aligned with desk height. This significantly reduces the amount of solar heat gain that can enter the building. Modelling for the building reflects this shading strategy. Internal blinds were not utilised. The following shows details of the external shading design.

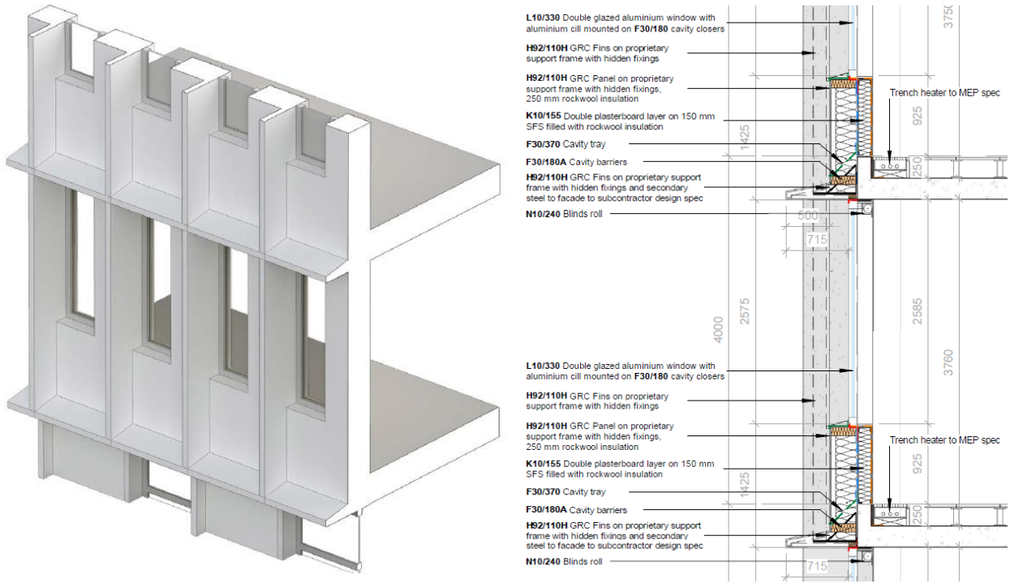


Figure 4-1 Detail of external shading strategy for New Annexe extension

4.2 Minimise internal heat generation through energy efficient design

The energy efficient design of the office minimises the internal heat generation within the building. This is achieved through the implementation of highly efficient LED lighting throughout both buildings. The use of this lighting reduces lighting heat gains when compared to the New Annexe notional building as well as Civic Centre baseline building. This also has the added effect of reducing energy consumption. Furthermore, all pipework is specified as insulated and limit internal heat gains in the building. Small power allowance has been informed with BCO guidance to limit internal equipment gains and energy consumption.

4.3 Manage the heat within the building through exposed internal thermal mass and high ceilings

The new Annexe building design incorporates the use of exposed concrete ceilings. When in operation, this higher internal thermal mass will help mitigate some of the internal heat gains in the summer. The exposed ceilings are particularly in use in the primary open office spaces when secure windows are open allowing cross ventilation or the mechanical ventilation system is operational at night as detailed in sections 4.4 and 4.5.

Due to heritage and design constraints, the Civic Centre does not utilise exposed ceilings.

Figure 4-2 Ceiling layout for ground floor of project

4.4 Provide passive ventilation

The project incorporates the use of passive ventilation in both the Civic Centre and the New Annexe the buildings. This comes in the form of operable windows in all façade orientations. The inclusion of operable windows creates the opportunity for mixed mode ventilation during the summer which would potentially reduce the demand on the active cooling system. The narrower open office layouts of the Civic Centre also create opportunities of cross ventilation during the right conditions if window on opposing facades are opened at the same time. This might lead to instances during the year where active cooling is not required. Through this, operable windows improve the internal thermal comfort and help to reduce energy consumption.

It should be noted that traffic noise may limit the potential use of opening windows adjacent to the road.

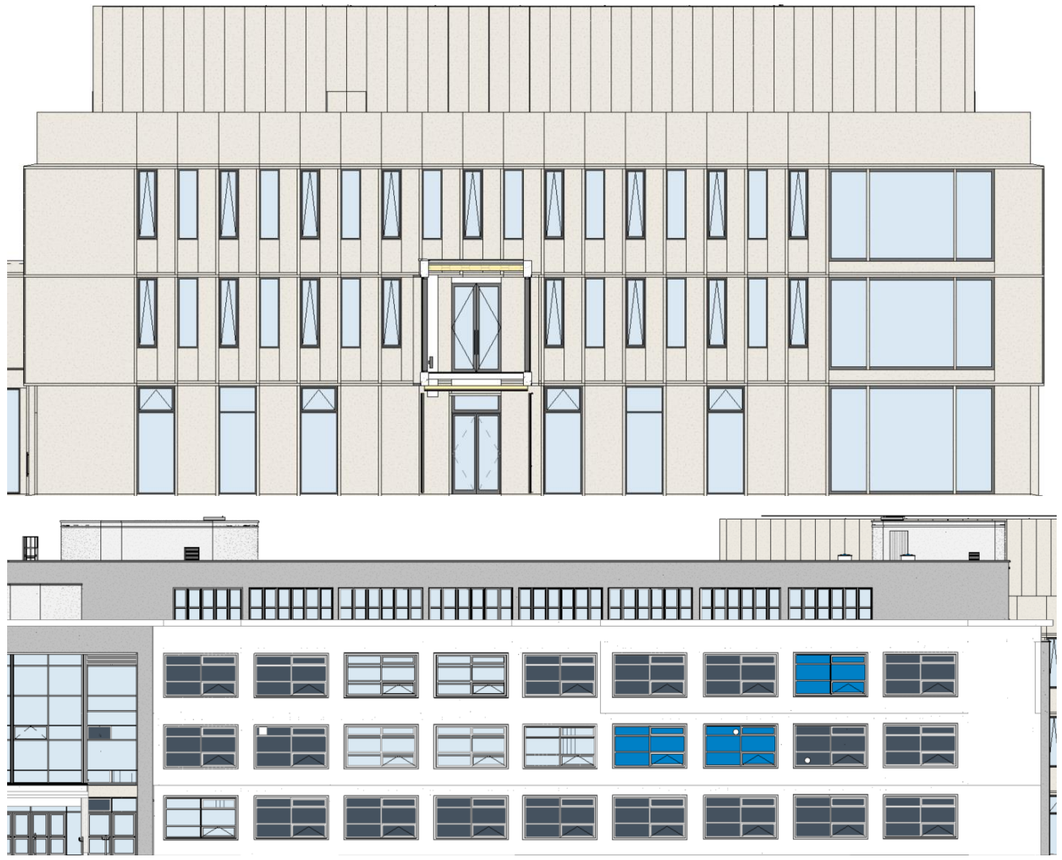


Figure 4-3 Operable windows on the east facing facades of the Civic Centre and New Annexe

4.5 Provide mechanical ventilation

The development includes a mechanical ventilation system with efficient heat recovery. In both the Civic Centre and New Annexe, the efficiency of the heat recovery system is 80%. Through supplying fresh air all year round, there is the potential of providing free cooling when air temperatures are below the summer setpoint with the use of thermal by-pass in the summer. All owned spaces in the development have been provided with mechanical ventilation.

4.6 Provide active cooling systems

The application of the GLA cooling hierarchy reduces the risk of overheating in the project. Through a comparison review of the actual and notional cooling demands of both the existing Civic Centre and New Annexe buildings, both buildings performed better than their notional counterpart. This demonstrates that the GLA cooling hierarchy has been appropriately implemented in the design of the development. The extensive use of external shading, lower glazing percentages, energy efficient design, and other measures, significantly improved the performance of both buildings.

The particularly high occupant density of offices in the project when in operation does introduce an additional risk for overheating. The small power equipment in use during the operation of the building, along with expected occupancies will lead to internal heat gains that would be difficult to maintain solely with natural ventilation. Thus, active cooling is necessary to ensure that adequate summer indoor environments are maintained. This is especially pertinent given the increasing severity of summer seasons in England. However, the preceding design targets that have been taken in accordance with the GLA cooling hierarchy minimises the demand for active cooling.

All owned spaces have active cooling provided. The following shows the ventilation and fan coil unit layout of the ground floor.

Figure 4-4 Ventilation and fan coil layout of ground floor

5 Thermal Comfort Criteria

For mechanically cooled buildings, such as the Haringey Civic Centre and Annexe, BREEAM Hea04 requires summer and winter operative temperature ranges in occupied spaces to be in accordance with the criteria set out in CIBSE Guide A Environmental design, Table 1.5. An occupied space is defined by BREEAM as *"a room or space within the assessed building that is likely to be occupied for 30 minutes or more by a building user"*.

The table below shows the occupied space typologies, the assumed project space type mapping to CIBSE Guide A Environmental design Table 1.5, and the associated operative temperature ranges prescribed.

Table 5—1 Operative temperature targets for each project space types

Space Type	CIBSE Guide A 2015, Table 1.5: Building/room type	Project winter operative temperatures (°C)	Project summer operative temperatures (°C)
Civic Chamber	Offices: board room, large conference room	21-23	22-25
Collaboration Spaces	Offices: general, small conference room, executive office	21-23	22-25
Meeting Room	Offices: general, small conference room, executive office	21-23	22-25
Office	Offices: general, small conference room, executive office	21-23	22-25
Open Plan Office	Offices: open plan	21-23	22-25
Entrance Lobby	General building areas: entrance halls/lobbies	19-21	21-25

6 Results

The results of the thermal comfort study for winter and summer based on current and future climate projection are provided in Appendix A. Operative temperatures have been rounded to the nearest degree. All rooms are shown to comply with the targets set out in CIBSE Guide A, Table 1.5 as required under BREEAM Hea04.

A review of the actual and notional buildings demonstrates that the proposed design successfully minimises cooling demand. This confirms that the passive measures implemented in the design have been adequately incorporated to reduce overheating risk and the demand on active cooling. This is in line with the cooling hierarchy of the GLA Energy Assessment Guidance (2022).

Table 6—1 Cooling demand

	Area weighted cooling demand (MJ/m^2)	**Total cooling demand (MJ/year)**
Civic Centre Actual	93.8	305,807
Civic Centre Notional	134.9	439,662
New Annexe Actual	82.1	296,669
New Annexe Notional	123.7	446,846
Site-Wide Actual	87.7	602,476
Site-Wide Notional	129	886,508

7 Conclusions

Thermal comfort for the Haringey Civic Centre and Annexe building has been assessed based on the RIBA Stage 3 design, in accordance with BREEAM credit Hea04 -Thermal modelling and BREEAM credit Hea04 - Design for future thermal comfort.

The results presented here demonstrate that the design is compliant with the BREEAM Hea04 Thermal Modelling and Design for Future Thermal Comfort credit criteria. And the GLA Cooling Hierarchy.

Appendix A Thermal comfort modelling results

Existing Civic Centre											
Mechanically Ventilated Spaces											
Space Name	Space Type	Winter condition			Summer condition						
		CIBSE Guide A, Table 1.5 - Customary winter operative temperatures (°C)	-3°C external dry bulb temperature		CIBSE Guide A, Table 1.5 - Customary summer operative temperatures (°C)	Current - London_DSY1.epw		Future climate projection - London_DSY2_2020High50_.epw		Future climate projection - London_DSY3_2020High50_.epw	
			Modelled winter minimum operative temperature (°C)	Compliant?		Modelled summer maximum operative temperature (°C)	Compliant?	Modelled summer maximum operative temperature (°C)	Compliant?	Modelled summer maximum operative temperature (°C)	Compliant?
00 - Changing Places Space	Entrance Lobby	19-21	21	TRUE	21-25	24	TRUE	24	TRUE	24	TRUE
00 - Civic Bridge Welcome Area/Circulation	Entrance Lobby	19-21	21	TRUE	21-25	24	TRUE	24	TRUE	24	TRUE
00 - Entrance Lobby/Reception 02	Entrance Lobby	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
00 - Entrance Lobby/Reception 03	Entrance Lobby	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
00 - Flexible Meeting/Event Space	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
00 - Meeting Room 01	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
00 - Meeting Room 02	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
00 - Meeting Room 03	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
00 - Meeting Room 04	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
00 - Meeting Room 05	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
00 - Meeting Room 06	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
00 - Meeting Room 07	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
00 - Open Office 01	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
00 - Open Office 02	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
00 - Room	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
00 - Study Room	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
00 - Wellbeing & Reflection	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Civic Chamber 01	Civic Chamber	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Committee 01	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Committee 02	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Committee 03	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Comms Room	Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Mayor Robing	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Mayor's Aid & Wating Area	Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Meeting 01	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Meeting 02	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Meeting 03	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Meeting Room	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Open Office 01	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Open Office 02	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Open Office 03	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Open Office 03	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE

Existing Civic Centre											
Mechanically Ventilated Spaces											
Space Name	Space Type	Winter condition			Summer condition						
		CIBSE Guide A, Table 1.5 - Customary winter operative temperatures (°C)	-3°C external dry bulb temperature		CIBSE Guide A, Table 1.5 - Customary summer operative temperatures (°C)	Current - London_DSY1.epw		Future climate projection - London_DSY2_2020High50_.epw		Future climate projection - London_DSY3_2020High50_.epw	
			Modelled winter minimum operative temperature (°C)	Compliant?		Modelled summer maximum operative temperature (°C)	Compliant?	Modelled summer maximum operative temperature (°C)	Compliant?	Modelled summer maximum operative temperature (°C)	Compliant?
01 - Open Office 04	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Opposition Leader's Office	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Parlour	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Study Room 01	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Study Room 02	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
02 - Civic Auditorium	Civic Chamber	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
02 - Civic Seating	Civic Chamber	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
02 - Meeting Room 01	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
02 - Meeting Room 02	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
02 - Open Office 01	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
02 - Open Office 02	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
02 - Open Office 03	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
02 - Open Office 04	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
02 - Study Room 01	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
02 - Study Room 02	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
02 - Study Room	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
03 - Booth	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
03 - MASH	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
03 - Open Office 01	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
03 - Open Office 02	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
03 - Open Office 03	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE

New Annexe Extension											
Mechanically Ventilated Spaces											
Space Name	Space Type	Winter condition			Summer condition						
		CIBSE Guide A, Table 1.5 - Customary winter operative temperatures (°C)	-3°C external dry bulb temperature		CIBSE Guide A, Table 1.5 - Customary summer operative temperatures (°C)	Current - London_DSY1.epw		Future climate projection - London_DSY2_2020High50_.epw		Future climate projection - London_DSY3_2020High50_.epw	
			Modelled winter minimum operative temperature (°C)	Compliant?		Modelled summer maximum operative temperature (°C)	Compliant?	Modelled summer maximum operative temperature (°C)	Compliant?	Modelled summer maximum operative temperature (°C)	Compliant?
00 - IT/tech store	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
00 - Meeting Room 01	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
00 - Meeting Room 02	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
00 - Meeting Room 03	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
00 - Meeting Room Wing W01	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
00 - Meeting Room Wing 01	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
00 - Office 01	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
00 - Office perimeter E03	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
00 - Office perimeter E01	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
00 - Office perimeter E02	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
00 - Office perimeter N01	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
00 - Office Perimeter S01	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
00 - Office Wing	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
00 - Study Room	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Booth 01	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Booth 02	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Furniture Storage	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Meeting Room 01	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Meeting Room 02	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Meeting Room 03	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Meeting Room 04	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Meeting Room Wing 01	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Meeting Room Wing 02	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Meeting Room Wing 03	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Meeting Room Wing 04	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Meeting Room Wing 05	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Meeting Room Wing 06	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Meeting Room Wing 07	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Meeting Room Wing 08	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Office Central 01	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Office Central 02	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Office perimeter E01	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Office perimeter N01	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Office perimeter S01	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Office perimeter S02	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Office perimeter W01	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
01 - Study Room 01	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE

New Annexe Extension											
Mechanically Ventilated Spaces											
Space Name	Space Type	Winter condition			Summer condition						
		CIBSE Guide A, Table 1.5 - Customary winter operative temperatures (°C)	-3°C external dry bulb temperature		CIBSE Guide A, Table 1.5 - Customary summer operative temperatures (°C)	Current - London_DSY1.epw		Future climate projection - London_DSY2_2020High50_.epw		Future climate projection - London_DSY3_2020High50_.epw	
			Modelled winter minimum operative temperature (°C)	Compliant?		Modelled summer maximum operative temperature (°C)	Compliant?	Modelled summer maximum operative temperature (°C)	Compliant?	Modelled summer maximum operative temperature (°C)	Compliant?
01 - Study Room 02	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
02 - Booth 01	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
02 - Booth 02	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
02 - Meeting Room 01	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
02 - Meeting Room 02	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
02 - Meeting Room 04	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
02 - Meeting Room 05	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
02 - Office central 01	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
02 - Office central 02	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
02 - Office perimeter E01	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
02 - Office perimeter N01	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
02 - Office perimeter S01	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
02 - Office perimeter W01	Open Plan Office	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
02 - Study Room 01	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE
02 - Study Room 02	Meeting Room	21-23	21	TRUE	22-25	24	TRUE	24	TRUE	24	TRUE

Future Summer Climate Projection:

Existing Civic Centre						
Mechanically Ventilated Spaces						
Space Name	Space Type	Summer condition				
		CIBSE Guide A, Table 1.5 - Customary summer operative temperatures (°C)	Future climate projection - London_DSY1_2050High50_.epw		Future climate projection - London_DSY1_2080High50_.epw	
			Modelled summer maximum operative temperature (°C)	Compliant?	Modelled summer maximum operative temperature (°C)	Compliant?
00 - Changing Places Space	Entrance Lobby	21-25	24	TRUE	24	TRUE
00 - Civic Bridge Welcome Area/Circulation	Entrance Lobby	21-25	24	TRUE	24	TRUE
00 - Entrance Lobby/Reception 02	Entrance Lobby	22-25	24	TRUE	24	TRUE
00 - Entrance Lobby/Reception 03	Entrance Lobby	22-25	24	TRUE	24	TRUE
00 - Flexible Meeting/Event Space	Meeting Room	22-25	24	TRUE	24	TRUE
00 - Meeting Room 01	Meeting Room	22-25	24	TRUE	24	TRUE
00 - Meeting Room 02	Meeting Room	22-25	24	TRUE	24	TRUE
00 - Meeting Room 03	Meeting Room	22-25	24	TRUE	24	TRUE
00 - Meeting Room 04	Meeting Room	22-25	24	TRUE	24	TRUE
00 - Meeting Room 05	Meeting Room	22-25	24	TRUE	24	TRUE
00 - Meeting Room 06	Meeting Room	22-25	24	TRUE	24	TRUE
00 - Meeting Room 07	Meeting Room	22-25	24	TRUE	24	TRUE
00 - Open Office 01	Open Plan Office	22-25	24	TRUE	24	TRUE
00 - Open Office 02	Open Plan Office	22-25	24	TRUE	24	TRUE
00 - Room	Meeting Room	22-25	24	TRUE	24	TRUE
00 - Study Room	Meeting Room	22-25	24	TRUE	24	TRUE
00 - Wellbeing & Reflection	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Civic Chamber 01	Civic Chamber	22-25	24	TRUE	24	TRUE
01 - Committee 01	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Committee 02	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Committee 03	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Comms Room	Office	22-25	24	TRUE	24	TRUE
01 - Mayor Robing	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Mayor's Aid & Wating Area	Office	22-25	24	TRUE	24	TRUE
01 - Meeting 01	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Meeting 02	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Meeting 03	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Meeting Room	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Open Office 01	Open Plan Office	22-25	24	TRUE	24	TRUE
01 - Open Office 02	Open Plan Office	22-25	24	TRUE	24	TRUE
01 - Open Office 03	Open Plan Office	22-25	24	TRUE	24	TRUE
01 - Open Office 03	Open Plan Office	22-25	24	TRUE	24	TRUE
01 - Open Office 04	Open Plan Office	22-25	24	TRUE	24	TRUE
01 - Opposition Leader's Office	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Parlour	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Study Room 01	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Study Room 02	Meeting Room	22-25	24	TRUE	24	TRUE

Existing Civic Centre						
Mechanically Ventilated Spaces						
Space Name	Space Type	Summer condition				
		CIBSE Guide A, Table 1.5 - Customary summer operative temperatures (°C)	Future climate projection - London_DSY1_2050High50_.epw		Future climate projection - London_DSY1_2080High50_.epw	
			Modelled summer maximum operative temperature (°C)	Compliant?	Modelled summer maximum operative temperature (°C)	Compliant?
02 - Civic Auditorium	Civic Chamber	22-25	24	TRUE	24	TRUE
02 - Civic Seating	Civic Chamber	22-25	24	TRUE	24	TRUE
02 - Meeting Room 01	Meeting Room	22-25	24	TRUE	24	TRUE
02 - Meeting Room 02	Meeting Room	22-25	24	TRUE	24	TRUE
02 - Open Office 01	Open Plan Office	22-25	24	TRUE	24	TRUE
02 - Open Office 02	Open Plan Office	22-25	24	TRUE	24	TRUE
02 - Open Office 03	Open Plan Office	22-25	24	TRUE	24	TRUE
02 - Open Office 04	Open Plan Office	22-25	24	TRUE	24	TRUE
02 - Study Room 01	Open Plan Office	22-25	24	TRUE	24	TRUE
02 - Study Room 02	Meeting Room	22-25	24	TRUE	24	TRUE
02 - Study Room	Meeting Room	22-25	24	TRUE	24	TRUE
03 - Booth	Meeting Room	22-25	24	TRUE	24	TRUE
03 - MASH	Meeting Room	22-25	24	TRUE	24	TRUE
03 - Open Office 01	Open Plan Office	22-25	24	TRUE	24	TRUE
03 - Open Office 02	Open Plan Office	22-25	24	TRUE	24	TRUE
03 - Open Office 03	Open Plan Office	22-25	24	TRUE	24	TRUE

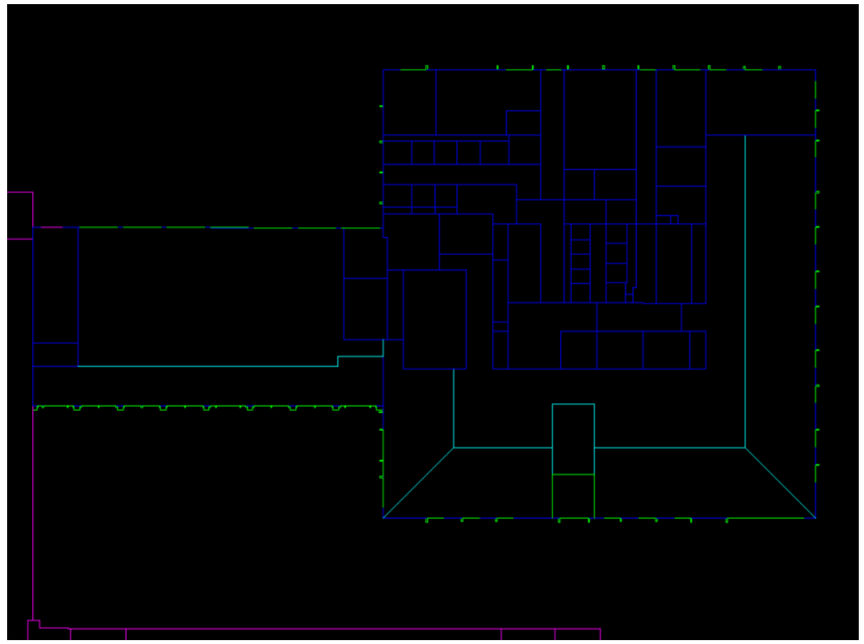
New Annexe Extension						
Mechanically Ventilated Spaces						
Space Name	Space Type	Summer condition				
		CIBSE Guide A, Table 1.5 - Customary summer operative temperatures (°C)	Future climate projection - London_DSY1_2050High50_.epw		Future climate projection - London_DSY1_2080High50_.epw	
			Modelled summer maximum operative temperature (°C)	Compliant?	Modelled summer maximum operative temperature (°C)	Compliant?
00 - IT/tech store	Meeting Room	21-25	24	TRUE	24	TRUE
00 - Meeting Room 01	Meeting Room	21-25	24	TRUE	24	TRUE
00 - Meeting Room 02	Meeting Room	22-25	24	TRUE	24	TRUE
00 - Meeting Room 03	Meeting Room	22-25	24	TRUE	24	TRUE
00 - Meeting Room Wing W01	Meeting Room	22-25	24	TRUE	24	TRUE
00 - Meeting Room Wing 01	Meeting Room	22-25	24	TRUE	24	TRUE
00 - Office 01	Open Plan Office	22-25	24	TRUE	24	TRUE
00 - Office perimeter E03	Open Plan Office	22-25	24	TRUE	24	TRUE
00 - Office perimeter E01	Open Plan Office	22-25	24	TRUE	24	TRUE
00 - Office perimeter E02	Open Plan Office	22-25	24	TRUE	24	TRUE
00 - Office perimeter N01	Open Plan Office	22-25	24	TRUE	24	TRUE
00 - Office Perimeter S01	Open Plan Office	22-25	24	TRUE	24	TRUE
00 - Office Wing	Open Plan Office	22-25	24	TRUE	24	TRUE
00 - Study Room	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Booth 01	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Booth 02	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Furniture Storage	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Meeting Room 01	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Meeting Room 02	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Meeting Room 03	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Meeting Room 04	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Meeting Room Wing 01	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Meeting Room Wing 02	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Meeting Room Wing 03	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Meeting Room Wing 04	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Meeting Room Wing 05	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Meeting Room Wing 06	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Meeting Room Wing 07	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Meeting Room Wing 08	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Office Central 01	Open Plan Office	22-25	24	TRUE	24	TRUE
01 - Office Central 02	Open Plan Office	22-25	24	TRUE	24	TRUE
01 - Office perimeter E01	Open Plan Office	22-25	24	TRUE	24	TRUE
01 - Office perimeter N01	Open Plan Office	22-25	24	TRUE	24	TRUE
01 - Office perimeter S01	Open Plan Office	22-25	24	TRUE	24	TRUE
01 - Office perimeter S02	Open Plan Office	22-25	24	TRUE	24	TRUE
01 - Office perimeter W01	Open Plan Office	22-25	24	TRUE	24	TRUE
01 - Study Room 01	Meeting Room	22-25	24	TRUE	24	TRUE
01 - Study Room 02	Meeting Room	22-25	24	TRUE	24	TRUE
02 - Booth 01	Meeting Room	22-25	24	TRUE	24	TRUE

New Annexe Extension						
Mechanically Ventilated Spaces						
Space Name	Space Type	Summer condition				
		CIBSE Guide A, Table 1.5 - Customary summer operative temperatures (°C)	Future climate projection - London_DSY1_2050High50_.epw		Future climate projection - London_DSY1_2080High50_.epw	
			Modelled summer maximum operative temperature (°C)	Compliant?	Modelled summer maximum operative temperature (°C)	Compliant?
02 - Booth 02	Meeting Room	22-25	24	TRUE	24	TRUE
02 - Meeting Room 01	Meeting Room	22-25	24	TRUE	24	TRUE
02 - Meeting Room 02	Meeting Room	22-25	24	TRUE	24	TRUE
02 - Meeting Room 04	Meeting Room	22-25	24	TRUE	24	TRUE
02 - Meeting Room 05	Meeting Room	22-25	24	TRUE	24	TRUE
02 - Office central 01	Open Plan Office	22-25	24	TRUE	24	TRUE
02 - Office central 02	Open Plan Office	22-25	24	TRUE	24	TRUE
02 - Office perimeter E01	Open Plan Office	22-25	24	TRUE	24	TRUE
02 - Office perimeter N01	Open Plan Office	22-25	24	TRUE	24	TRUE
02 - Office perimeter S01	Open Plan Office	22-25	24	TRUE	24	TRUE
02 - Office perimeter W01	Open Plan Office	22-25	24	TRUE	24	TRUE
02 - Study Room 01	Meeting Room	22-25	24	TRUE	24	TRUE
02 - Study Room 02	Meeting Room	22-25	24	TRUE	24	TRUE

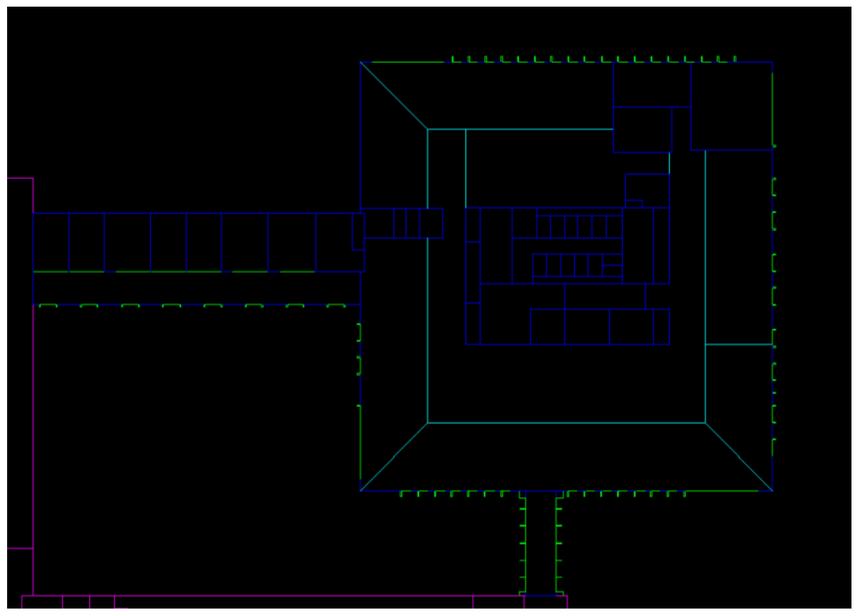
Appendix B Model zoning

B.1 New Annexe

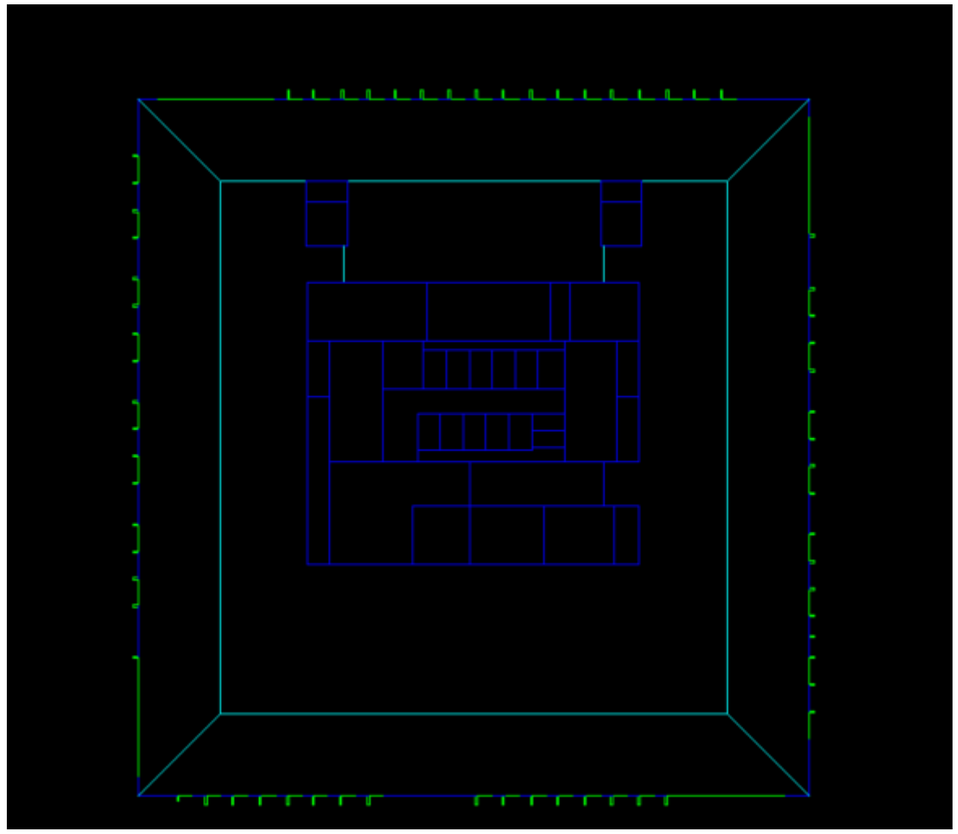
B.1.1 Ground Floor



B.1.2 First Floor

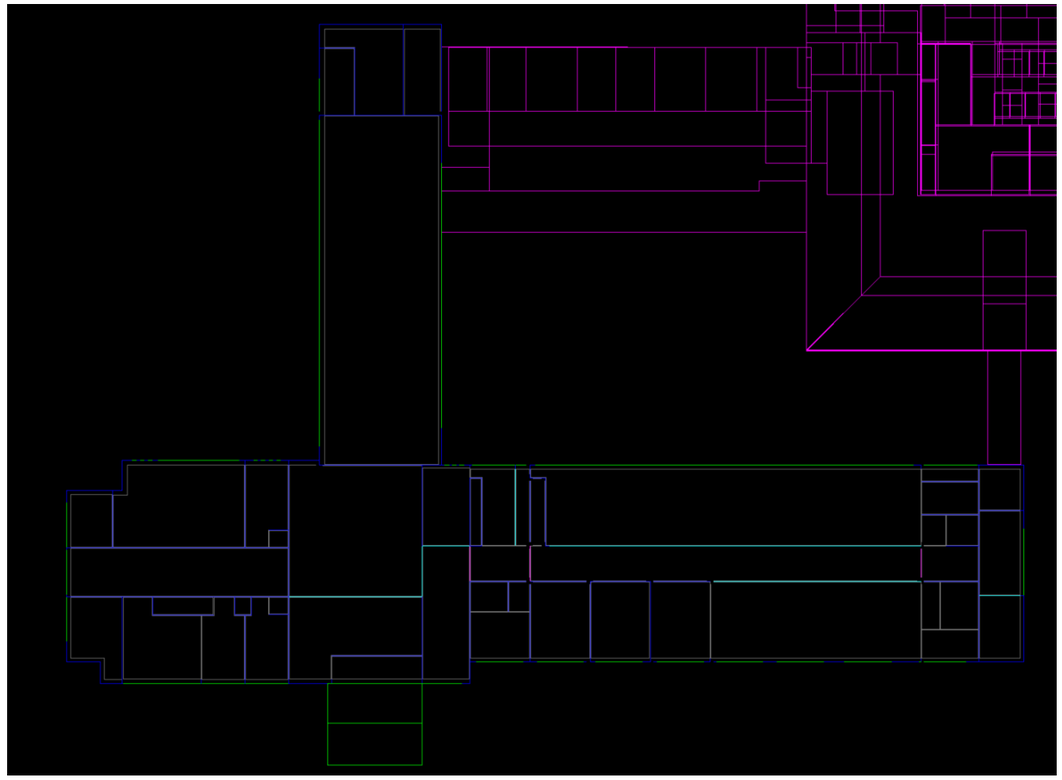


B.1.3 Second Floor

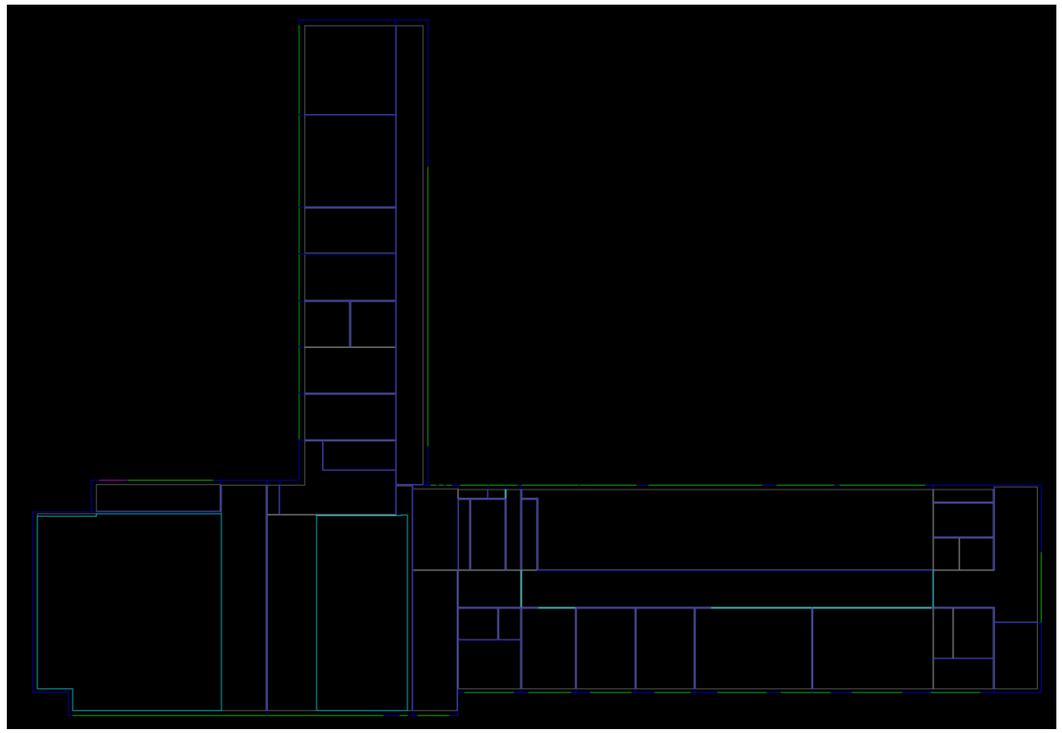


B.2 Civic Centre

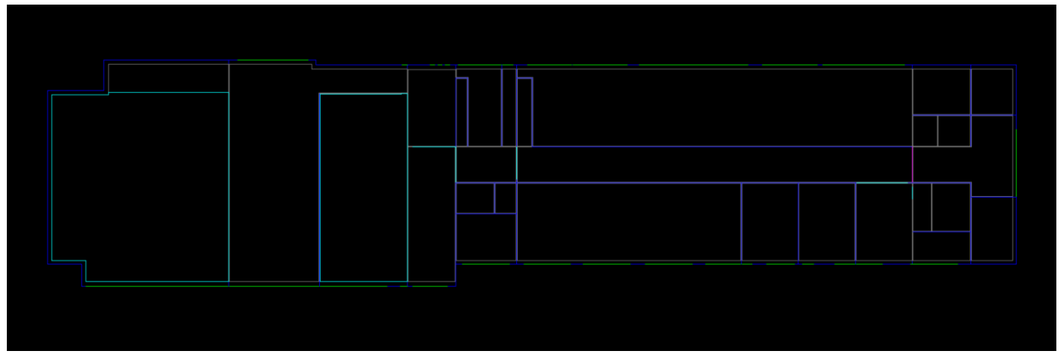
B.2.1 Ground Floor



B.2.2 First Floor



B.2.3 Second floor



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