TPS.
TAYLOR PROJECT SERVICES LLP
BUILDING SERVICES CONSULTANTS

THE BEDFORD ESTATES

Camden

29A Montague Street, London WC1B 5BL

Energy & Sustainability Statement

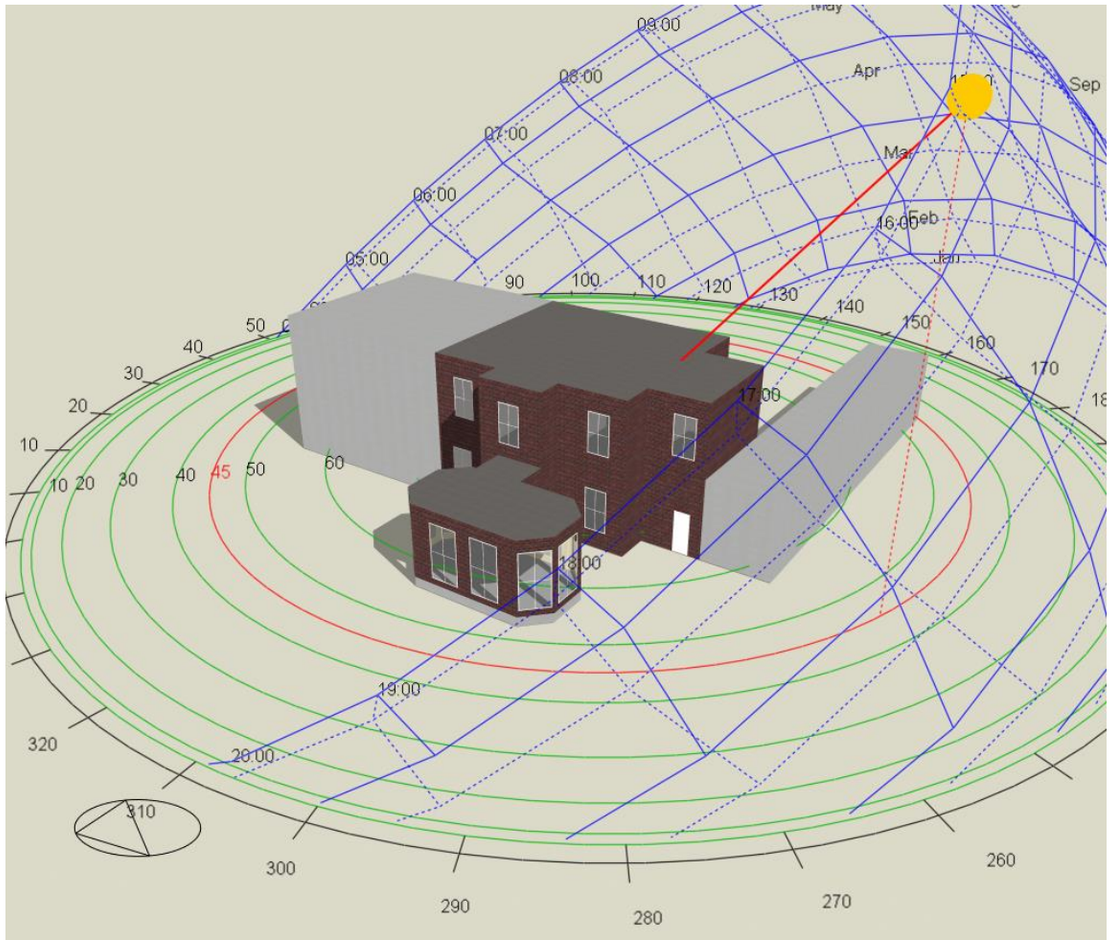
Rev O– July 2024

Executive Summary

The following energy brief is for the proposed upgrade works at 29a Montague Street, Camden, London. The upgrade works see the decommissioning of the existing gas boiler which provides heating to the office spaces and the installation of a new high-efficiency air source heat pump providing heating and cooling.

The proposed energy-efficient system resulted in the whole building achieving a 63.1% improvement in carbon saving against the existing building. This will ensure the building has high energy efficiency, is future-proofed and is fossil fuel free.

A detailed overheating study has also been carried out to determine the requirement for cooling following the cooling hierarchy. The results of this show that there is significant overheating during occupied summer hours and the building fails the TM52 standards with natural & mechanical ventilation. This shows that cooling would be viable in this case.



Screenshot of Design Builder model

Local & National Policies

National Planning Policy Framework (2021):

The National Planning Policy Framework (NPPF) sets out the governments planning policies for England and how these are expected to be applied. The purpose of the framework is to aid in the achievement of a sustainable development by providing guidance on three overarching objectives: economic, social and environmental. Relevant key information to take note of includes:

- Local planning polices and decisions should exploit any opportunity to make the location sustainable.
- Policies should plan for future challenges such as climate change, flooding and coastal change.
- Policies and decisions should prioritise the conservation and enhancement of natural environment.
- Promote the use if sustainable materials at all stages of development.
- Promote sufficient provision fir health infrastructure, promoting and maximising sustainable transport solutions and related air quality and public health improvements, making effective use of land, achieving well-designed places that function well for their lifetime and promote wellbeing.

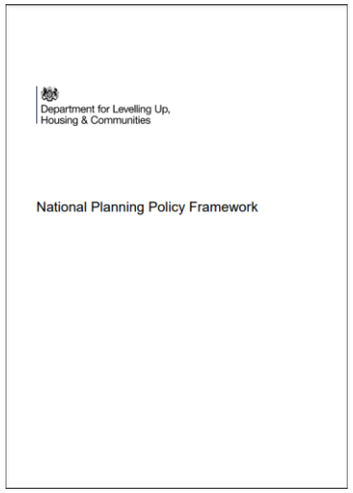
Key Policies to note include:

Paragraph 152 States the planning system should support the transition to a low carbon future in a changing climate and should help shape places in ways which aid in radical reductions in greenhouse gas emissions; minimise vulnerability and improve resilience; encourage reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.

Paragraph 153 goes on to state that local planning authorities are required to adopt a proactive approach to mitigate and adapt to climate change.

Paragraph 134 notes that when determining applications, significant weight should be given to outstanding or innovative designs which promote high levels of sustainability, so long as they fit in with the overall form and layout of the surroundings.

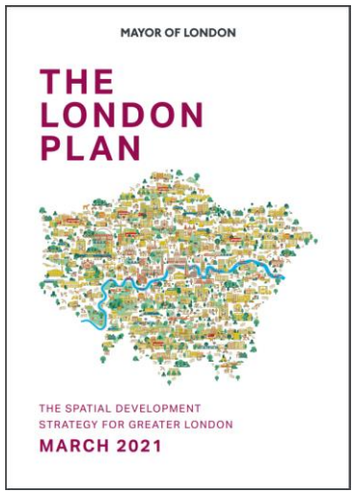
Paragraph 157 states that new development should comply with adopted local policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that is not feasible or viable. New development should take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.



The London Plan

The London Plan provides the overall strategic plan for London setting out an integrated economic, environmental, transport and social framework for the development of London over the next 20-25 years and the Mayor's vision for Good Growth.

The plan is part of the statutory development plan for London and therefore the policies outlined within the plan must be in general conformity with the London Borough's Local Plan and should inform decisions for planning application across the capital.

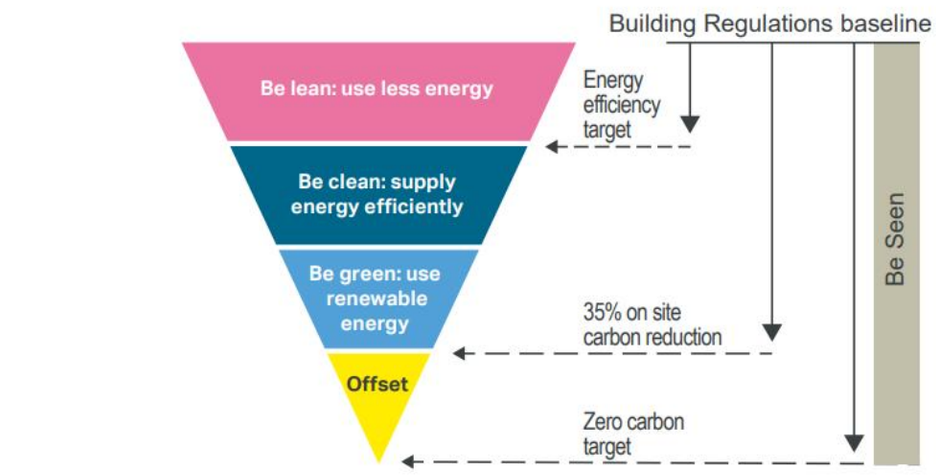


Local & National Policies

The London Plan

It should be noted that many of the targets and polices proposed within this document are mainly aimed at major developments. As 29a Montague Street is considered as a minor development, these targets do not need to be met. However, the targets along with the polices relating to major developments should be kept in mind.

Policy SI 2 - Within The London Plan it is noted that major developments should be net-zero carbon and carbon and energy operation should be minimised in accordance with the following energy hierarchy:

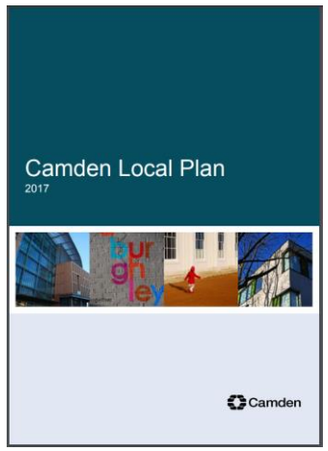


Source: Greater London Authority

Camden Local Plan

Camden's Adopted Local Plan is the key strategic document in Camden's development plan and replaces the Core Strategy and Development Policies planning documents, covering the period form 2016-2031.

Camden council aims to tackle the causes of climate change within the borough by ensuring that developments use less energy and assess the feasibility of decentralised energy and renewable technologies



The council will expect developments of more than 500 sqm of any gross internal floorspace to achieve a 20% reduction in carbon dioxide emissions from on-site renewables energy generation (which can include sources of suite related decentralised renewable energy),unless it can be demonstrated that provision is not feasible.

Policy CC 1 Climate Change Mitigation:

The council will require all development to minimise the effects of climate change and encourage all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation.

Policy CC 2 Adapting to Climate Change:

The council will require development to be resilient to climate change with all developments adopting appropriate climate change adaption measured such as:

The protection of existing green spaces and promoting new appropriate green infrastructure;

1. Not increasing, and wherever possible reducing, surface water runoff through increasing permeable surfaces and use of Sustainable Drainage Systems.
2. Incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate; and
3. Measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy.

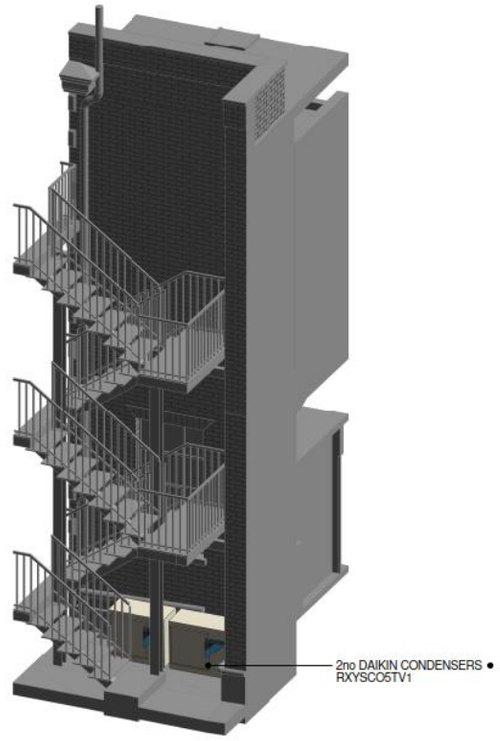
Renewable Energy Sources

The table below reviews each of the technologies that have been considered for the project in line with The London Renewable Toolkit, with the most feasible method being selected. The following renewable technologies have been considered to assess their potential to meet the renewable targets for the development but the feasibility of their installation and suitability will need to be explored further.

Technology	Viable	Reasoning
Solar (Photovoltaic)		There is space to potentially add a photovoltaic array on the top floor roof. However, there are large trees to the south of the building which have the potential for significant shading of the top floor roof. Due to this PV cannot be considered.
Solar Thermal (Hot Water)		As with the PV panels, there is potential to install a small solar thermal array to the roof, to provide renewable hot water to office areas. However, due to the offices small predicted domestic hot water load and significant shading from trees this option would not be feasible.
Wind Turbine		Due to the location the uneven and turbulent wind patterns that can be expected to occur near buildings, the effective operational time is likely to be limited. Additionally due to noise, vibration, reflected light and shadow flicker it is not best practice to locate in close proximity to office areas.
Biomass		Biomass technology could potentially offer a solution to satisfying heating and hot water loads to the project. However, it has been discounted as there is no space allocation for the pellets on site. There is also an increased fire risk where combustible materials are going to be stored
Combined Heat and Power		A small, centralised CHP could provide a good level of CO2 reduction. However, initial studies found an inadequate heating and electrical demand within scheme, to justify a CHP system.
Air Source Heat Pump (Cooling)		Air Source Heat Pumps could be installed to future proof the units and provide efficient cooling. The system will need to be A rated and should have a COP of no less than 3.5. Condensers to be installed in an enclosure to the rear of the building.
Ground Source Heat Pump		The use of horizontal ground source heat pumps is inhibited because of the areas required for the horizontal ground loop system. The site would also be difficult to accommodate both a vertical borehole system or plateau setup, in regards to safe working area and lack of open available space. Ground Source Heat Pumps have therefore been discounted based on these potential constraints.

Proposed Air Source Heat Pump System

The proposed system sees the removal and decommissioning of the existing gas-fired boiler. To replace this a new Daikin RXYSCQ5TV1 VRV air source heat pump system has been proposed. This will provide the office areas with heating and as a by-product also provide cooling (the need for active cooling has been proven later in the report under the overheating section). The diagram on the right shows the proposed location of the external condensers to the rear of the building.



Energy Comparison

Data	Existing	Proposed
Building Emission Rate (BER) kg.CO2/m2.yr	52.42	19.34
Building Energy Consumption kWh/m2.yr	261.42	130.28
Carbon Emissions TonnesCO2.yr	14.84	5.48
Rating	F 141	C 52
Area (m2)	283.13	283.13
%Carbon Saving	-	**63.1%**

Sustainable Measures

Reuse & Recycling

Scope for increased recycling will be incorporated by specifying recycled materials where possible and ensuring that even where new materials are used, as much as possible can be recycled at the end of the buildings' life.

Any material not required from the original building can be recycled and used as aggregate.

Specifying materials with high-recycled content is also another method of saving processing or manufacturing energy. The recycled content of a material can be described as either post-consumer or post-industrial to indicate at what point in the life cycle a material is reclaimed.

Adaptation to Climate Change

The building will be assessed under the CIBSE TM52; Design Methodology for the Assessment of Overheating Risk in European Building and will enable the design team to assess the risk of overheating and allows a future adaptation to climate change strategy.

Mitigation of Climate Change

The building will be an all-electric scheme and will ensure future proofing and mitigation of climate change through the use of low carbon technologies. Technologies such as heat pumps will be utilised.

Overheating

Introduction

Simulations have been undertaken using the Design Builder software (DSM) to accurately simulate the indoor temperatures and conditions to identify areas of potential overheating.

Note: CIBSE TM52 is used as a design benchmark to demonstrate the performance of the building. The development does not commit to meeting these standards.

Where information is unavailable, reference figures have been used based on the National Calculation Methodology (NCM) document.

CIBSE TM52: Limits of Thermal Comfort

In order to assess the overheating risk at 29a Montague Street, the CIBSE TM52 methodology has been followed. The memorandum states:

“Overheating has become a key problem for building design. The need to reduce energy consumption whilst dealing with global climate change has reduced the options available for building comfortable, low-energy buildings. Research has been directed towards methods for increasing indoor winter temperatures, but this can lead to lightweight, highly insulated buildings that respond poorly in the summer.

An issue for designers has been the absence of an adequate definition of overheating in naturally ventilated buildings. In the past overheating has been defined as a number of hours over a particular temperature, irrespective of conditions outside the building. Recent work embodied in European standards suggests that the temperature that occupants will find uncomfortable changes with the outdoor conditions in a predictable way. This research informs the CIBSE guidance presented in this Technical Memorandum (TM). The meaning of the research and the link with overheating are explained and a series of criteria by which the risk of overheating can be assessed or identified are suggested.

The CIBSE Technical Memorandum 52 sets out the definition and compliance with limiting overheating.

The standard introduces three categories of building:

1. Category I – buildings whose occupants are sensitive or fragile

2. Category II – normal expectation, recommended for new build or renovations

3. Category III – moderate expectation, mainly applicable in existing buildings

The standard provides a robust, yet balanced, assessment of the risk of overheating of buildings in the UK and Europe. A room or building that fails any two of the three following criteria is classed as overheating:

Criterion 1 sets a limit of 3% for the number of hours that the operative temperature can exceed the threshold comfort temperature (upper limit of the range of comfort temperature) by one degree or more during the occupied hours of a typical non-heating season (1st May to the 30th September) temperature. The number of hours where ΔT is greater than or equal to one degree (ºK) during the period of May to September inclusive shall not last more than 3% of occupied hours. ΔT is defined as operative temperature less the maximum acceptable temperature.

Criterion 2 deals with the severity of overheating within any one day, which can be as important as its frequency. This is a function of both temperature above maximum temperature and its duration. This criterion sets a daily limit for acceptability. If each hour (or part-hour) in which the temperature exceeds max temperature by at least 1ºK is multiplied by the number of degrees by which it is exceeded, then this ‘excess’ should not be more than six degree-hours.

Criterion 3 sets an absolute maximum temperature of (Tmax + 4) °C for a room (Tupp), beyond which the level of overheating is unacceptable. To set an absolute maximum value for the indoor operative temperature, the value of (ºK) shall not exceed 4 ºK.

The weather file for the TM52 analysis is the London Design Summer Year (DSY) 2016, obtained by CIBSE data.

Overheating

Consideration of the cooling Hierarchy

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

Upgrades to the fabric are not being considered as this scheme only includes the removal of the gas boiler and installation of a new high-efficiency heat pump. However internal blinds are to be included in the study.

2) minimise internal heat generation through energy-efficient design

LED lighting is installed with low heat output.

3) manage the heat within the building through exposed internal thermal mass and high ceilings

The building already has a high thermal mass as this is an existing Georgian building. There are no false ceilings, and the ceilings will be left exposed. The building also features generous floor-to-ceiling heights.

4) provide passive ventilation

Reduction of summertime overheating currently via passive ventilation measures, with large secure openings provided which afford maximum air change rates. *There are several rooms which are dual aspect which allows for improved passive ventilation via cross ventilation.*

5) provide mechanical ventilation

Mechanical ventilation has been explored and it has been determined that this would still not enable the building to pass the TM52 criteria with office spaces still overheating in some occupied summer hours. This will be discussed later on in the report. Furthermore, mechanical ventilation would also not be feasible in this building due to building constraints

6) provide active cooling systems.

Finally, active cooling has been proposed to mitigate the risk of overheating during the summer months. This would also be a by-product of installing the high-efficiency heat pump system in lieu of the existing gas-fired heating system

Overheating

Model Inputs

Geometry

The geometry for the building has been modelled using Design Builder Software (DSM). The building has been modelled from drawings provided by Bedford Estates.

Weather

The weather file used for the CIBSE TM52 assessment is the CIBSE London Design Summer Year (DSY).

Modelling Inputs

Unless specified, the following data has been assumed, based on NCM (National Calculation Methodology). The methodology states:

1. In order to facilitate estimating energy performance on a consistent basis, a key part of the NCM is an Activity database that defines the activities in various types of space in different classes of building (which closely align with the Town and Country Planning (TCP) Use Classes). One of these standard activities must be assigned to each space in the building

2. The database provides standard occupancy, temperature set-points, outdoor air rates and heat gain profiles for each type of space in the building so that buildings with the same mix of activities will differ only in terms of their geometry, construction, building services, and weather location. Thus, it is possible for the Building Regulation 26 compliance test and EPCs to compare buildings on the basis of their intrinsic potential performance, regardless of how they may actually be used in practice.

3. The fields of information in the database are as follows:

   a. Occupancy times and density; total metabolic rate and percentage which is latent (water vapour)

   b. Set-point temperature and humidity in heating and cooling modes; DSM software will use air temperature as the basis for temperature set-points for the Actual, Notional, and Reference buildings

   c. Set-back conditions for unoccupied periods

   d. Sensible and latent heat gain from other sources

   e. Outside air requirement

   f. Level of illuminance for general lighting and the power density for display lighting

   g. Hot water demand

   h. Type of space for glazing, lighting, and ventilation classification within Building Regulations compliance

   i. A marker indicating whether the activity requires high efficiency filtration, thereby justifying an increased SFP allowance for that space to account for the increased pressure drop.

Building Fabric

Fabric Criteria	Existing Element U values
External Walls	1.60 W/m^{2}k
Floors	0.58 W/m^{2}k
Roofs	1.40 W/m^{2}k
Windows	5.08 W/m^{2}k
Window (g-value)	0.85
Air Permeability	25.00 m^3/h.m^2

Internal Gains

Lighting	
Office Areas	15.0 W/m^2

Power (Sensible Gain)	
Office Areas	25.0 W/m^2

Occupancy

Space	Watts per m^2 person latent/sensible
Offices	6.25/11.25

Overheating (TM52)

Results

No Openable Windows & No Blinds

Block	Zone	Criterion 1 (%)	Criterion 2 (K.hr)	Criterion 3 (hr)	Pass/Fail
FIRSTFLOOR	OFFICE	76.45	97.5	388	Fail
FIRSTFLOOR	OFFICE1	49.12	71	80	Fail
GROUNDFLOOR	MEETINGROOM1	71.18	57.5	84.5	Fail
GROUNDFLOOR	RECEPTION/OFFICE	36.43	23	0	Fail

The results above show the building with no natural ventilation or internal blinds to show how the building performs as a baseline. As suspected all applicable areas of the building fail to meet the CIBSE TM52 criteria under these conditions.

Openable Windows & No Blinds

Block	Zone	Criterion 1 (%)	Criterion 2 (K.hr)	Criterion 3 (hr)	Pass/Fail
FIRSTFLOOR	OFFICE	63.84	83.5	227	Fail
FIRSTFLOOR	OFFICE1	38.07	59.5	42	Fail
GROUNDFLOOR	MEETINGROOM1	55.28	46	9.5	Fail
GROUNDFLOOR	RECEPTION/OFFICE	13.26	14	0	Fail

The results above show the building with natural ventilation and no internal blinds. The natural ventilation consists of windows opening to 40% of their area (typical of sash windows). The windows have also been automated to start opening at 22°C which approximately simulates occupants manually opening the windows. This is scheduled between the hours of 8:00 am and 7:00pm (typical office operational hours). From the results, you can see that this does reduce the hours in which all the office areas exceed the TM52 Criterion however all zones still fail the criterion.

Openable Windows & Blinds

Block	Zone	Criterion 1 (%)	Criterion 2 (K.hr)	Criterion 3 (hr)	Pass/Fail
FIRSTFLOOR	OFFICE	51.91	71.5	84	Fail
FIRSTFLOOR	OFFICE1	30.35	53	19	Fail
GROUNDFLOOR	MEETINGROOM1	35.17	28	0	Fail
GROUNDFLOOR	RECEPTION/OFFICE	2.56	6	0	Pass

The results above show the building with natural ventilation and internal blinds. The natural ventilation consists of windows opening to 40% of their area (typical of sash windows).

The windows have also been automated to start opening at 22°C which approximately simulates occupants manually opening the windows. This is scheduled between the hours of 8:00 am and 7:00pm (typical office operational hours). The internal blinds were also automated to operate during office operational hours. From the results, we do see the reception/office space passes the criterion however all other spaces fail.

Mechanical Ventilation & Blinds

Block	Zone	Criterion 1 (%)	Criterion 2 (K.hr)	Criterion 3 (hr)	Pass/Fail
FIRSTFLOOR	OFFICE	60.09	82	187.5	Fail
FIRSTFLOOR	OFFICE1	35.93	58.5	35	Fail
GROUNDFLOOR	MEETINGROOM1	53.25	45.5	6	Fail
GROUNDFLOOR	RECEPTION/OFFICE	10.97	12.5	0	Fail

The results above show the building with mechanical ventilation and internal blinds. The ventilation rate assumed is 14L/per person/s based on BCO. The internal blinds were also automated to operate during office operational hours. rom the results, you can see that this does reduce the hours in which all the office areas exceed the TM52 Criterion however all zones still fail the criterion.

Active Cooling

Block	Zone	Criterion 1 (%)	Criterion 2 (K.hr)	Criterion 3 (hr)	Pass/Fail
FIRSTFLOOR	OFFICE	0	0	0	Pass
FIRSTFLOOR	OFFICE1	0	0	0	Pass
GROUNDFLOOR	MEETINGROOM1	0	0	0	Pass
GROUNDFLOOR	RECEPTION/OFFICE	0	0	0	Pass

Following the cooling hierarchy, it can be seen that there is still a risk of overheating after passive measures, passive ventilation and mechanical ventilation have been considered. We have proposed that active cooling is utilised to mitigate this risk and provide cooling in the summer months.