Building Services Engineering
Sustainability Consultants
Low Carbon Design

FLATT

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27 KINGS MEWS LONDON WC1N

OVERHEATING STATEMENT

Engineering Sustainability

Revision

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EXECUTIVE SUMMARY

This report has been prepared by **FLATT** in response to London Borough of Camden and the planning application Ref: 2019/2066/P, for the new commercial office premises at 27 Kings Mews, London on behalf of **Nico Warr Architects.**

The London Borough of Camden (LBoC) requires the development to comply with the current Camden Local Plan (2017) and the guidance document 'CPG Energy efficiency and adaptation planning guidance' (March 2019). At circa 350m^2 GIA, the development falls under the 1,000m^2 threshold and thus is not considered a major development. However, it still has to comply with the cooling hierarchy as stated in policy CC2 of the Camden Local Plan (2017) where all developments should consider measures to reduce the impact of urban overheating.

This report demonstrates compliance with policy CC2 through a 2-step analysis:

- Step 1 - Reducing Cooling Demand
- Step 2 - Assessing the need for Active Cooling

Results:

- Step 1 achieves a 48% reduction in cooling demand through the implementation of passive measures and efficient building services such as using LED lighting, removing Low Temperature Hot Water heating pipework, a light coloured roof, and high performance thermal insulation.

- Step 2 follows the ''cooling hierarchy'' to analyse the need for active cooling. The dynamic overheating assessment considered the building under four scenarios: passive ventilation, mechanical ventilation, natural ventilation (through fully openable windows) and active cooling.

  The results demonstrate that only the active cooling scenario allowed all rooms to pass TM52 and therefore maintain a comfortable internal temperature, thus providing a high-quality working environment.

1.0 INTRODUCTION

This report has been prepared by **FLATT** in response to London Borough of Camden and the planning application Ref: 2019/2066/P, for the construction of a new commercial development.

The construction of this unit, as a new build, falls under the requirements of the Camden Local Plan (2017) Policy CC2 and 'CPG Energy efficiency and adaptation planning guidance' (March 2019).

This Overheating Statement outlines how the reductions in cooling energy consumption is achieved through the use of building fabric performance and energy efficient services, thereby demonstrating compliance with the aforementioned London Borough of Camden policy documents. The implementation of the cooling hierarchy is also outlined within this report.

This Overheating Statement focuses on:

- Notional Building Regulations compliant building / Actual Cooling Demand
- Government and Local Authority Policies
- Enhanced Building Fabric & Systems
- Implementing the Cooling Hierarchy

The aim is to ensure the client, design team and local authority are fully informed as to how the development, in context to the planning requirements, will:

- Reduce its Cooling Demand
- Assess the need for Active Cooling

2.0 THE DEVELOPMENT

2.1 General

27 Kings Mews is a small commercial office development, located near Theobalds Road in the London Borough of Camden. It comprises a basement, ground floor and three upper floors of commercial office space of circa 350m^2 GIA.

This development is subject to the current requirements of The London Plan (2016), London Borough of Camden Local Plan (2017) and Planning Guidance 'CPG -Energy Efficiency and Adaptation' (March 2019).

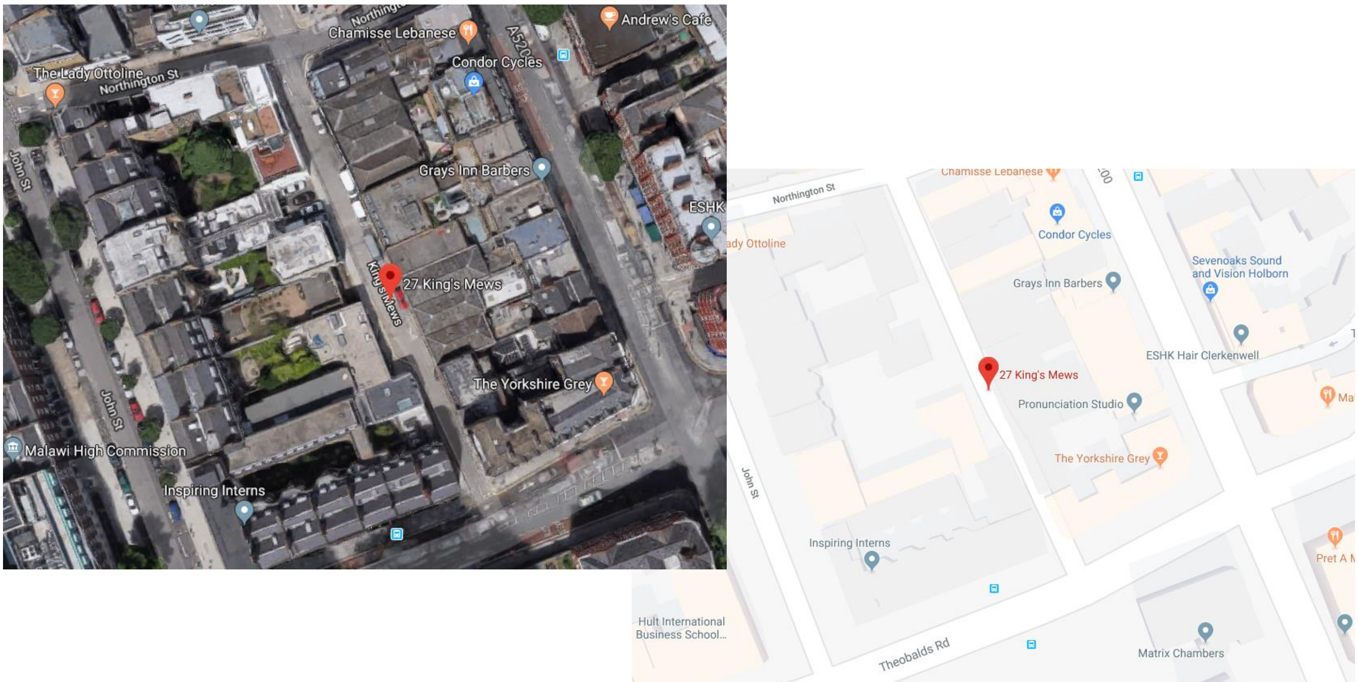


Figure 1. 27 Kings Mews Location

The Overheating Statement is based upon the following architectural plans:

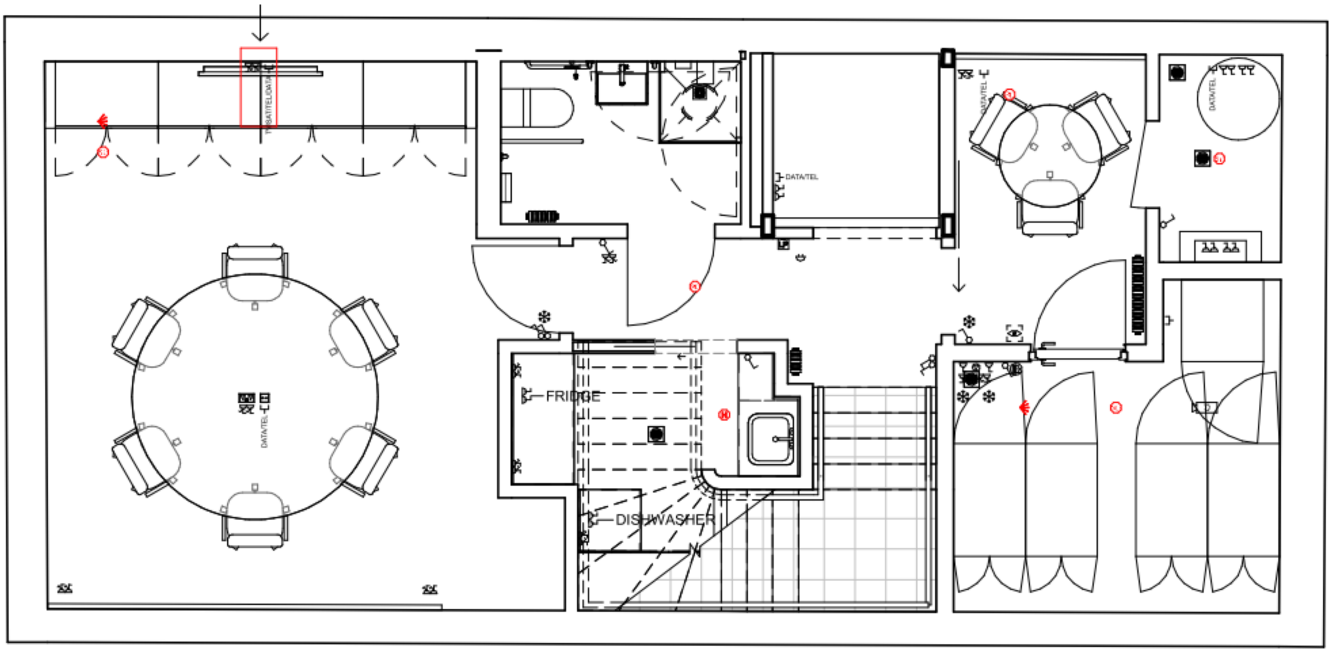


Figure 2. Basement Floor Plan

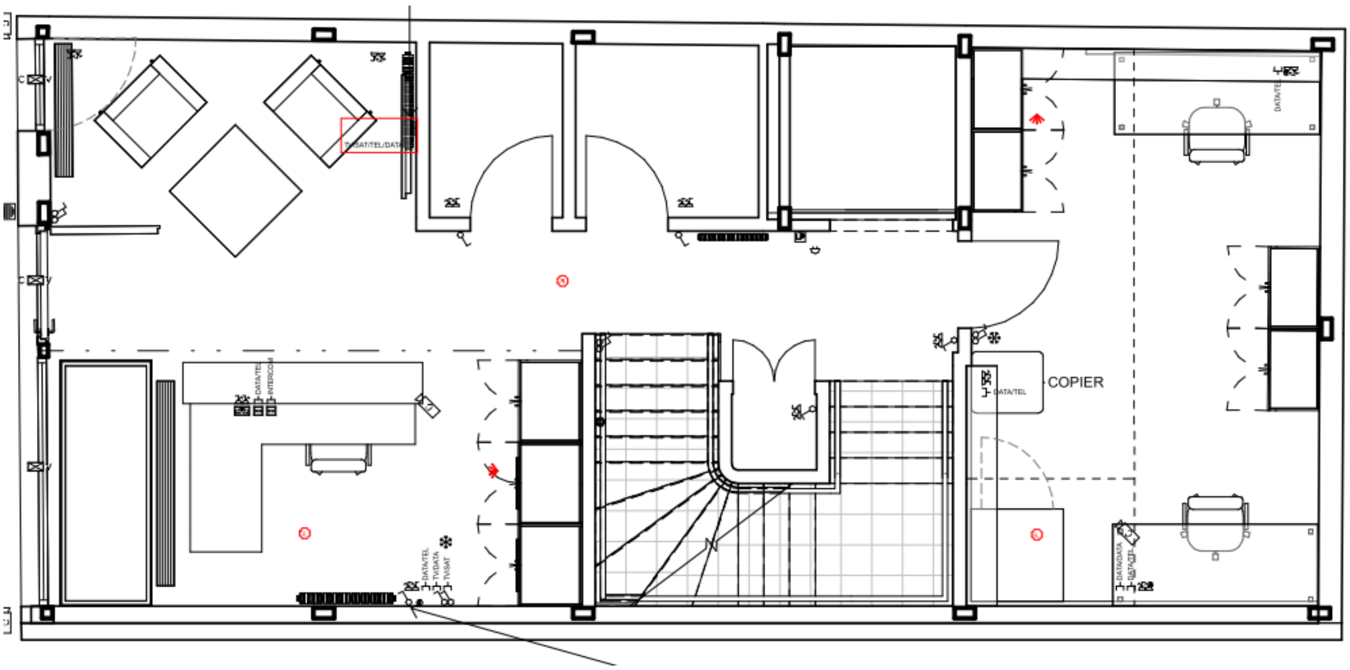


Figure 3. Ground Floor Plan

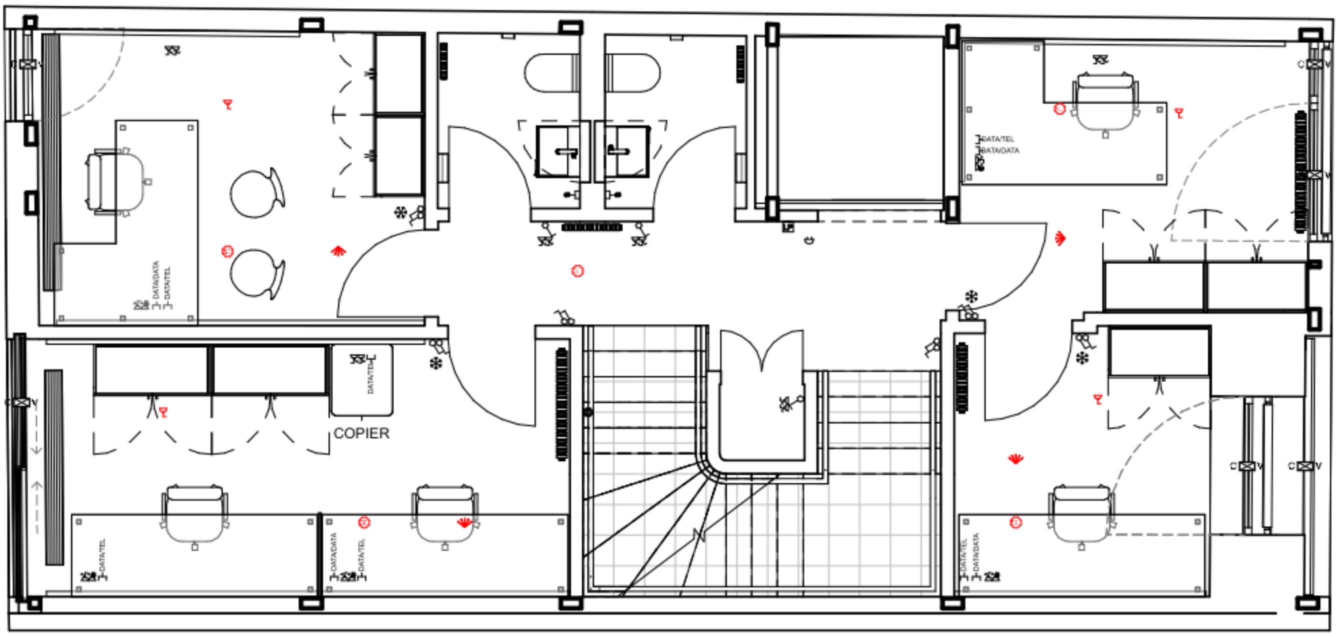


Figure 4. First Floor Plan

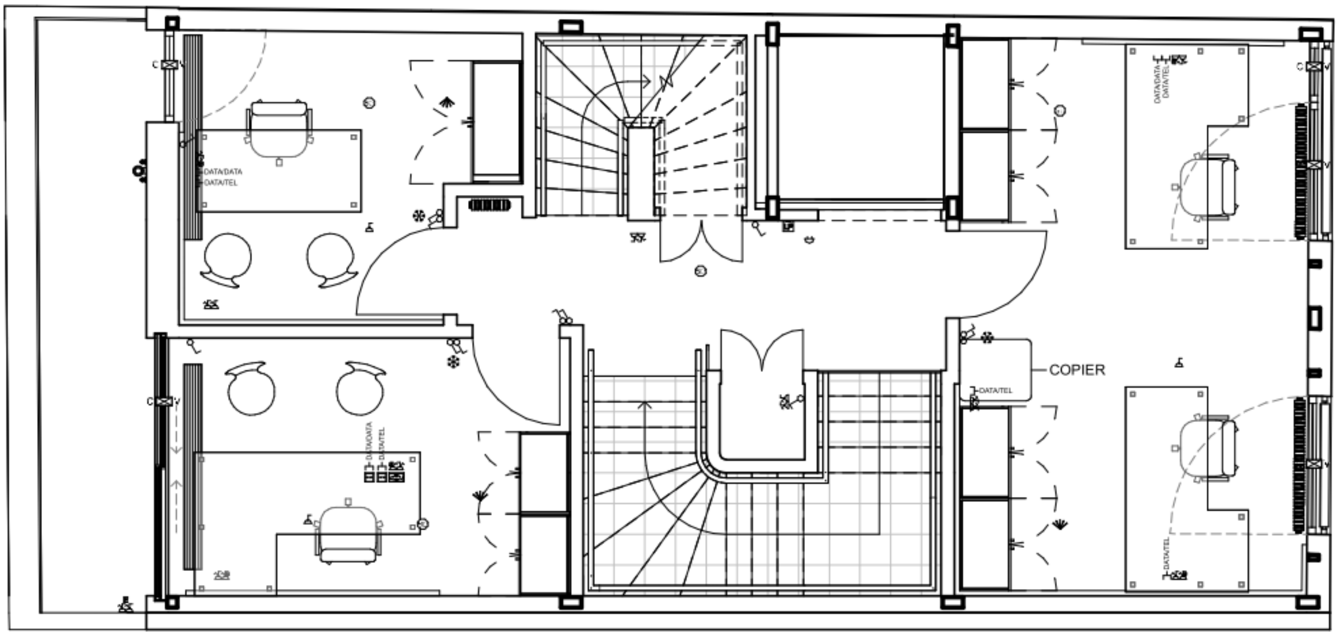


Figure 5. Second Floor Plan

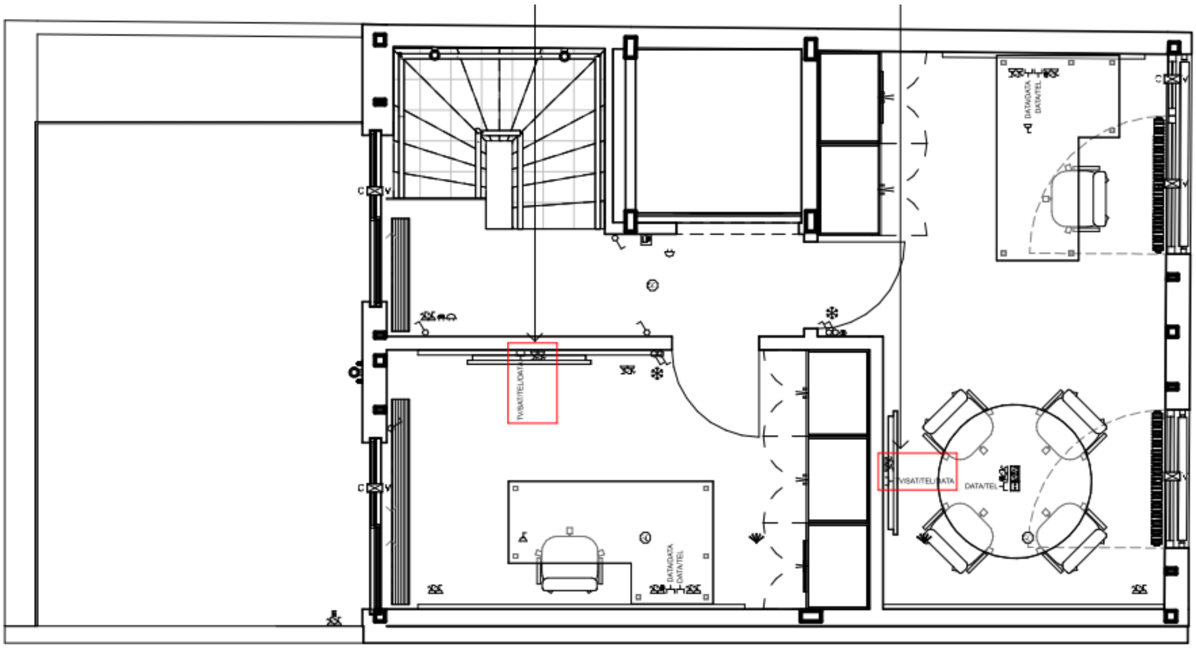
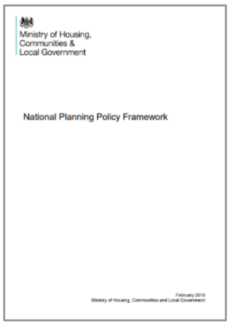


Figure 6. Third Floor Plan

3.0 PLANNING POLICY AND CONTEXT

3.1 National Policy


Ministry of Housing, Communities & Local Government
National Planning Policy Framework

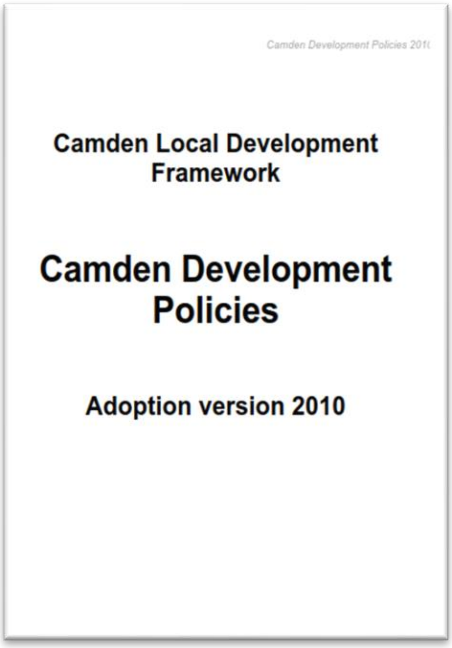
The National Planning Policy Framework (NPPF) was adopted in March 2012, updated February 2019, and this document supersedes the previous national planning policy statements and guidance. The framework sets out a structure for delivering sustainable development with particular relevance for energy and carbon issues.

3.2 Regional Policy – The London Plan

This development is required to follow the guidance provided within The London Plan (2016). In particular, this includes the Cooling Hierarchy as cited in Policy 5.9 Overheating and Cooling.

3.3 Local Policy – The London Borough of Camden

In relation to overheating, the development is required to follow the guidance of Development Policies (2010), Camden Local Plan (2017) Policy CC2 and 'CPG Energy efficiency and adaptation (March 2019). These policies have been extracted from these documents and are shown here below:


Camden Local Development Framework

Camden Development Policies

Adoption version 2010

Policy DP22 - Promoting sustainable design and construction

The Council will require development to incorporate sustainable design and construction measures. Schemes must:

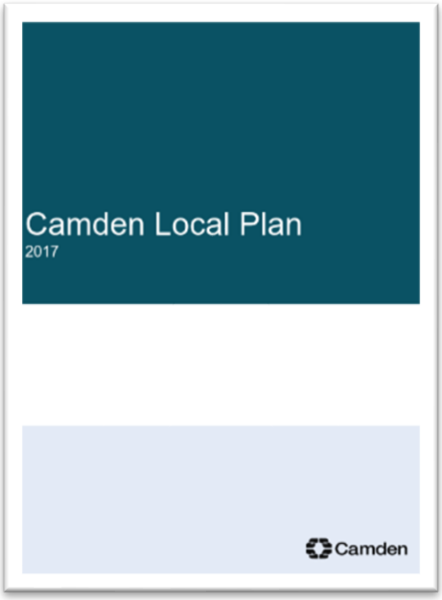
a) demonstrate how sustainable development principles, including the relevant measures set out in paragraph 22.5 below, have been incorporated into the design and proposed implementation; and
b) incorporate green or brown roofs and green walls wherever suitable.

The Council will promote and measure sustainable design and construction by:

c) expecting new build housing to meet Code for Sustainable Homes Level 3 by 2010 and Code Level 4 by 2013 and encouraging Code Level 6 (zero carbon) by 2016.
d) expecting developments (except new build) of 500 sq m of residential floorspace or above or 5 or more dwellings to achieve "very good" in EcoHomes assessments prior to 2013 and encouraging "excellent" from 2013;
e) expecting non-domestic developments of 500sqm of floorspace or above to achieve "very good" in BREEAM assessments and "excellent" from 2016 and encouraging zero carbon from 2019.

The Council will require development to be resilient to climate change by ensuring schemes include appropriate climate change adaptation measures, such as:

f) summer shading and planting;
g) limiting run-off;
h) reducing water consumption;
i) reducing air pollution; and
j) not locating vulnerable uses in basements in flood-prone areas.


Camden Local Plan
2017
Camden

Policy CC2 Adapting to climate change

The Council will require development to be resilient to climate change.

All development should adopt appropriate climate change adaptation measures such as:

a. the protection of existing green spaces and promoting new appropriate green infrastructure;
b. not increasing, and wherever possible reducing, surface water run-off through increasing permeable surfaces and use of Sustainable Drainage Systems;
c. incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate; and
d. measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy.

Any development involving 5 or more residential units or 500 sqm or more of any additional floorspace is required to demonstrate the above in a Sustainability Statement.

Sustainable design and construction measures

The Council will promote and measure sustainable design and construction by:

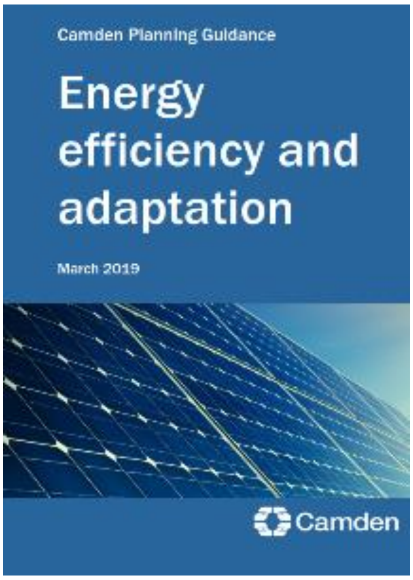
Cooling

8.41 All new developments will be expected to submit a statement demonstrating how the London Plan's 'cooling hierarchy' has informed the building design. Any development that is likely to be at risk of overheating (for example due to large expanses of south or south west facing glazing) will be required to complete dynamic thermal modelling to demonstrate that any risk of overheating has been mitigated.

8.42 Active cooling (air conditioning) will only be permitted where dynamic thermal modelling demonstrates there is a clear need for it after all of the preferred measures are incorporated in line with the cooling hierarchy.

8.43 The cooling hierarchy includes:

- Minimise internal heat generation through energy efficient design;
- Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls;
- Manage the heat within the building through exposed internal thermal mass and high ceilings;
- Passive ventilation;
- Mechanical ventilation; and
- Active cooling.



Overheating

10.4 Where developments are likely to be at risk of overheating applicants will be required to complete dynamic thermal modelling to demonstrate that any risk to overheating has been mitigated (see Local Plan Policy CC2, paragraph 8.41).

10.5 This assessment should be undertaken in addition to any assessment of overheating risk obtained from the Part L Building Regulation compliance tools SAP and SBEM. This is because these basic overheating compliance tests do not cover all factors which influence overheating. Dynamic thermal modelling should be carried out in accordance with guidance and data sets in CIBSE and GLA 'Design Summer Years for London (TM49: 2014) which provides guidance on future proofing for future impacts of overheating from climate change.

10.6 Active cooling (such as air conditioning) is discouraged, unless the applicant can demonstrate exceptional circumstances where opportunities for cooling are unable to be controlled through passive measures alone.

Cooling hierarchy

10.7 All developments should follow the cooling hierarchy outlined below, to reduce the risk of overheating and subsequent reliance on active cooling:

6. **Active cooling**:
   - Ensuring they are the lowest carbon options.
   - Ground Source Heat Pumps and Air Source Heat Pumps can be used in reverse to provide cooling to buildings.
   - Water based cooling systems also reduce the need for air conditioning by running cold water through pipes in the floor and/or ceiling to cool the air.

10.8 The Council will discourage the use of air conditioning and excessive mechanical plant because of the additional energy consumption from operating the equipment, impacts on microclimate from the warm air expelled from the equipment, and because of the competition for plant space, which could otherwise be used for other renewables or green roofs.

10.9 If active cooling is unavoidable, applicants need to identify the cooling requirement of the different elements of the development in the Energy Statement. Where cooling proposed, the efficiency of the system and details of controls should be provided, as well as the ability to take advantage of free cooling and/or renewable cooling sources (e.g. ASHP).

10.10 Where cooling is provided in residential development, this should be modelled and the monthly kWh/m2 consumption attributed to the cooling included in the energy assessment. Where cooling is required in non-residential development, the cooling demand of the actual and notional buildings should be compared, with the aim of reducing the cooling demand below that of the notional building. If this is not possible, the applicant should provide a clear explanation of why it is not possible, and outline the implications for building design.

10.11 Comfort cooling (air conditioning) should not be specified in developments where it has been demonstrated that passive or other measures proposed have successfully addressed the risk of overheating. The Council will resist applications proposing active cooling in residential developments to meet market expectations, where no risk of overheating is identified.

The key policies are highlighted in orange

4.0 OBJECTIVES

4.1 General

To analyse whether active cooling is required, after having followed the London Plan's Cooling Hierarchy and reduced cooling demand.

To achieve compliance with the Regional and Local policies, the following measures have been considered.

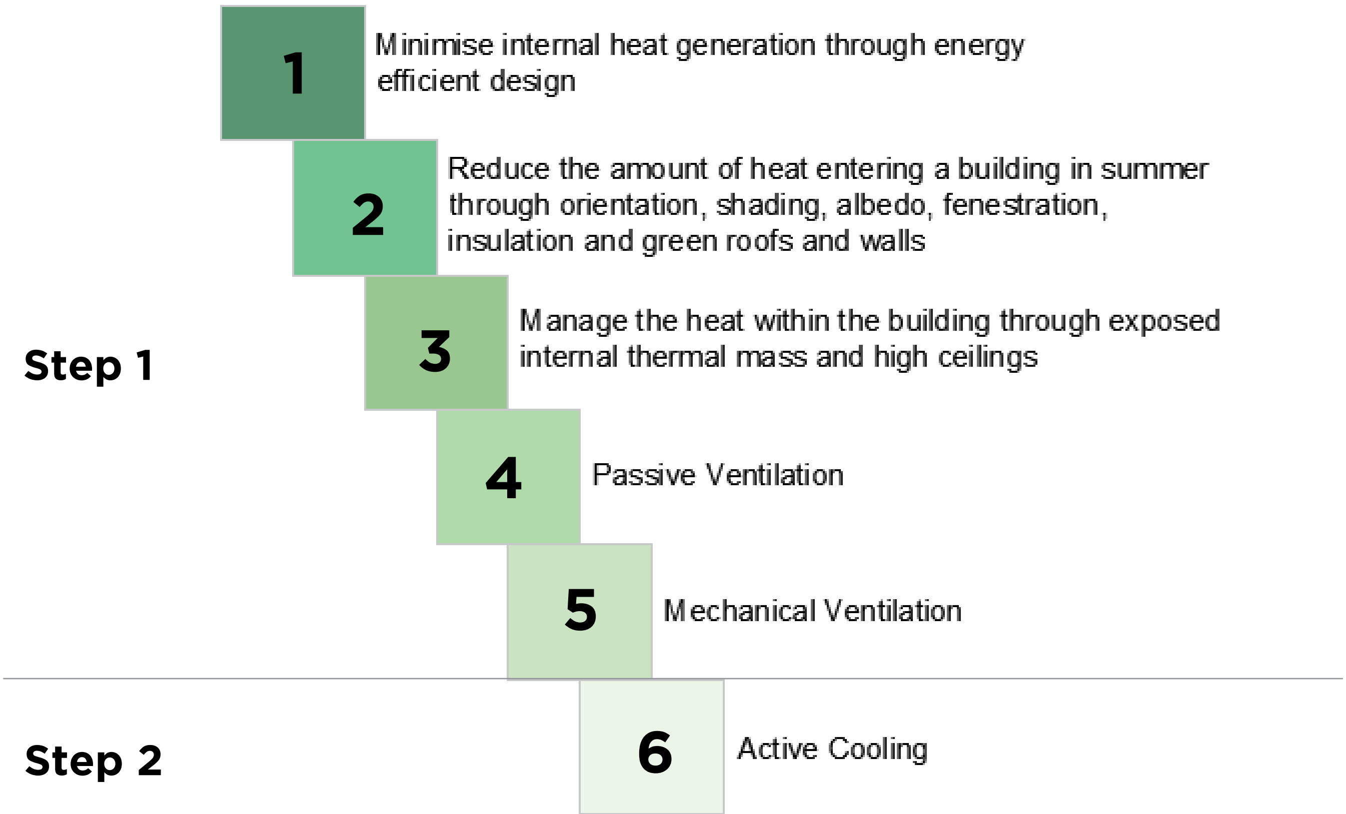


Figure 7. Cooling Hierarchy

4.2 Specific Development Objectives

The development objectives are in line with the requirements of the London Plan (2016) and the London Borough of Camden's Local Plan (2017).

- Step 1 - Reducing Cooling Demand

  Follow the guidance on adopting the ''cooling hierarchy'', as illustrated within The London Plan Policy 5.9 and Camden Local Plan Policy CC2.

  Demonstrate a cooling demand reduction in the Actual building when compared to the Notional Building Regulations compliant construction.

- Step 2 - Assessing the need for Active Cooling

  Evaluate the need for active cooling by conducting a dynamic overheating model according to the CIBSE TM52 methodology.

5.0 THERMAL MODEL

The development was required to undertake an analysis of the risk of overheating.

As required by the GLA Energy Assessment Guidance (Oct 2018), the following assumptions have been used within the thermal modelling and overheating assessments:

Design Assumptions	
Dynamic overheating analysis software used.	The thermal modelling has been undertaken using IES-VE 2019.1.0.0 with VE Compliance v7.0.12 software.
Site location	27 King Mews, WC1N 2JB
Site orientation	South West
Weather file used	Thermal Modelling: HeathrowDSY weather file TM52 Overheating Analysis: Heathrow 2020 DSY1 High percentile 50% weather file
Internal gains	As per NCM templates for B1 office.
Occupancy profiles	As per NCM templates for B1 office.
Thermal elements performance (U-values and glazing g-values)	Refer to Fig.9.
Shading features (i.e. blinds, overhangs etc.)	Solar Control glazing
Thermal mass details	Light/Medium weight construction
Ventilation strategy	MVHR from first floor upwards.
Model images indicating the sample units modelled	Refer to Fig.10.
Units' internal layout	Refer to plans in Section 2.1

Figure 8. Design Assumptions

Building Fabric	2013 Building Regs Maximum U-Values	2013 Notional Building U-Values	Proposed U-Values
Windows	2.20 W/m² °K	1.60 W/m² °K g-value = 0.68	1.70 W/m² °K g-value = 0.68
Rooflights	2.20 W/m² °K	1.80 W/m² °K g-value = 0.55	n/a
External Walls	0.35 W/m² °K	0.26 W/m² °K	0.24 W/m² °K
Ground Floor	0.25 W/m² °K	0.22 W/m² °K	0.22 W/m² °K
Roof	0.25 W/m² °K	0.18 W/m² °K	0.18 W/m² °K
Vehicle Access Doors	1.50 W/m² °K	1.50 W/m² °K	n/a
Personnel Doors	2.20 W/m² °K	2.20 W/m² °K	2.20 W/m² °K
Infiltration	**2013 Building Regs Target**	**2013 Notional Building**	**Proposed**
Air Tightness	10.0 m³/h/m² @ 50Pa	3.0 m³/h/m² @ 50Pa	6.8 m³/h/m² @ 50Pa

Figure 9. Building Fabric and Infiltration

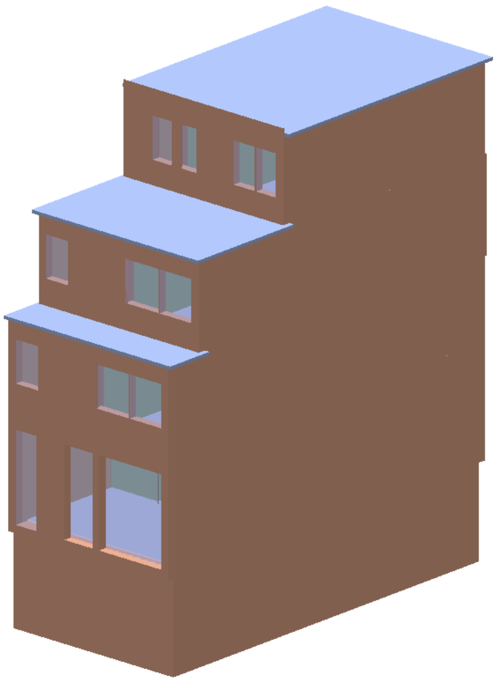


Figure 10. IES Thermal Model

6.0 COOLING HIERARCHY

To reduce the impact of the urban heat island effect and encourage the design of places and spaces to take measures to mitigate overheating risks, the proposed development has followed the cooling hierarchy as outlined below:

1. Minimise internal heat generation through energy efficient design;
2. Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls;
3. Manage the heat within the building through exposed internal thermal mass and high ceilings;
4. Passive ventilation;
5. Mechanical ventilation
6. Active cooling

The design has responded to each step of hierarchy as follows:

1) Minimise Internal Heat Gains through Energy Efficient Design

- The use of LTHW heating pipework within the building was removed with the provision of the installed VRF system reducing standing heat losses from any LTHW installations.
- Hot Water distribution pipework has been limited to local pipework through the use of local instantaneous hot water heaters with time/temperature control.
- The ventilation unit (MVHR unit) that serves the Ground and Basement floors incorporates heat recovery and summertime boost function to lower internal temperatures
- LED lighting has been specified throughout to minimise internal heat gains during the non-heating season.

2) Reduce the amount of heat entering the building in Summer

- Orientation – The building is a terraced property (with North and South facades being party walls to the adjoining properties), and thus a fixed constraint of the design that could not be altered.
- Shading – Being a terraced property the adjoining properties effectively provide shading from the greatest direct solar gains, that is, from the south
- Internal blinds – These enable the end users to control the amount of heat gain entering the building.
- Albedo – The roof finish has been installed in a light colour to increase the albedo and reflect more of the sun's radiation.
- Insulation – The external walls were further insulated over the Building Regulations notional U value to assist in reducing heat entering the building.

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

- Thermal Mass – the false ceiling design allows for air passage to the ceiling slab. This partially exposed thermal mass reduces the cooling demand within the office areas.

4) Passive Ventilation

- The building is designed with opening windows on the 1st floor and above to minimise the use of mechanical ventilation.

5) Mechanical Ventilation & Active Cooling

- The building is provided with mechanical ventilation to the basement area, as there was no reasonable means of providing natural ventilation to this floor.

- The Ground Floor is provided with mechanical ventilation to the ground floor as well, as there were no opening windows at this level.

- Mechanical ventilation shall be used to make use of 'free cooling' where the outside air temperature is below that of the internal temperature

6) Active Cooling

- Active Cooling is provided by a heating/cooling VRF system (EER 4.5, SEER 4.5) solution, as this by minimises internal heat gains as no Low Temperature Hot Water distribution pipework is required. The high EER and SEER values provide a very efficient means of heating and cooling.

6.1 Step 1 - Reducing Cooling Demand

The first step to mitigating against overheating risk is to reduce internal and solar gains. This is within the context of maintaining a comfortable internal temperature to provide a high-quality working environment.

For non-domestic buildings, the Building Regulations BRUKL output report contains an 'HVAC Systems Performance' table comparing the cooling demand of the actual and notional (Building Regulations compliant) building.

Cooling Demand		
	Total area weighted non-domestic cooling demand (MJ/m²)	Total area weighted non-domestic cooling demand (MJ/year)
Notional	929	320,598
Actual	485	167,374
Reduction	**444**	**153,224**
% Cooling Demand reduction	**48 %**	

Figure 11. Active Cooling Demand

The results in the table above indicate that the building design ('Actual' building) has significantly reduced heat gains, and likewise the risk of overheating and the cooling demand.

The Actual building active cooling demand is 48% less than Notional (Building Regulations compliant) building.

6.2 Step 2 - Assessing the need for Active Cooling

A dynamic thermal model overheating analysis has been undertaken according to the CIBSE TM52 methodology, utilising the London Heathrow DSY1 (Design Summer Year) for the 2020s, high emissions, 50% percentile scenario weather file.

The thermal comfort category used is defined within CIBSE Guide A as Category II, Normal expectations (for new buildings and renovations).

The NCM room templates and plant profiles have been applied as per the Building Regulations compliance calculations. Transient occupancy areas such a corridors and stairs etc have been excluded. The results of the analysis are tabled below, with the overheating analysed under the following scenarios a) to d) in accordance with the cooling hierarchy.

The CIBSE TM52 analysis assesses overheating risk according to three criteria, and at least two criteria must be passed for each room, in order to classify as a 'PASS'.

a) Passive Ventilation

The building is assumed to be fully sealed and relying on passive infiltration only.

b) Mechanical Ventilation

The building is provided with mechanical ventilation to all floors.

c) Natural Ventilation

The building is assumed to have fully openable windows to achieve an air change rate of 8 air changes per hour.

d) Active Cooling

Active Cooling was provided through the use of an efficient VRF solution, which minimises internal heat gains as no Low Temperature Hot Water distribution pipework is required.

The results for Scenario a) Passive ventilation are shown below.

Room Name	Occupied days (%)	Criteria 1 (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg.Hrs)	Criteria 3 (Max. DeltaT)	Criteria failing	TM 52 PASS / FAIL
0/01 OFF	100	99.6	202	18	1 & 2 & 3	FAIL
1/00 OFF4	100	97.2	139	13	1 & 2 & 3	FAIL
1/01 OFF5	100	99.6	258	33	1 & 2 & 3	FAIL
1/06 OFF6	100	98.7	162	15	1 & 2 & 3	FAIL
1/08 OFF7	100	99.8	226	22	1 & 2 & 3	FAIL
2/00 OFF8	100	99.8	230	21	1 & 2 & 3	FAIL
2/03 OFF9	100	99.8	254	28	1 & 2 & 3	FAIL
2/05 OFF10	100	99.8	229	21	1 & 2 & 3	FAIL
3/01 OFF12	100	99.5	202	20	1 & 2 & 3	FAIL
3/04 OFF13	100	99.8	249	22	1 & 2 & 3	FAIL
1/00 MEET	100	99.8	251	28	1 & 2 & 3	FAIL
1/00 MEET	100	99.8	250	22	1 & 2 & 3	FAIL
0/00 ENT	100	99.6	214	23	1 & 2 & 3	FAIL

Figure 12. TM:52 Results – Passive Ventilation

The results for Scenario b) Mechanical Ventilation are shown below.

Room Name	Occupied days (%)	Criteria 1 (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg.Hrs)	Criteria 3 (Max. DeltaT)	Criteria failing	TM 52 PASS / FAIL
0/01 OFF	100	90.5	111	11	1 & 2 & 3	FAIL
1/00 OFF4	100	68.9	69	7	1 & 2 & 3	FAIL
1/01 OFF5	100	92	175	24	1 & 2 & 3	FAIL
1/06 OFF6	100	77.5	88	9	1 & 2 & 3	FAIL
1/08 OFF7	100	93.3	135	14	1 & 2 & 3	FAIL
2/00 OFF8	100	94.7	139	13	1 & 2 & 3	FAIL
2/03 OFF9	100	95.4	161	19	1 & 2 & 3	FAIL
2/05 OFF10	100	94.7	139	13	1 & 2 & 3	FAIL
3/01 OFF12	100	88.8	121	13	1 & 2 & 3	FAIL
3/04 OFF13	100	96.2	152	14	1 & 2 & 3	FAIL
1/00 MEET	100	94.3	164	20	1 & 2 & 3	FAIL
1/00 MEET	100	95.3	154	14	1 & 2 & 3	FAIL
0/00 ENT	100	91.7	134	15	1 & 2 & 3	FAIL

Figure 13. TM:52 Results – Mechanical Ventilation

The results for Scenario c) Natural Ventilation are shown below.

Room Name	Occupied days (%)	Criteria 1 (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg.Hrs)	Criteria 3 (Max. DeltaT)	Criteria failing	TM 52 PASS / FAIL
0/01 OFF	100	3.2	21	4	1 & 2	PASS
1/00 OFF4	100	19.5	50	10	1 & 2 & 3	FAIL
1/01 OFF5	100	3.3	20	4	1 & 2	PASS
1/06 OFF6	100	6.7	29	6	1 & 2 & 3	FAIL
1/08 OFF7	100	6.9	34	6	1 & 2 & 3	FAIL
2/00 OFF8	100	13	39	7	1 & 2 & 3	FAIL
2/03 OFF9	100	6.4	32	6	1 & 2 & 3	FAIL
2/05 OFF10	100	6.7	29	6	1 & 2 & 3	FAIL
3/01 OFF12	100	7.8	38	6	1 & 2 & 3	FAIL
3/04 OFF13	100	15.3	44	8	1 & 2 & 3	FAIL
1/00 MEET	100	8.3	38	6	1 & 2 & 3	FAIL
1/00 MEET	100	10.2	34	6	1 & 2 & 3	FAIL
0/00 ENT	100	3.2	21	4	1 & 2	PASS

Figure 14. TM:52 Results – Natural ventilation (8 ach)

The results for Scenario d) Active Cooling are shown below.

Room Name	Occupied days (%)	Criteria 1 (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg.Hrs)	Criteria 3 (Max. DeltaT)	Criteria failing	TM 52 PASS / FAIL
0/01 OFF	100	0	0	0	-	PASS
1/00 OFF4	100	0	0	0	-	PASS
1/01 OFF5	100	0	0	0	-	PASS
1/06 OFF6	100	0	0	0	-	PASS
1/08 OFF7	100	0	0	0	-	PASS
2/00 OFF8	100	0	0	0	-	PASS
2/03 OFF9	100	0	0	0	-	PASS
2/05 OFF10	100	0	0	0	-	PASS
3/01 OFF12	100	0	0	0	-	PASS
3/04 OFF13	100	0	0	0	-	PASS
1/00 MEET	100	0	0	0	-	PASS
1/00 MEET	100	0	0	0	-	PASS
0/00 ENT	100	0	0	0	-	PASS

Figure 15. TM:52 Results – Active Cooling

7.0 CONCLUSION

The heat gains to the building and therefore the cooling demand have been minimised through the use of passive measures and the specification of efficient building services such as using LED lighting, removing LTHW heating pipework, light coloured roof, and high performance thermal insulation. The design of the building has achieved a 48% reduction in active cooling demand compared to the Building Regulations notional building.

A full dynamic overheating assessment has been undertaken according to the CIBSE TM52 methodology. This is in response to the London Borough of Camden Local Plan (2017) policy CC2 and the guidance document 'CPG Energy efficiency and adaptation planning guidance' (March 2019).

The dynamic overheating assessment considered the building under four scenarios: passive ventilation, mechanical ventilation, natural ventilation (through fully openable windows) and active cooling.

The results demonstrate that only the active cooling scenario allowed all rooms to pass TM52 and therefore maintain a comfortable internal temperature and thus provide a high-quality working environment.