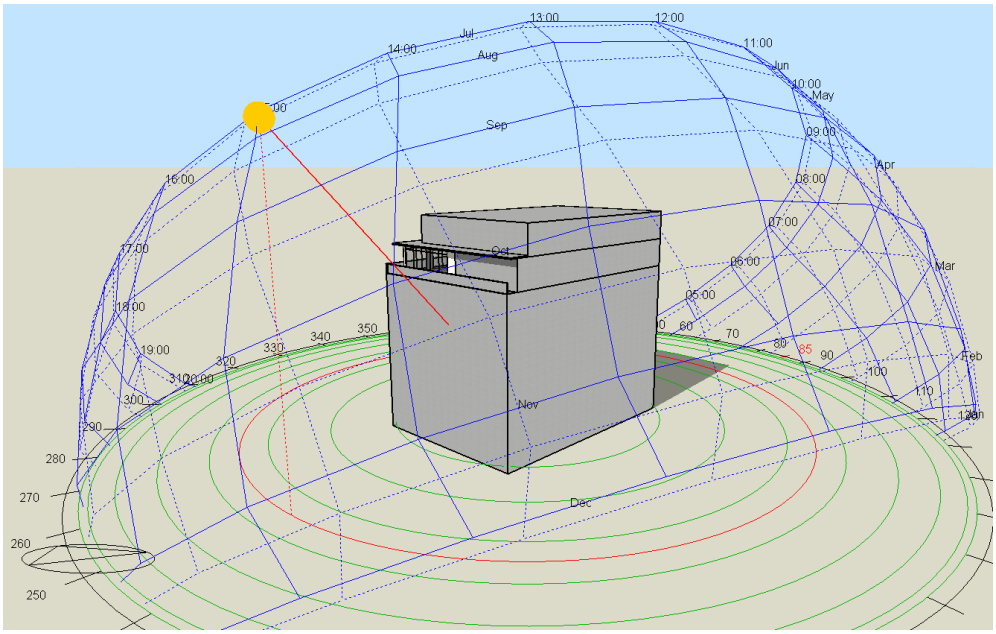
TM59: Overheating Risk Assessment
Revision 1

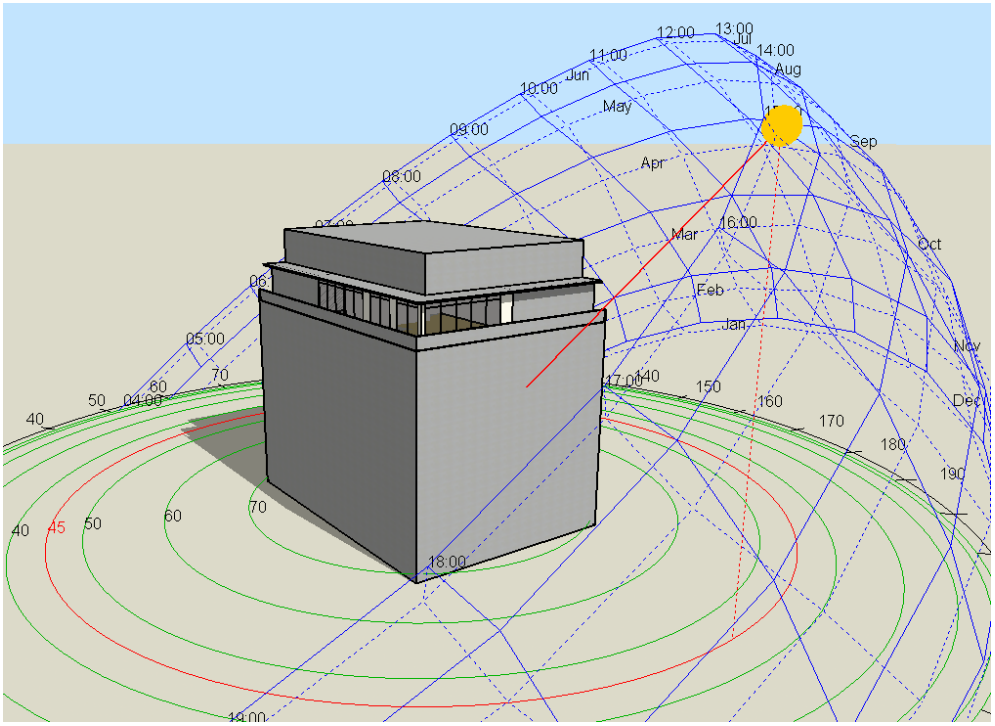
For

Flat 17, 6th Floor
55 Saffron Hill
London
EC1N 8QX

Date: 22 January 2024

EXISTING DWELLING
FLAT 17, 6th FLOOR, 55 SAFFRON HILL





Modelled in DesignBuilder 7.2.0.032 Utilizing Energyplus Version 9.4.0.002 in accordance with CIBSE AM11 using guidance outlined in CIBSE TM59.

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EXECUTIVE SUMMARY

This report seeks to demonstrate whether the existing dwelling, Flat 17, 6th Floor, 55 Saffron Hill, London meets the requirements of TM59: Design methodology for the assessment of overheating risk in homes. If the requirements of TM59 are shown not to be met, installing Air Conditioning is an option which may be sought providing the requirements of the Cooling Hierarchy within the Camden Local Plan are investigated and other methods of achieving acceptable comfort levels cannot be introduced as an alternative.

Compliance Criteria

Homes that are predominantly naturally ventilated, including homes that have mechanical ventilation with heat recovery (mvhr), with good opportunities for natural ventilation in the summer should assess overheating using the adaptive method based on CIBSE TM52 (2013).

In order to allow the occupants to 'adapt', each habitable room needs operable windows with a minimum free area that satisfies the purge ventilation criteria set in Part F of the Building Regulations for England (NBS, 2010), i.e. the window opening area should be at least 1/20th of the floor area of the room (different conditions exist for windows with restricted openings, and the same requirement applies for external doors). Control of overheating may require accessible, secure, quiet ventilation with a significant openable area.

Homes that are predominantly mechanically ventilated because they have either no opportunity or extremely limited opportunities for opening windows (e.g. due to noise levels or air quality) should be assessed for overheating using the fixed temperature method based on CIBSE Guide A (2015a).

Criteria for homes predominantly naturally ventilated

Compliance is based on passing *both* of the following two criteria:

(*a*) *For living rooms, kitchens and bedrooms*: the number of hours during which D*T* is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3 per cent of occupied hours. (CIBSE TM52 Criterion 1: *Hours of exceedance*).

(*b*) *For bedrooms only*: to guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26 °C for more than 1% of annual hours. (*Note*: 1% of the annual hours between 22:00 and 07:00 for bedrooms is 32 hours, so 33 or more hours above 26 °C will be recorded as a fail).

Criteria for homes predominantly mechanically ventilated

For homes with restricted window openings, the CIBSE fixed temperature test must be followed, i.e. all occupied rooms should not exceed an operative temperature of 26 ˚C for more than 3% of the annual occupied annual hours (CIBSE Guide A (2015a)).

Basis of Methodology for this Assessment

There is good opportunity for natural ventilation in the summer within the property and therefore the adaptive method for homes predominately naturally ventilated is to be used.

Assessments are based upon occupied hours between May and September, this equates to 3,672 hours per year for bedrooms and 1,989 hours per year for Living rooms.

Results Overview

The results obtained from the thermal model demonstrate that all bedrooms and the living room of the property do not pass the requirements of TM59, indicating significant overheating will occur.

CALCULATION PARAMETERS

The building was redeveloped in circa 2000/2001 when three addition floors were added to a conversion from offices to residential flats, Flat 17 was within the new portion and therefore u-values have been taken from ADL1 1996 of Building Regulations

U-Values

External Walls	0.45 W/m²K
Roof	0.25 W/m²K
Ground Floor	N/A
Windows	2.80 W/m²K

Glazing

Existing windows and glazed doors with an anticipated g-value of 0.70 and light transmission of 0.80 has been allowed for.

Room and Glazing Sizes

A survey was undertaken taking full dimensions, window and opening sizes and room layouts.

Thermal Mass

Medium-weight construction has been allowed to all elements, with the exception of lightweight internal partition walls.

Ventilation Strategy

Openable windows available to all occupied areas via sliding doors and windows above. Free Areas calculated accordingly. Sliding doors have been modelled as closed from 11pm with windows above being opened throughout the day and night.

In accordance with TM59 windows to be open when the internal dry bulb temperature exceeds 22°C and the room is occupied.

Lighting

In accordance with TM59, lighting gains are set at 2 W/m² and on between 6pm and 11pm.

Air Permeability

Air permeability set at 15.0 m³/(h.m²) at 50 Pa.

Internal Gains

In accordance with TM59

Room Ref:	Occupancy Gains	Lighting Gains W/m²	Equipment Gains W/m²
Bedrooms	2*	2.0	80W Peak Load*
Kitchen Living	3*	2.0	450W Peak Load*

*Adjusted in accordance with TM59 for differing time periods of the day.

Occupied Times

In accordance with TM59

Room Ref	Occupancy
Single Bedrooms	1 person at 70% gains from 11pm to 8am 1 person at full gains from 8am to 11pm
Double Bedrooms	2 people at 70% gains from 11pm to 8am 2 people at full gains from 8am to 9am and from 10pm to 11pm 1 person at full gain in the bedroom from 9am to 10pm
Living	4 people at 5% gains from 9 am to 10 pm; room is unoccupied for the rest of the day
Kitchen	4 people at 25% gains from 9 am to 10 pm; room is unoccupied for the rest of the day

Weather File

London Central DSY1 2020s, high emissions, 50% percentile scenario in accordance with TM59

OVERHEATING

Compliance is based on passing *both* of the following two criteria:

(*a*) *For living rooms, kitchens and bedrooms*: the number of hours during which D*T* is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3 per cent of occupied hours. (CIBSE TM52 Criterion 1: *Hours of exceedance*).

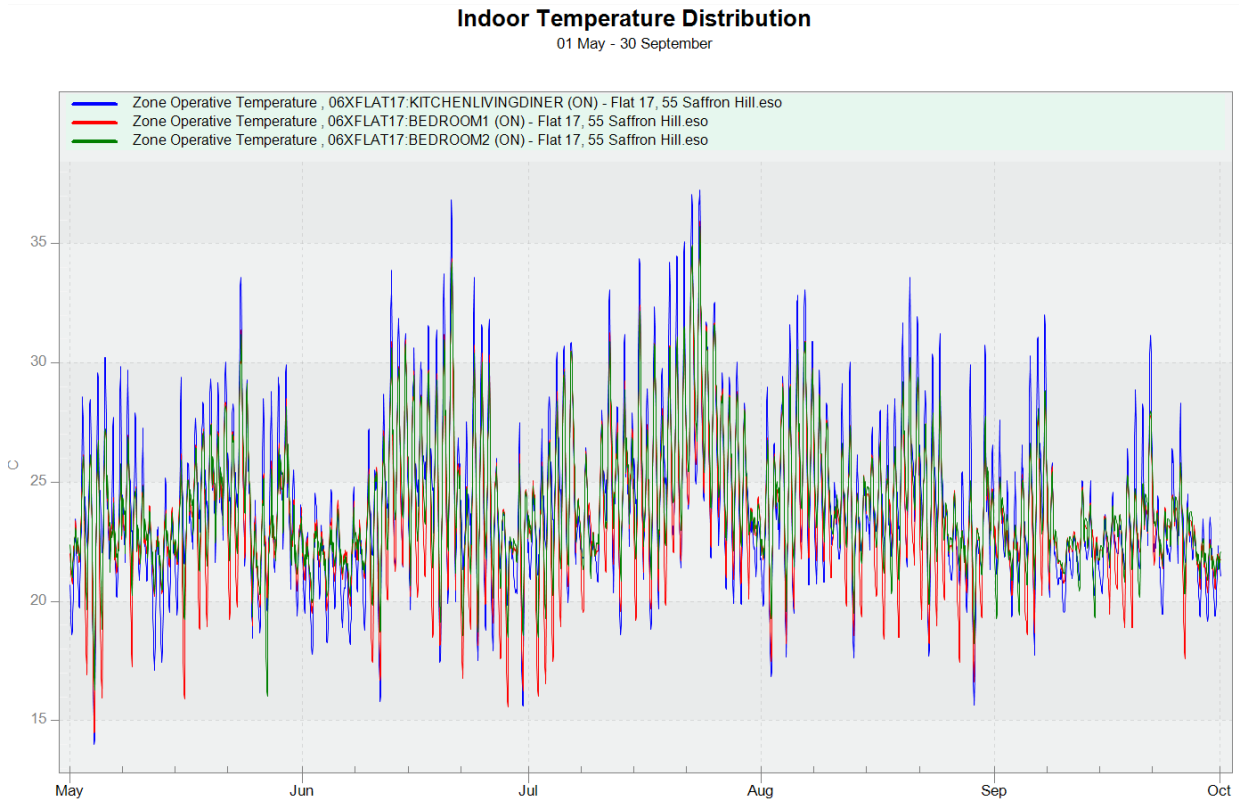
(*b*) *For bedrooms only*: to guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26 °C for more than 1% of annual hours. (*Note*: 1% of the annual hours between 22:00 and 07:00 for bedrooms is 32 hours, so 33 or more hours above 26 °C will be recorded as a fail).

Results of the above calculations can be viewed below and can be seen that all tested occupied space fails the required benchmark of CIBSE TM59

Results

Dwelling	Level	Zone	Criterion A (%)	Criterion B (hr)	Pass / Fail
Flat 17, 55 Saffron Hill	Sixth Flr	Kitchen - Living Room	16.58	N/A	Fail
	Sixth Flr	Bedroom 1	4.10	68.33	Fail
	Sixth Flr	Bedroom 2	4.02	127.00	Fail

Indoor Temperature Distribution



COOLING HIERARCHY

In accordance with Camden Local Plan 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.

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 mass and high ceilings;
- Passive ventilation;
- Mechanical ventilation;
- Active cooling.

As this is an existing dwelling many of the above design considerations, applicable to new developments, cannot be incorporated as it forms part of a block of flats. There is little option to add any further thermal mass to the property as this could compromise the structural integrity of the building. The bedrooms and living room could only be improved by changing all of the windows to include solar glazing or by adding window film to reduce solar gains. Passive shading is already included from the full length balcony above and could not be extended further.

The property already benefits from adequate passive ventilation with openable windows being readily available but not providing much in the way of through ventilation as windows are not directly opposite one another.

Mechanical ventilation would be difficult to achieve as windows are full height and ceiling levels are insufficient to install ducting without leaving it exposed which would significantly impact on headroom and the internal look of the property, however for the purposes of the exercise it is worth investigating the impact of increasing the air change rate through mechanical ventilation.

The options available to try and meet the requirements of TM59 are therefore as below.

1. Reducing solar gains by introducing window film, film can reduce solar gains by around 40%
2. Adding mechanical ventilation

See calculations overleaf

1. Adding Solar Film to Windows

The calculations have been re-run to include solar film to the windows to reduce the solar gains entering the flat by as much as 40% this would be a straightforward installation and felt this may be reasonably cost effective. However, from the results below it can be seen that all of the rooms will still overheat although an improvement has been indicated.

Dwelling	Level	Zone	Criterion A (%)	Criterion B (hr)	Pass / Fail
Flat 17, 55 Saffron Hill	Sixth Flr	Kitchen - Living Room	6.86	N/A	Fail
	Sixth Flr	Bedroom 1	1.29	43.83	Fail
	Sixth Flr	Bedroom 2	1.46	80.83	Fail

2. Adding Mechanical Ventilation at 3 Air Changes per Hour

To gain further improvement in potential comfort levels, mechanical ventilation has been added to the dynamic thermal model at 3 air changes per hour whilst leaving the window film in place. A slight improvement can be seen however the calculations still do not meet the requirements of TM59

Dwelling	Level	Zone	Criterion A (%)	Criterion B (hr)	Pass / Fail
Flat 17, 55 Saffron Hill	Sixth Flr	Kitchen - Living Room	6.4	N/A	Fail
	Sixth Flr	Bedroom 1	1.22	41.67	Fail
	Sixth Flr	Bedroom 2	1.33	68.67	Fail

The results indicate, in order to provide thermal comfort within the property, active cooling would be the only way this can be achieved within the pre-existing building.

REDUCTION IN CO2 EMISSIONS

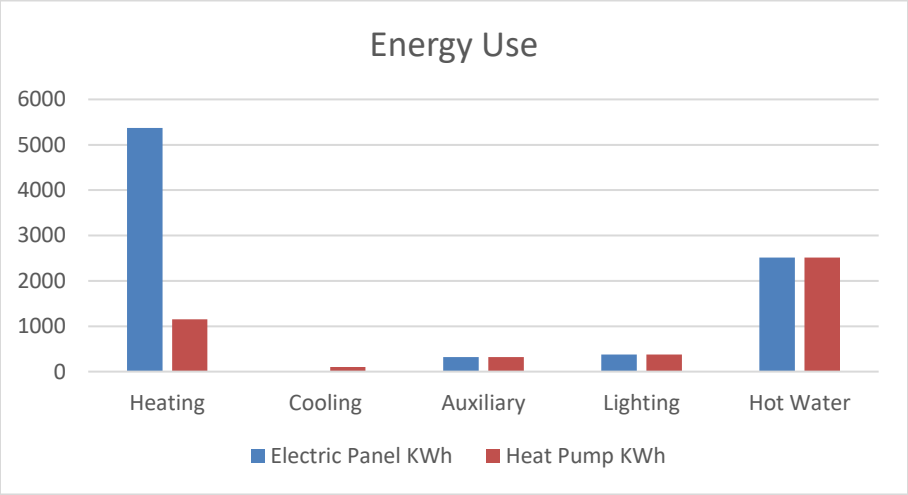
The installation of high efficient heat pumps to provide both active cooling and heating can significantly reduce the carbon footprint of a building that would otherwise be heated by electric panel heaters or electric underfloor heating throughout. There is no Gas connection to this building, however the carbon factor for gas is 0.21 Kg/CO2 per KWh whilst electricity is 0.136 Kg/CO2 per KWh, therefore electric solutions are much less carbon intensive.

The installed units are as follows with corresponding efficiencies

Bedrooms 2no. Fujitsu AOYG18KBTA2 (SCOP 4.7, SEER 8.6, EER 4.03)
Living/Kitchen 1no. Fujitsu ASYG24KMTA (SCOP 4.2, SEER 7.3, EER 3.41)

The table below demonstrates the savings which are made when calculating the energy use using the dynamic thermal modelling software.

	Electric Panel Heating KWh.annum	Heat Pump (Split AC) KWh.annum
Heating	5372	1151
Cooling	0	103
Auxiliary	324	324
Lighting	376	376
Hot Water	2515	2515
Total	8586	4468



This represents a 48% reduction in energy use and equates to a CO2 saving of 560 Kg per annum being emitted into the atmosphere.

CONCLUSION

When following the cooling hierarchy in accordance with the Camden Local Plan, it is demonstrated that active cooling should be allowable within this dwelling as all other options within the hierarchy have been explored and tested within the realms of the existing flat to bring the flat within reasonable comfort levels as set by CIBSE TM59. The dynamic thermal modelling proved that satisfactory comfort levels are not achievable without active cooling.

Furthermore, the installation of high efficiency heat pumps to provide both heating and cooling would saving in the order of 560 Kg of CO_2 being emitted into the atmosphere each year, another valuable statistic in favor of the installation of heat pumps.