Flat B

34 Parkhill Road, London, NW3 2YP

Part O
CIBSE TM59 Overheating Assessment

To show requirements for Comfort Cooling

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1.0 Executive Summary

A Dynamic Simulation Thermal Model has been created for Flat B, 34 Parkhill Road, London to determine if the Habitable rooms including Kitchen/Living and bedroom areas of the Dwelling satisfies a Part O CIBSE TM 59 Overheating Risk Assessment.

The overheating assessment has been carried out under the CIBSE TM59 Methodology and results have been produced for the years 2020, 2050, and 2080, as well as for different Design Weather Years DSY1, DSY2, and DSY3.

All windows are to comply with Building regulation requirements regarding security, protection from falling and ease of escape etc.

Table 1 - Summary of CIBSE TM59 Overheating Assessment Results - Fail

	Number of Rooms Assessed	Number of Rooms Passing CIBSE TM59
		DSY1 2020
Original Building	4	0
Passive Upgrades	4	0

The summary of results shows that:

- Existing Building fails the overheating assessment,
- Introduction of passive improvements i.e. Solar control film to all windows and doors along with additional mechanical ventilation to all habitable rooms, all the rooms would still not satisfy the overheating criteria under the DSY1 2020 weather data, therefore failing the requirements of CIBSE TM59.

Fail

To prevent overheating now and in future years to come the client wishes to install comfort cooling throughout the building serving all habitable rooms.

Table 2 - Summary of CIBSE TM59 Overheating Assessment Results - Pass

	Number of Rooms Assessed	Number of Rooms Passing CIBSE TM59				
		DSY1 2020	DSY1 2050	DSY1 2080	DSY2 2020	DSY3 2020
Comfort Cooling	4	4	4	4	4	4

The summary of results now shows that all the rooms would satisfy the overheating criteria under the DSY1 2020 weather data, therefore failing the requirements of CIBSE TM59.

Pass

The proposed Fujitsu AOEG30KBTA4 air conditioning unit uses R32 refrigerant which is the most balanced refrigerant in terms of environmental impact, energy efficiency, and cost-effectiveness.

It has a Global Warming Potential (GWP) of just 675, considerably lower than other refrigerants such as R410A that has a value of 2,090, or R22 that is 1,810.

The proposed air conditioning system would have a cooling efficiency EER of 3.90 and heating efficiency COP of 4.90, indicating that the proposed system would be very environmentally friendly and cost effective for the occupiers to run.

2.0 Introduction

EEABS (Elmstead Energy Assessments & Building Services) were instructed to carry the Part O CIBSE TM59 Overheating Risk Assessments for Flat B, 34 Parkhill Road, London.

The purpose of the overheating assessment is to provide advice as to the possibility of overheating occurring within the dwelling. A dwelling shown to be satisfying the CIBSE TM59 criteria can be described as providing a comfortable internal environment, within sensible limits, for the occupants.

Any room that maybe initially failing the criteria can have mitigating methods for reducing the amount of overheating investigated.

CIBSE TM59 is one way of complying with Part O of the building regulations and is recommended by The Good Homes Alliance as one method of providing overheating guidance within homes.

As CIBSE TM59 requires the use of Dynamic Simulation Modelling (DSM) software capable of simulating the temperature every hour in a year and as it uses location specific CIBSE DSY (Design Summer Year) weather data, it is thought to be far more accurate than other types of overheating assessments such as SAP, PHPP, or the Home Quality Mark.

O1 ONLINE VERSION

Section 2: Dynamic thermal modelling

2.1 This section details a dynamic thermal modelling method for demonstrating compliance with requirement O1. It provides a standardised approach to predicting overheating risk for residential buildings using dynamic thermal modelling as an alternative to the simplified method in Section 1.

2.2 The methodology is suitable for all residential buildings. It may offer the designer additional design flexibility over the solutions in Section 1 in the following situations.

a. Residential buildings with very high levels of insulation and airtightness.

b. Residential buildings with specific site conditions that mean the building is not well represented by the two locations in paragraph 1.3, for example Manchester city centre (see Appendix C).

NOTE: Local microclimates may not be well reflected by the geographically closest weather file.

c. Residential buildings that are highly shaded by neighbouring properties, structures or landscape.

Dynamic thermal modelling method

2.3 To demonstrate compliance using the dynamic thermal modelling method, all of the following guidance should be followed.

a. CIBSE's TM59 methodology for predicting overheating risk.

b. The limits on the use of CIBSE's TM59 methodology set out in paragraphs 2.5 and 2.6.

c. The acceptable strategies for reducing overheating risk in paragraphs 2.7 to 2.11.

2.4 The building control body should be provided with a report that demonstrates that the residential building passes CIBSE's TM59 assessment of overheating. This report should contain the details in CIBSE's TM59, section 2.3.

Figure 1 - Part O Section 2 Building Regulations

2.1 Development Proposal

The proposed Site is in Parkhill Road, London.

2.2 Architectural Information Provided

This assessment has been based on drawings and information provided to us by our client. Location plan of the dwelling can be seen below.

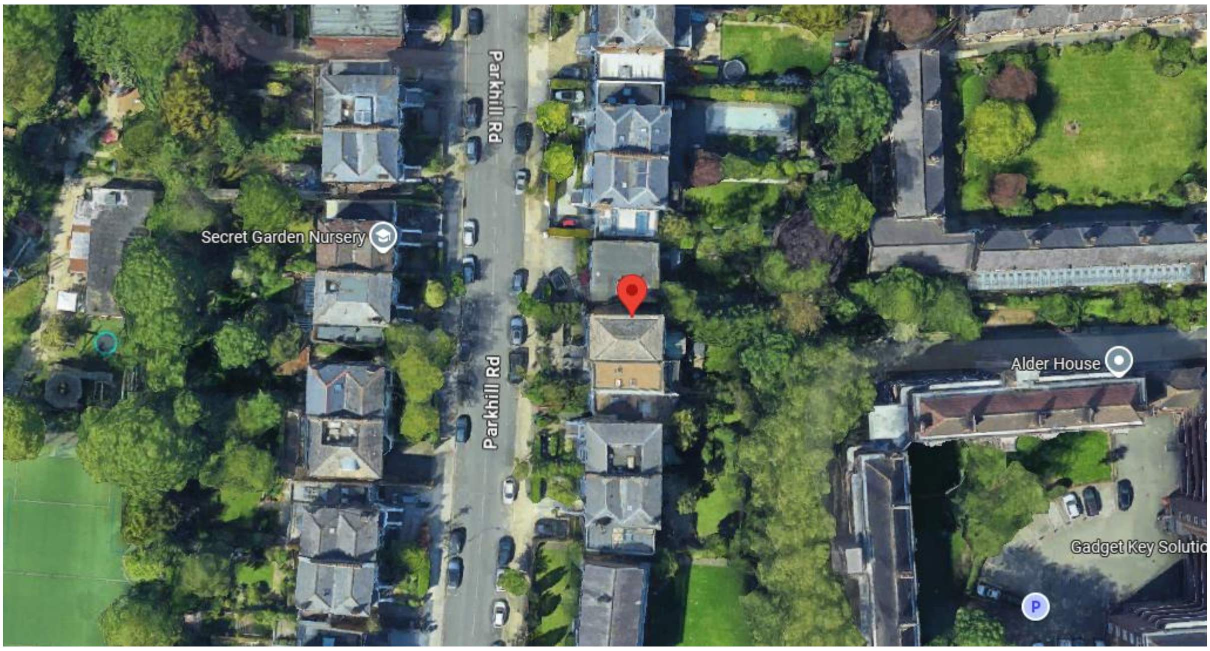


Figure 2 - Location Plan

2.3 Assessment Limitations

The appraisals within this report are based on the CIBSE TM59 methodology and should not be understood as an exact calculation of internal temperatures or overheating experienced. Passing of CIBSE TM59 criteria does not mean that the spaces will be comfortable all year round, but rather that the overheating risk is limited to an acceptable level when using pre-defined parameters.

Weather conditions at the site may be different to those within the weather data used and occupants may behave differently than suggested within this report, for example not opening windows when required or having higher internal heat gains than allowed for. With the impacts of climate change increasing, the occurrence of extreme heat wave events is also likely to escalate.

Overheating can be subjective with vulnerable occupants such as infants or the elderly more likely to be affected. If an occupant is suffering from the effects of overheating, please do not hesitate to seek medical help.

All details outlined in this assessment have been based, wherever possible, on those provided by the client or sensible design assumptions.

3.0 Dynamic Simulation Modelling

EDSL TAS Dynamic Simulation Modelling software has been used for the CIBSE TM59 Overheating Assessment. The EDSL TAS software has been approved by the Department for Communities and Local Government (DCLG) for use as a Dynamic Simulation Model (DSM) software package.

As part of its approval process, the TAS software had to demonstrate that it satisfies all the tests and other requirements defined within sections 2 and 3 of the documents "CIBSE TM33:2006, CIBSE standard tests for the assessment of building services design software". The thermal modelling has also been carried out in accordance with CIBSE AM11 Building Energy and Environmental Modelling.

The following images are taken from the EDSL TAS software used for the overheating assessment.

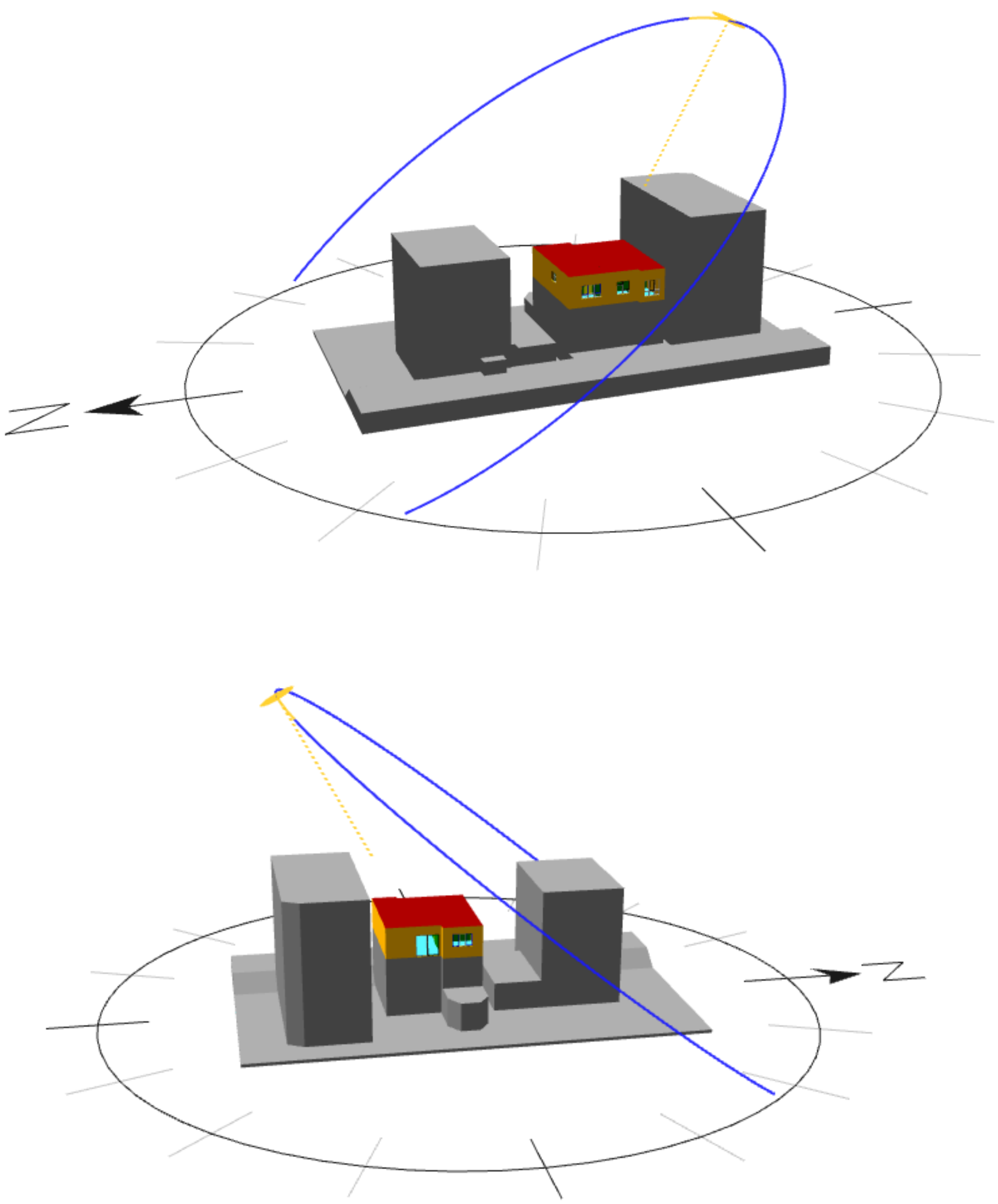


Figure 3 - EDSL TAS Model

4.0 Model Details and Assumptions

The following construction, glazing, and building details have been used within the EDSL TAS computer model to achieve a pass under the CIBSE TM59 Assessment.

4.1 Weather Data

The proposed development is in London. CIBSE provide weather data for 14 different locations across the UK, with 3 separate weather files for London. We believe the most appropriate weather data to use for the proposed building would be London (LWC) weather data.

For the TM59 overheating assessment Design Summer Year (DSY1) High emissions, 50th Percentile weather data for the year 2020 must be used, however we have also simulated the dwelling under both 2050 and 2080 weather data to provide a greater analysis of how the units are likely to perform in the future. As well as using DSY 2 and DSY 3 weather data that simulates different types of summer conditions.

This allows for any mitigating measures that may be required to be incorporated early in the design stages. A description of DSY weather types can be seen below:

- DSY1: Moderately warm summer
- DSY2: Short, intense warm spell
- DSY3: Long, less intense warm spell

4.2 Constructions

Construction details for the building were assumed as below.

Table 3 - Construction Details

Construction	U-Value (W/m².K)
External Walls	0.50
Roof	0.25
Party Floor	-
Internal Walls	-

4.3 Glazing

Glazing U-Values for the development were also assumed as below.

Table 4 - Glazing Details

Element	Glazing Type	Overall U-Value (W/m².K)	Solar Gain G-Value
Existing Glazing	Double Glazing	2.2	0.63

4.4 Infiltration

We have assumed an infiltration rate of 0.15 ACH.

4.5 Natural Ventilation

A summary of the natural ventilation openings and their profiles used within the model can be seen below.

- A whole house infiltration rate of 0.15 ACH has been assumed.
- Windows/Glazed doors serving Living/Kitchen/Dining areas were assumed to be openable when required during the hours of 8am - 11pm. Outside of these hours they would be closed for security purposes.
- Windows/Glazed doors serving Bedroom areas were assumed to be openable when required during the hours of 8am - 11pm.
- At night (11pm to 8am), The Bedroom Windows and doors are modelled as open if the internal temperature exceeds 23°C at 11pm.
- Openable Windows in all other rooms are assumed to start to open once the internal temperature reaches 22°C and fully open at 26°C during the hours of 8am - 11pm
- Internal Doors were assumed to be openable during the hours of 8am - 11pm to allow cross ventilation between rooms, outside of these hours they would be closed for privacy purposes.

4.6 Background Ventilation

Background air turnover rates of 0.3 l/s per m^2 have been accounted for within this assessment in line with Part F of the building regulations.

4.7 Occupancy and Internal Heat Gains

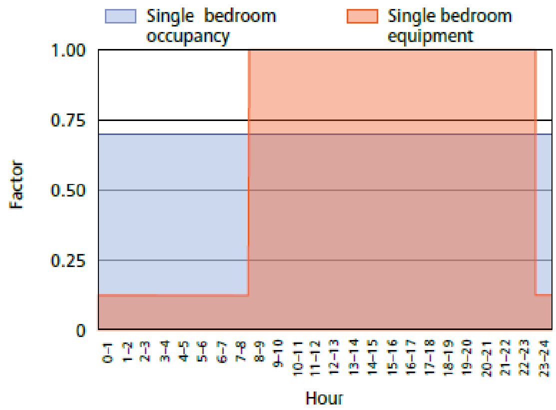
As each room within a dwelling will be used differently depending on the occupant's requirements, CIBSE TM59 provides a mandatory set of occupancy profiles and internal heat gains to be used across all assessments. This ensures that each dwelling is assessed on a level basis and allows the merits of any overheating reduction techniques to be evaluated effectively.

Dependent on the type of unit (Studio, 1 Bedroom, 2 Bedroom or 3 Bedroom) and the type of room being assessed (Living Room, kitchen, Double or Single Bedroom), TM59 provides a full list of occupancy and heat gain profiles to use within the computer model.

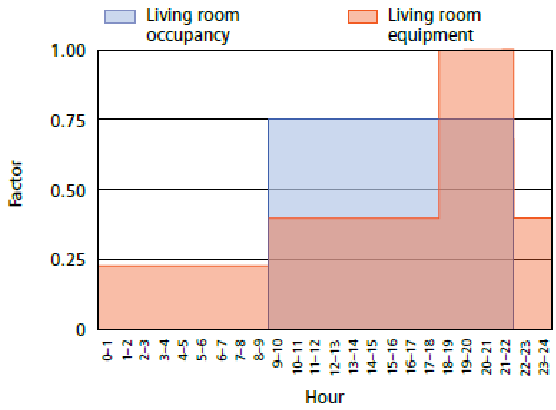
Internal lighting gain is assumed to be 2 W/m2 in all occupied rooms.

Unit/ room type	Occupancy	Equipment load
Studio	2 people at all times	Peak load of 450 W from 6 pm to 8 pm*. 200 W from 8 pm to 10 pm 110 W from 9 am to 6 pm and 10 pm to 12 pm Base load of 85 W for the rest of the day
1-bedroom apartment: living room/kitchen	1 person from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 450 W from 6 pm to 8 pm 200 W from 8 pm to 10 pm 110 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 85 W for the rest of the day
1-bedroom apartment: living room	1 person at 75% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 150 W from 6 pm to 10 pm 60 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 35 W for the rest of the day
1-bedroom apartment: kitchen	1 person at 25% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 300 W from 6 pm to 8 pm Base load of 50 W for the rest of the day
2-bedroom apartment: living room/kitchen	2 people from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 450 W from 6 pm to 8 pm 200 W from 8 pm to 10 pm 110 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 85 W for the rest of the day
2-bedroom apartment: living room	2 people at 75% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 150 W from 6 pm to 10 pm 60 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 35 W for the rest of the day
2-bedroom apartment: kitchen	2 people at 25% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 300 W from 6 pm to 8 pm Base load of 50 W for the rest of the day
3-bedroom apartment: living room/kitchen	3 people from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 450 W from 6 pm to 8 pm 200W from 8 pm to 10 pm 110 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 85 W for the rest of the day
3-bedroom apartment: living room	3 people at 5% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 150 W from 6 pm to 10 pm 60 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 35 W for the rest of the day
3-bedroom apartment: kitchen	3 people at 25% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 300 W from 6 pm to 8 pm base load of 50 W for the rest of the day
Double bedroom	2 people at 70% gains from 11 pm to 8 am 2 people at full gains from 8 am to 9 am and from 10 pm to 11 pm 1 person at full gain in the bedroom from 9 am to 10 pm	Peak load of 80 W from 8 am to 11 pm Base load of 10 W during the sleeping hours
Single bedroom (too small to accommodate double bed)	1 person at 70% gains from 11 pm to 8 am 1 person at full gains from 8 am to 11 pm	Peak load of 80 W from 8 am to 11 pm Base load of 10 W during sleeping hours
Communal corridors	Assumed to be zero	Pipework heat loss only; see section 3.1 above

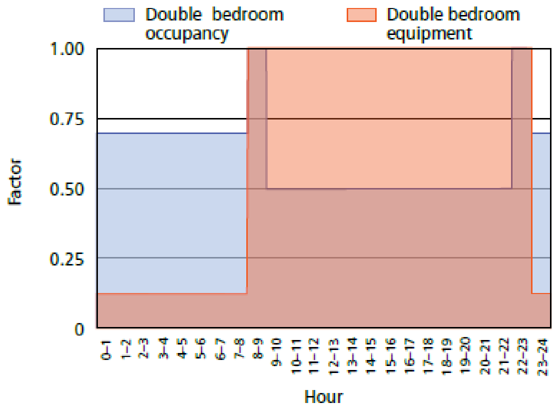
Figure 4 - Occupancy and Heat Gain Profiles from CIBSE TM59 Table 2



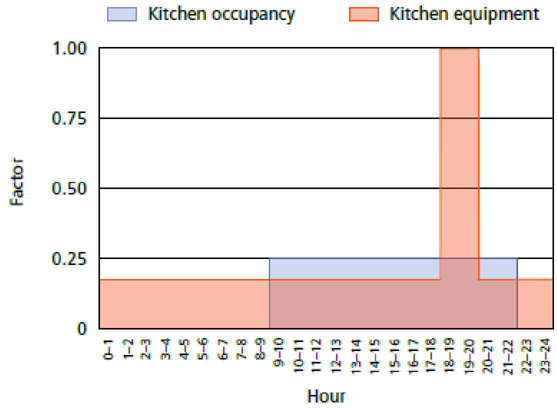
Heat gain profile: single bedroom



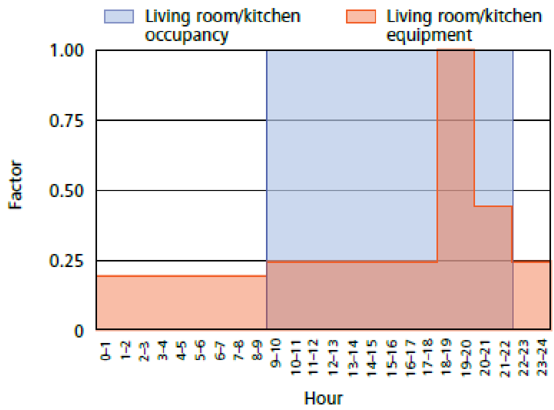
Heat gain profile: living room



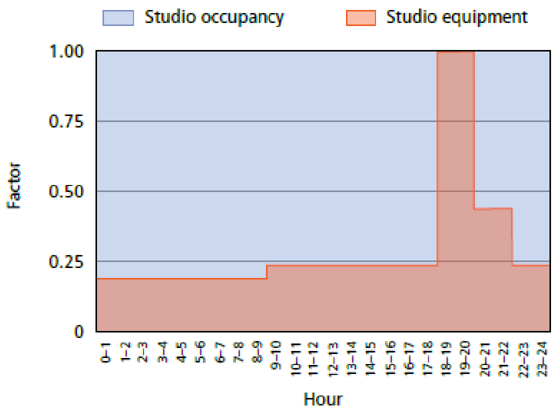
Heat gain profile: double bedroom



Heat gain profile: kitchen



Heat gain profile: combined living room/kitchen



Heat gain profile: studio

Figure 5 - Graphs of the CIBSE TM59 Heat Gain Profiles for Different Room Types

5.0 CIBSE TM59 Overheating Methodology

CIBSE TM59 is the very latest design methodology provided by CIBSE (Chartered Institute of Building Services Engineers) for the assessment of overheating risk in homes.

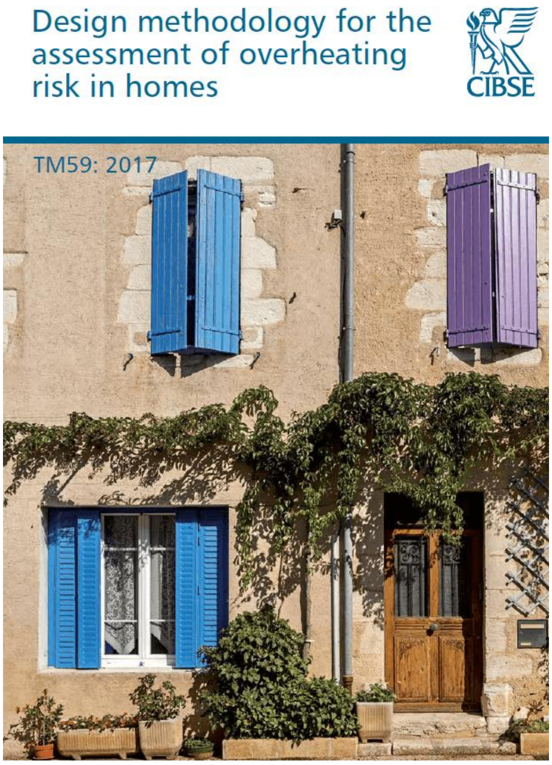


Figure 6 - CIBSE TM 59

To comply with the CIBSE TM59 Overheating Methodology the following two criteria need to be passed.

- For Living Rooms, Kitchens, and Bedrooms – The number of hours during which ΔT is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3% of occupied hours.
- For Bedrooms only – To guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10pm to 7am shall not exceed 26°C for more than 1% of annual hours.

For predominantly mechanically ventilated homes, the following criteria needs to be met.

- All occupied rooms should not exceed an operative temperature of 26°C for more than 3% of the annual occupied hours.

6.0 Overheating Assessment Results

The results of the CIBSE TM59 overheating assessments carried out, for Flat B, 34 Parkhill, London described throughout this report, can be seen below with more detailed results found within Appendices.

6.1 CIBSE TM59 Results - Original

Table 5 - Summary of CIBSE TM59 Overheating Assessment Results - Original

	Number of Rooms Assessed	Number of Rooms Passing CIBSE TM59
		DSY1 2020
Original Building	4	0

The summary of results shows that the dwelling as it currently stands would fail the Part O Overheating Assessment.

6.2 CIBSE TM59 Results - Passive Design following Cooling Hierarchy

To try to improve the overheating risk of the flat through passive means, the cooling hierarchy has been followed. However, certain passive upgrades would be unfeasible for this building, such as external shading devices, due to the building being in a conservation area.

<u>Cooling Hierarchy</u>

1. Limit Unwanted Solar Gains - To limit unwanted solar gains entering the property solar control film could be applied to all windows and glazed doors. This would lower the Solar Gain G-Value of the glazing from 0.63 under the original design to 0.46.
2. Minimise Internal Heat Gains - Occupants will be encouraged to install efficient lighting and appliances and will ensure that they are switched off when not in use.
3. Manage Heat within the Building - The Building is existing with no proposed construction changes being carried out, this means that it would not be possible to increase the thermal mass of the structure or increase ceiling heights.
4. Passive Ventilation - Windows are already openable and the flat can utilise cross ventilation.
5. Mechanical Ventilation - A Mechanical Ventilation system could be installed in the flat providing an additional 60 l/s of fresh air. However, this would increase energy consumption and air would only be provided at external temperatures. Meaning that if it is hot outside, it would provide hot air inside.

Table 6 - Summary of CIBSE TM59 Overheating Assessment Results - Passive Upgrades

	Number of Rooms Assessed	Number of Rooms Passing CIBSE TM59
		DSY1 2020
Passive Upgrades	4	0

The results show that even with the passive measures outline above the rooms would still fail the assessment.

6.3 CIBSE TM59 Results - Comfort Cooling

As the building would still be failing the overheating assessment even after following the cooling hierarchy, it makes sense to go straight to the installation of an air conditioning system.

A standard AOEG30KBTA4 Fujitsu 8kW Multi split system serving 2 x 2kW wall mounted indoor units to bedrooms & 1 x 4.2kW wall mounted indoor unit will be installed in the living area.

To prevent overheating now and in future years to come we have recommended having comfort cooling installed throughout the building serving all habitable rooms.

Table 7 - Summary of CIBSE TM59 Overheating Assessment Results - Comfort Cooled

	Number of Rooms Assessed	Number of Rooms Passing CIBSE TM59				
		DSY1 2020	DSY1 2050	DSY1 2080	DSY2 2020	DSY3 2020
Comfort Cooling	4	4	4	4	4	4

The summary of results now shows that all the rooms would satisfy the overheating criteria under the DSY1 2020 weather data, therefore passing the requirements of CIBSE TM59.

The habitable rooms would also satisfy the overheating criteria under future weather years, and different types of summers, indicting that the installation of air conditioning would be the most feasible choice as this would future proof the property.

6.3.1 Sustainability

The proposed Fujitsu AOEG30KBTA4 air conditioning unit uses R32 refrigerant which is the most balanced refrigerant in terms of environmental impact, energy efficiency, and cost-effectiveness.

It has a Global Warming Potential (GWP) of just 675, considerably lower than other refrigerants such as R410A that has a value of 2,090, or R22 that is 1,810.

The proposed air conditioning system would have a cooling efficiency EER of 3.90 and heating efficiency COP of 4.90, indicating that the proposed system would be very environmentally friendly and cost effective for the occupiers to run.

Appendices

Appendix A - CIBSE TM59 Overheating Results DSY1-2020

Existing Building

Zone Name	Room Use	Occupied Summer Hours	Max. Exceedable Hours	Criterion 1: #Hours Exceeding Comfort Range	Annual Night Occupied Hours for Bedroom	Max Exceedable Night Hours	Criterion 2: Number of Night Hours Exceeding 26 °C for Bedrooms.	Result
Flat B Bedroom 1	Bedroom	3672	110	83	3285	32	67	Fail
Flat B Bedroom 2	Bedroom	3672	110	135	3285	32	73	Fail
Flat B Kitchen	Kitchen	1989	59	145	N/A	N/A	N/A	Fail
Flat B Reception	Living Room	1989	59	111	N/A	N/A	N/A	Fail

Upgraded Passive Measures

Zone Name	Room Use	Occupied Summer Hours	Max. Exceedable Hours	Criterion 1: #Hours Exceeding Comfort Range	Annual Night Occupied Hours for Bedroom	Max Exceedable Night Hours	Criterion 2: Number of Night Hours Exceeding 26 °C for Bedrooms.	Result
Flat B Bedroom 1	Bedroom	3672	110	56	3285	32	49	Fail
Flat B Bedroom 2	Bedroom	3672	110	92	3285	32	57	Fail
Flat B Kitchen	Kitchen	1989	59	99	N/A	N/A	N/A	Fail
Flat B Reception	Living Room	1989	59	69	N/A	N/A	N/A	Fail

Comfort Cooled Building

Zone Name	Room Use	Annual Occupied Hours	Max. Exceedable Hours	Criterion 1: Number of Hours Exceeding 26 °C	Result
Flat B Reception	Living Room	4745	142	0	Pass
Flat B Kitchen	Kitchen	4745	142	15	Pass
Flat B Bedroom 1	Bedroom	8760	262	0	Pass
Flat B Bedroom 2	Bedroom	8760	262	0	Pass

Appendix B - CIBSE TM59 Overheating Results DSY1-2050

Comfort Cooled Building

Zone Name	Room Use	Annual Occupied Hours	Max. Exceedable Hours	Criterion 1: Number of Hours Exceeding 26 °C	Result
Flat B Reception	Living Room	4745	142	0	Pass
Flat B Kitchen	Kitchen	4745	142	36	Pass
Flat B Bedroom 1	Bedroom	8760	262	0	Pass
Flat B Bedroom 2	Bedroom	8760	262	0	Pass

Appendix C - CIBSE TM59 Overheating Results DSY1-2080

Comfort Cooled Building

Zone Name	Room Use	Annual Occupied Hours	Max. Exceedable Hours	Criterion 1: Number of Hours Exceeding 26 °C	Result
Flat B Reception	Living Room	4745	142	0	Pass
Flat B Kitchen	Kitchen	4745	142	56	Pass
Flat B Bedroom 1	Bedroom	8760	262	0	Pass
Flat B Bedroom 2	Bedroom	8760	262	0	Pass

Appendix D - CIBSE TM59 Overheating Results DSY2-2020

Comfort Cooled Building

Zone Name	Room Use	Annual Occupied Hours	Max. Exceedable Hours	Criterion 1: Number of Hours Exceeding 26 °C	Result
Flat B Reception	Living Room	4745	142	0	Pass
Flat B Kitchen	Kitchen	4745	142	8	Pass
Flat B Bedroom 1	Bedroom	8760	262	0	Pass
Flat B Bedroom 2	Bedroom	8760	262	0	Pass

Appendix E - CIBSE TM59 Overheating Results DSY3-2020

Comfort Cooled Building

Zone Name	Room Use	Annual Occupied Hours	Max. Exceedable Hours	Criterion 1: Number of Hours Exceeding 26 °C	Result
Flat B Reception	Living Room	4745	142	0	Pass
Flat B Kitchen	Kitchen	4745	142	32	Pass
Flat B Bedroom 1	Bedroom	8760	262	0	Pass
Flat B Bedroom 2	Bedroom	8760	262	0	Pass