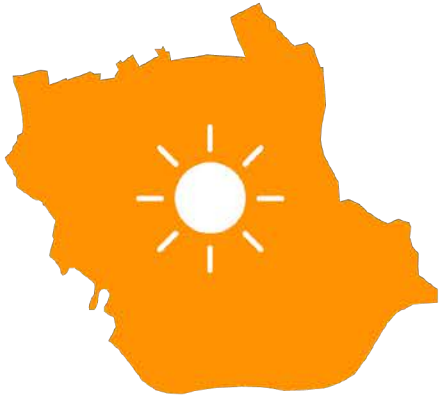
Newham London



NEW LOCAL PLAN | CLIMATE EMERGENCY

Overheating guidance and topic paper

May 2022 | Rev D

Levitt Bernstein People.Design

ELEMENTA

Currie & Brown

Etude

Who prepared this guidance document and topic paper?

The London Borough of Newham commissioned a multidisciplinary team of architects, engineers, cost consultants and energy specialists to develop this guidance document and topic paper.

The work was directed by Ellie Kuper Thomas (Planning Policy Manager) and James Scantlebury (Senior Planner).

Levitt Bernstein is an award-winning architectural practice with a progressive and sustainable outlook.

Levitt Bernstein have specialised in the design of homes since 1968 and have a national reputation for our work in policy, standards and regulation. This includes work on the Nationally Described Space Standard and the three-tier standard for Approved Document M..

Elementa Consulting, a member of Integral Group, provide Mechanical, Electrical and Public Health (MEP) services design, fire and lighting design, resilience consultancy, strategic sustainability, wellness consultancy and advanced energy modelling for projects in the UK and abroad.

Elementa operate in all sectors of the built environment.

Currie & Brown has developed over the last 15 years specialist expertise in cost, technical and commercial advice on sustainability in construction, high performance and low carbon buildings. They provide specialist cost and techno-economic modelling to support the development of national policy and work with a range of private and public developers to maximise the benefits of their projects.

Etude is a SME of engineers specialising in energy and sustainability and dedicated to finding solutions to the climate crisis. One of our strengths is to combine building projects (which we work on at all phases) and strategic technical work on Net Zero carbon, including evidence bases and action plans. We regularly advise Local Authorities on carbon reduction, including Greater Cambridge, Cornwall Council, and many London boroughs.

Why does overheating need to be assessed?

In an increasingly warming climate, overheating in homes is becoming even more critical. All new homes should be designed to mitigate overheating effectively. Ideally, this should be reflected in the way planning applications are assessed, to ensure the design of new homes strikes the right balance between helpful heat gain in winter and unhelpful heat gain in summer. This topic paper provides a high-level overview of overheating assessment methods to allow for an effective planning assessment process.

In the context of achieving Net Zero Carbon, it is also important that 'passive design' (i.e. good window design and external shading) are prioritised over 'active cooling' (i.e. air-conditioning) so that homes can operate as efficiently as possible.

Approved Document O was released in December 2021 which outlines an approach to mitigating overheating and complying to the latest building regulations. However, it also important that a robust planning assessment process is put in place by the council to ensure the right design considerations are made at the right stages of the design in order to be coordinated effectively.

This Topic Paper provides :

- An overview of current policy and regulations
- An overview of supplementary guidance
- Recommendations for improvements to Newham's planning process
- An overview of TM59 Overheating assessment methodology
- Watch points that the council should look out for in terms of good elevation design and spot checking TM59 overheating risk assessments

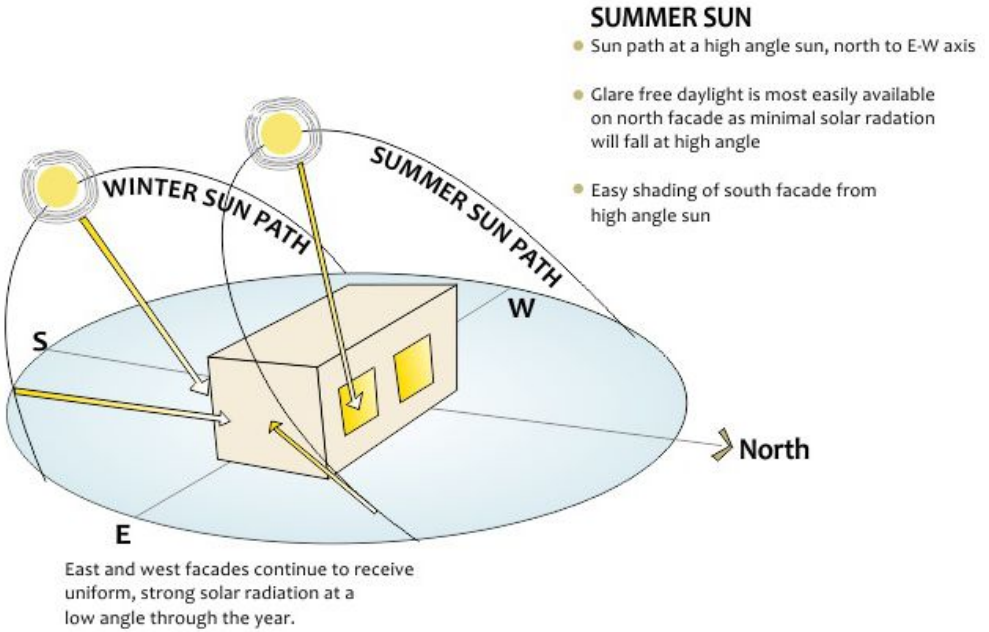
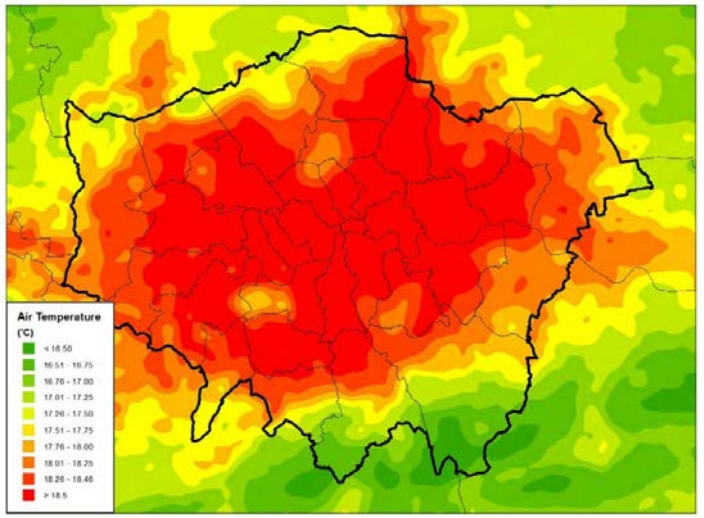


Diagram to demonstrate the sun path and the impact of orientation.



Greater London Air Temperature Map: Homes in London are particularly at risk to overheating due to the urban heat island effect.

Current policy and regulation

Policy in Newham's Local plan & London Plan

- Policy SC1 in the Newham's Local plan addresses overheating, which also refers to GLA guidance i.e. London Plan - Policy S14 Managing heat risk.
- This requires the use of thermal modelling for assessing overheating risks in major developments only. CIBSE TM59 for Domestic Developments and CIBSE TM52 for Non-Domestic.
- Applicants for referable and major residential schemes are also required to submit the Good Homes Alliance overheating risk tool to the GLA at early design stages (more information provided on the next page).

Building Regulations

Approved Document O was released in December 2021 and sets out two methods for calculating and assessing overheating in domestic properties. The main requirements are to demonstrate the project **limit unwanted solar gains**, and **provides an adequate means to remove heat from indoor environment**.

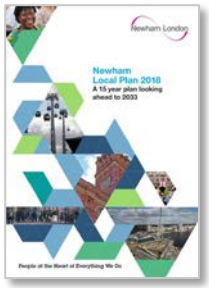
Compliance is demonstrated by either of the following methods:

1. Simplified Method

Which categorizes buildings according to location and cross ventilation applicability. For this method compliance is based on maximum glazing areas; minimum opening areas.

2. Dynamic Thermal Modelling

This is in accordance with the CIBSE TM59 methodology but with additional limitations.

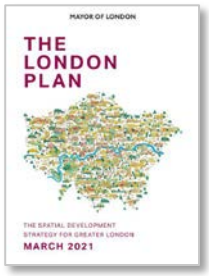


Newham Local Plan - Policy SC1 - Environmental Resilience

3d. Development should demonstrate that the risks of overheating have been addressed through design and construction choices, particularly in the case of high density and public realm schemes and in relation to energy and glazing solutions.

In terms of implementation, Newham Local Plan recommends:

In relation to overheating, reference to guidance from recognised sources should be made. Major residential schemes should conduct modelling that takes in to account climate change and is in line with relevant GLA and CIBSE guidance.



London Plan - Policy SI 4 Managing heat risk

A. Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure.

B. 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
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. provide passive ventilation
5. provide mechanical ventilation
6. provide active cooling systems.

Approved Document - O1 Overheating mitigation (requirement)

1) Reasonable provision must be made in respect of a dwelling, institution or any other building containing one or more rooms for residential purposes, other than a room in a hotel ("residences") to:
   a) limit unwanted solar gains in summer
   b) provide an adequate means to remove heat from the indoor environment.
2) In meeting the obligations in paragraph (1) :
   a) account must be taken of the safety of any occupant, and their reasonable enjoyment of the residence; and
   b) mechanical cooling may only be used where insufficient heat is capable of being removed from the indoor environment without it.

Recommended supplementary guidance

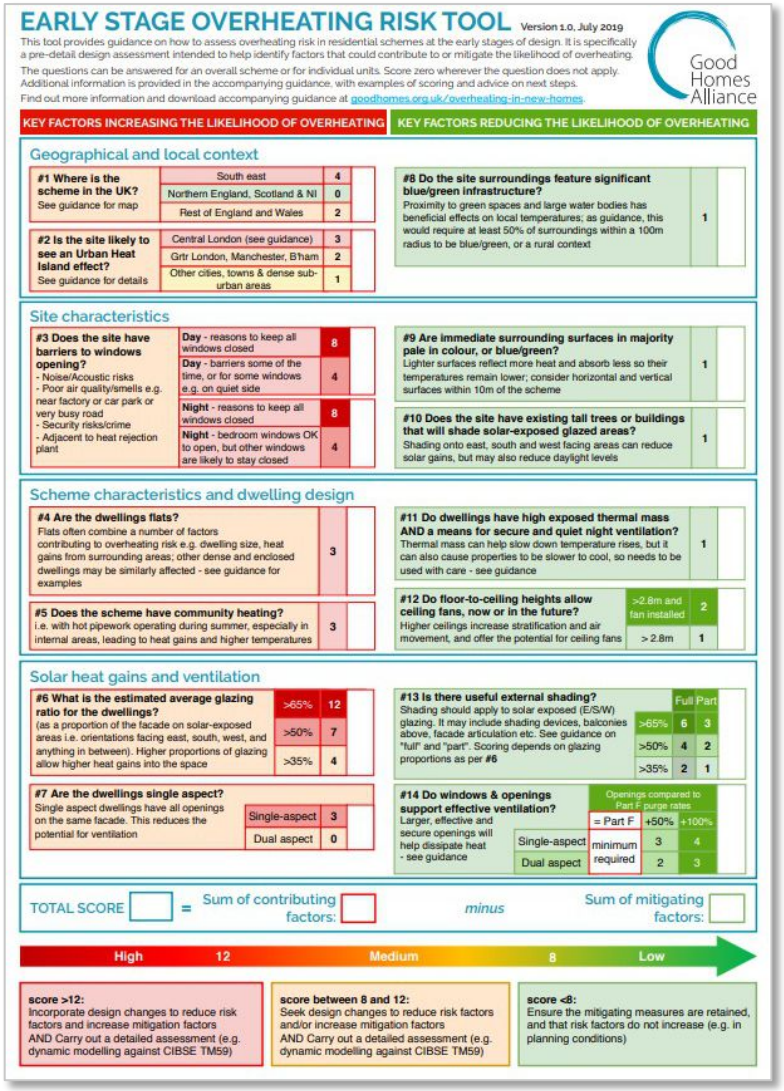
Overheating Risk Tool

The Good Homes Alliance provides an early stage overheating risk tool. This identify risks at early stages of development. Applicants for major and referable developments are required to submit this to the GLA at early design stages. We recommend this as a useful tool to for applicants to fill out at Pre-application stage for both major and minor schemes.

The tool is very useful as it is very easy for developers/ applicants to complete, and it is easy to interpret for planning officers. However it is important to note that it is not a detailed assessment and should not be used in place of a full TM59 assessment. It looks at the development as a whole, rather than individual homes. Thus there is a risk that a some dwellings with high overheating risk dwellings will be masked by the rest of the well performing homes.

Scoring to determine level of overheating risk

Applicants should fill out the scoring criteria and total up the score to determine whether the application is considered low (<8), medium (8-12) or high risk (>12). For medium or high risk score it is recommended that design changes are made to reduce risk/mitigate overheating and that a CIBSE TM59 assessment is carried out.



Extract of the Good Homes Alliance Early Stage Overheating Tool

Recommendations for Newham

Policy recommendation

- That all schemes must submit the Good Homes Alliance 'Early Stage Overheating Risk Tool to Newham at early design stages. (Currently this must be submitted to the GLA, but only for Major and referable schemes).
- Proof of ability to meet the Building Regulations Part O provided as part of the planning application.

Improvements to pre-application assessment process

1. Advise that applicants provide evidence of Good Homes Alliance 'Early Stage Overheating Risk Tool' for both minor and major applications. If the Good Homes Alliance 'Early Stage Overheating Risk Tool' identified as a medium or high risk score (>8) advise applicants to use the Dynamic Thermal Modelling method in accordance with CIBSE TM59 but with the additional limitations stipulated in Approved Document O:
    - For minor applications evidence of the Dynamic Thermal modelling overheating risk assessment should be provided at the time of the planning application
    - For major application initial results of the Dynamic Thermal modelling overheating risk assessment should be provided during the pre-application process and a further iteration of the assessment at the time of planning application.

    See page 6 for more information on CIBSE TM59 and the simplified method
2. Assess watch points for elevation design and to spot check for good practice overheating assessment.
3. If the Dynamic Thermal modelling overheating risk assessment is passing but there are multiple aspects of the design that are showing up as red flags from the Watch point list (as explained on p9) or the Good Homes Alliance Tool assessment scores still falls within the medium/high risk category – share these red flags with the applicant and ask for them to be resolved.
4. *OPTIONAL: If the red flags are still not addressed by the applicant, you could ask for an independent technical review of the overheating assessment but this is likely to be an aspirational requirement for exceptional circumstances or very large developments. The technical review would give some assurance to the council, on understanding the issues and risk.*

In Future

In the future Newham could change the overheating criteria, but in order to do this it is suggested that various studies would need to be carried out.

A Post Occupancy Evaluation study of homes in various developments that monitors the internal temperature of the homes, as well as occupancy feedback on perceived thermal comfort. This data could be mapped against the overheating risk shown in an CIBSE TM59 assessment. This study would show if the CIBSE TM59 approach is sufficient at driving design approaches that lead to overheating risk and thermal comfort that is deemed appropriate by Newham council. If it is shown that CIBSE TM59 is not sufficient, either a completely different approach could explored, or the CIBSE TM59 framework could be used with modified compliance criteria.

Dynamic modelling - CIBSE TM59 methodology

What is CIBSE TM59?

CIBSE TM59 is a design methodology for assessing the overheating risk of homes. A building which complies will have a lower risk of overheating, but it does not mean it will never overheat. It cannot account for residents preferences in terms of what indoor temperatures are comfortable to them, as this is subjective.

Why use CIBSE TM59?

CIBSE TM59, if carried out and coordinated effectively, it should be used to inform the building design to reduce the overheating risk and determine if active cooling is appropriate or not.

When should you recommend CIBSE TM59 be used?

The earlier a CIBSE TM59 assessment is carried out within the design process the more likely it can be used to inform the elevation design to ensure passive measures to mitigate overheating are prioritised. This should ideally be carried out prior to any planning application to avoid changes to the elevations design after permission is granted. This may not always be feasible for all schemes.

In Part O, what is the difference between Dynamic Thermal modelling and the Simplified method?

The simplified method is a more conservative and simplistic approach to comply with building regulation requirements for overheating. The simple method is not applicable for buildings with communal heating and more suitable for single dwellings rather than apartments. Dynamic thermal modelling (using CIBSE TM59) allows for more design parameters to be assessed in more detail. It provides a more comprehensive overview of the overheating risk.

Who carries out a CIBSE TM59 assessment?

An energy/sustainability/MEP consultant can carry out the assessment this appointment should be made prior to the planning application.

Overview of CIBSE TM59

CIBSE TM59 provides an indication of the overheating risk

CIBSE TM59 is not designed to be an overheating prediction tool, but instead an indication of the level of overheating risk. A building which complies will have a lower risk of overheating, but it does not mean it will never overheat. If you look at the heat map on the top right you can see that that the red areas demonstrate some high internal temperatures (>26C) during the summer, but the number hours this occurs is acceptable to comply with CIBSE TM59. In comparison, the heat map below demonstrates an unacceptable level of overheating.

CIBSE TM59 assessment criteria

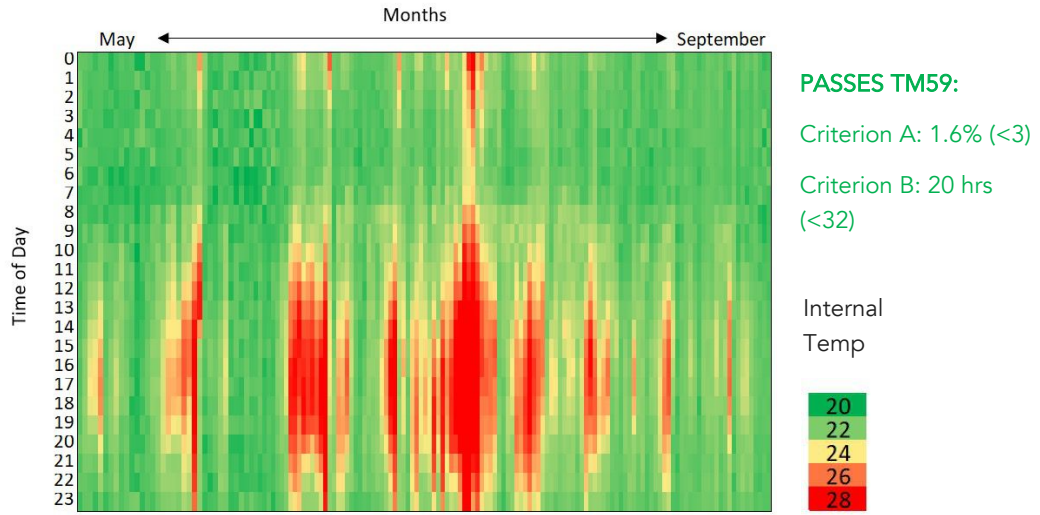
CIBSE TM59 is used for assessing the overheating risk against specific criteria, which varies depending on room use (see below). A bedroom is assessed against two sets of criteria as it is assumed to be occupied both during the day and night. This means that a bedroom could be more likely to fail CIBSE TM59 without a robust overheating strategy. See appendix p12-13.

Criteria A. – Living rooms & Kitchens
Internal temperature shall not exceed comfort level (T Max) by 1 degree for more than 3% of occupied hours (or 60 hours) for the overheating period May-September

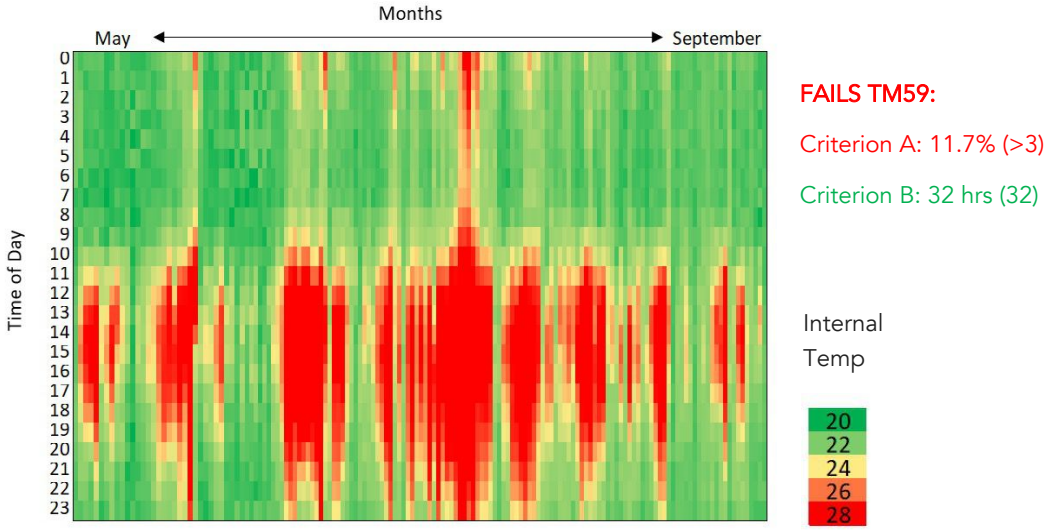
Criteria A. - Bedrooms
Internal temperature shall not exceed comfort level (T Max) by 1 degree for more than 3% of occupied hours (or 110 hours) for the overheating period May-September

Criteria B. - Bedrooms
Internal temperature shall not exceed 26C for more than 1% of annual occupied hours from 10pm to 7am (*equivalent to 32 hours)*

Corridors
Internal temperature shall not exceed 28C for more than 3% of total annual occupied hours. Applies to corridors with district heating systems.



Heat map demonstrating a bedroom which passes CIBSE TM59 criteria. Based on modelling data by Elementa.



Heat map demonstrating a bedroom which fails CIBSE TM59 as it does not comply with Criterion A, even when the requirements for Criterion B are met. Based on modelling data by Elementa.

Key design drivers that mitigate overheating risk

Relative impact diagram

The diagram on the right demonstrates the key design drivers that mitigate overheating risk. The larger circles have the largest impact on overheating and the green 'passive design' measures should be targeted first to mitigate any overheating issue..

Encourage sensible glazing proportions

Getting the right proportion of glazing is critical to getting the right balance between useful solar heat gains in winter and unhelpful solar gains in the summer. Encouraging wider windows with a window sill in favour of full height glazing will often strike a better balance between overheating and daylight.

Be cautious with lower window g-values*

Windows with lower g-values allow less heat transmittance through the window, but g-values below 0.4 could compromise the thermal performance of the home.

Ensure thermal mass is located correctly to be effective

Thermal mass can be used to mitigate overheating, but ensure it is utilised appropriately to be effective. For example, concrete floors which are exposed to the sunlight in the summer may store-up the heat in the day but then release heat at night time which could result in more overheating, particularly in bedrooms.

Ensure effective shading

Horizontal shading is more effective to block out high angled summer sun from the south. Whilst alternative shading, such as shutters, are more effective for lower angled sun from the east or west. External shading is always more effective than internal blinds, and should be encouraged as common practice. Generally buildings with a south facing elevations (as opposed to east/west) are easier to control the solar gains as externally fixed shading devices can be used rather shutters which relies on the building occupant to operate them effectively.

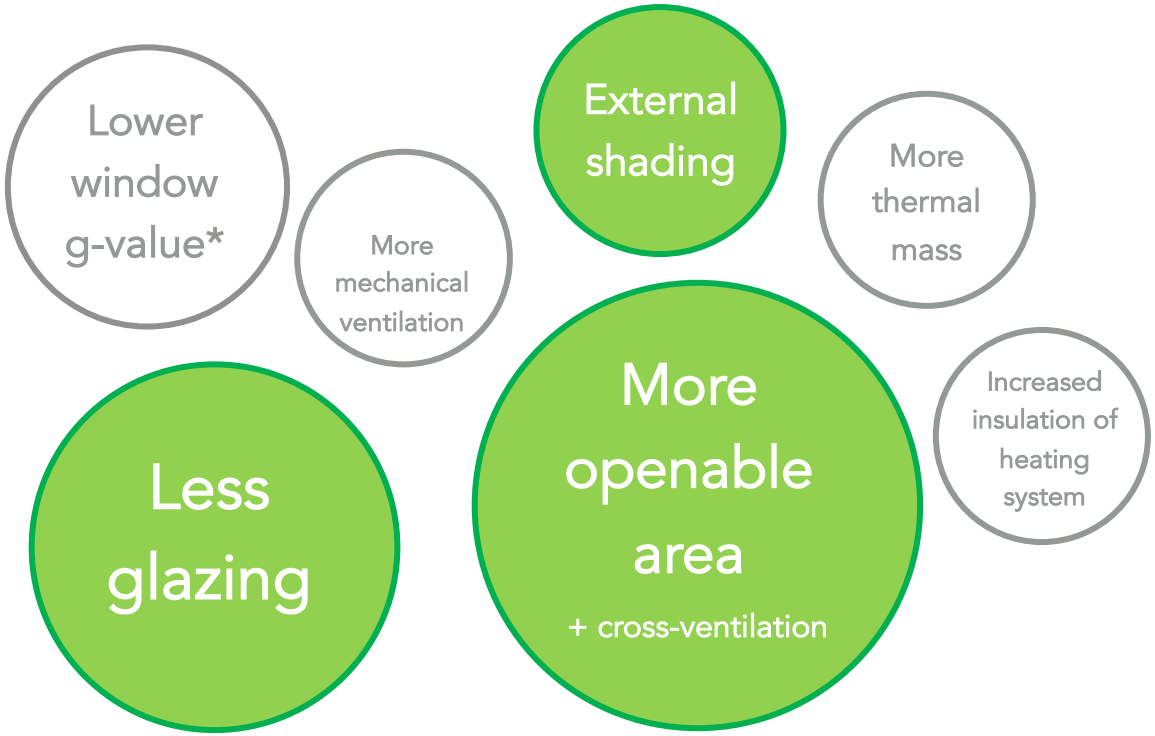
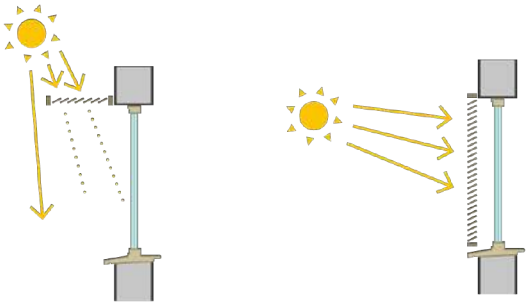


Diagram demonstrating the key drivers that mitigate overheating. The larger the circle the larger the impact it has on mitigating overheating. The green circles should be prioritised first. This was based on modelling data by Elementa.



South facing East/West facing

Diagrams on the left: demonstrate best practice external shading for different window orientations.

Watch points

1. Acoustics: Are the overheating and acoustic requirements met together. Also be wary that acoustically attenuated openings have a very small free area. Approved Document O gives some acoustic limitations for windows at night, make sure these have been considered in the assessment.

Watch out for developments by noisy roads and rail, overheating strategies need scrutiny

Watch out for acoustically attenuated openings which have a very small free area and need to be modelled properly.

2. Openability of windows/Fall hazard: Windows that are below a certain height pose a fall hazard, and are typically restricted to 200mm wide opening windows. This can severely impact the volume of air that enters the room.

Watch out for windows that has the lowest point of opening below 1.1m height for ground floor/easily accessible windows.

3. Windows in bedrooms: Overheating compliance in bedrooms is more stringent than in living rooms as CIBSE TM59 considered bedrooms as being occupied both day and night.

Watch out for full height glazing in bedrooms.

Ensure that bedrooms in windows can be opened (securely) at night to ensure they can mitigate overheating risk.

4. Shading: All South East to South- West facing windows are likely to need external shading

Watch out for windows particularly south and west facing that do not have external shading.

Watch out for apartments on top floors which don't have the benefit of shading provided by balconies above. Ensure external shading is provided.

5. Secure openings: CIBSE TM59 only allows windows to be open in unoccupied rooms (ie at night in the living spaces). Tilt and turn windows have the ability to provide a secure opening option, and an option where the window is open wide.

Watch out for rooms that only have natural ventilation provided by doors, particularly those that are easily accessed and pose a security risk. All windows should have the option to open wide for maximum ventilation and were security is an issue have a setting that allows for secure opening when rooms are unoccupied

6. Low g-values: Be wary of applications that use windows with a low g-value (<0.4) to pass CIBSE TM59 as this could be signal of poor elevation design.

Watch out for application that use windows with g-values <0.4. Ensure that elevation design has been optimised to mitigate overheating before resorting to reducing the g-value below 0.4.

7.Use of active cooling: Active cooling can be an acceptable solution especially in acoustically challenges locations- but this could also be signal of poor elevation design

Watch out for active cooling which is the result of poor elevation design, this should be seen as the last resort. Ask for a demonstration of CIBSE TM59 with and without active cooling.

Appendices

HIGH RISK

1. Single aspect apartments south/west facing

(top story- where there is no balcony above- highest risk)

2. Single aspect apartments East/North facing

(top story- where there is no balcony above- highest risk)

3.Corner apartments

4. Duplex apartments

5. Dual aspect apartments

6. houses

LOW RISK

+ By noisy road/rail

Summary of CIBSE TM59 Compliance criteria

CIBSE TM59 compliance is based on:

Criteria A. – Living rooms & Kitchens
Internal temperature shall not exceed comfort level (T Max) by 1 degree for more than 3% of occupied hours (or 60 hours) for the overheating period May-September

Criteria A. - Bedrooms
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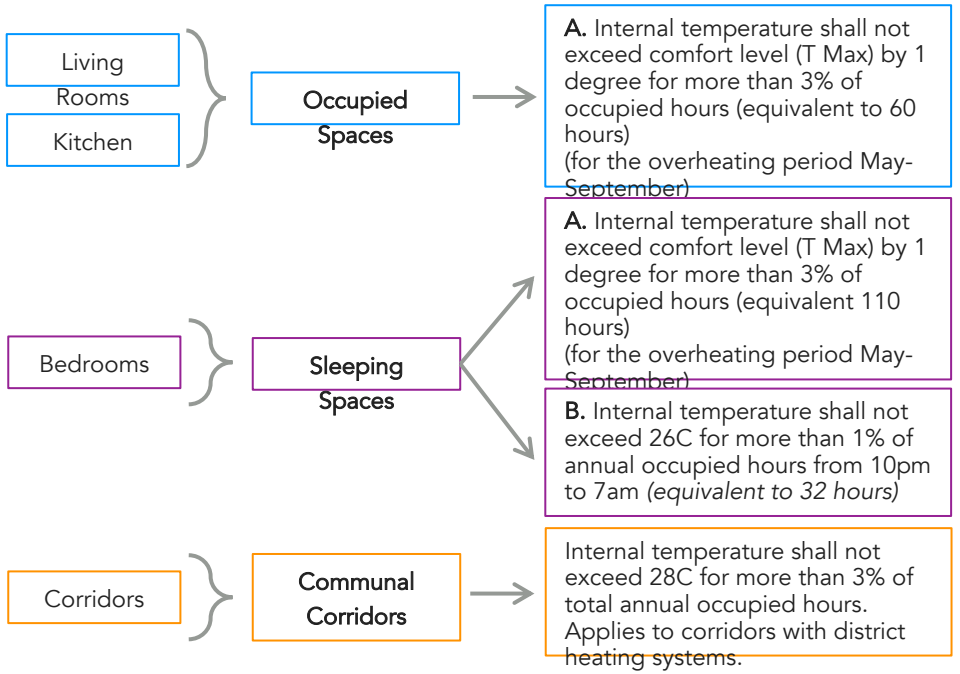


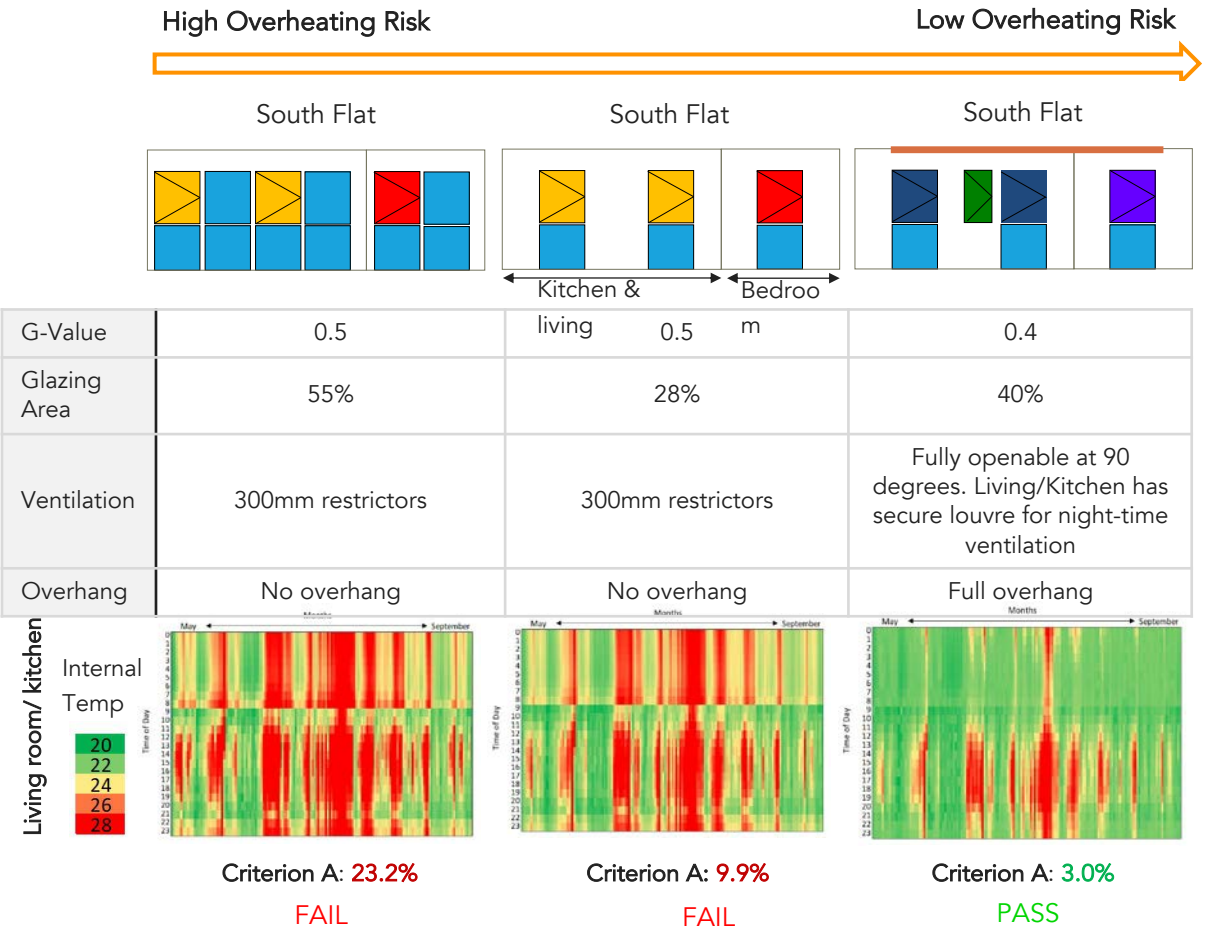
CIBSE TM59 example

CIBSE TM59 example

This page outlines an example of how CIBSE TM59 evaluates overheating risk for a kitchen and living space, for a south facing 1 bedroom single aspect apartment located in London. The examples show how a variety of design changes effect the overheating risk assessed by CIBSE TM59.

For each example a heat map is shown that outlines the temperature in the space over the summer period. This is shown to help you understand the temperature in a space that fail or passes a CIBSE TM59 assessment.

The examples also show the benefit of external shading and secure night time ventilation.



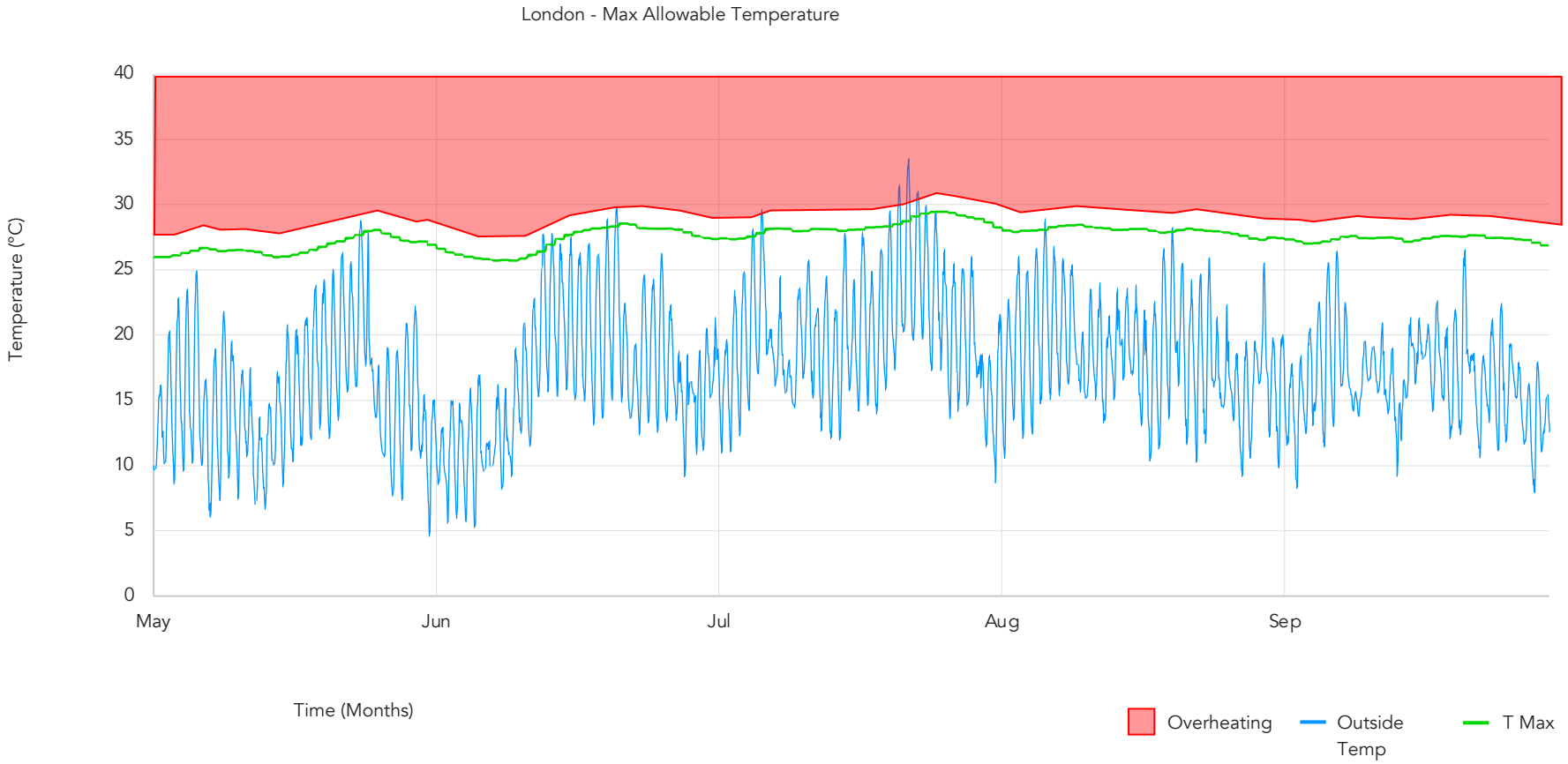
Notes on Ventilation:

- Windows open when air temperature exceeds 22°C
- Bed Rooms: Windows can be open all night.
- Living Rooms: Windows only open between 9am-10pm. Closed at night because the space is assumed to be unoccupied

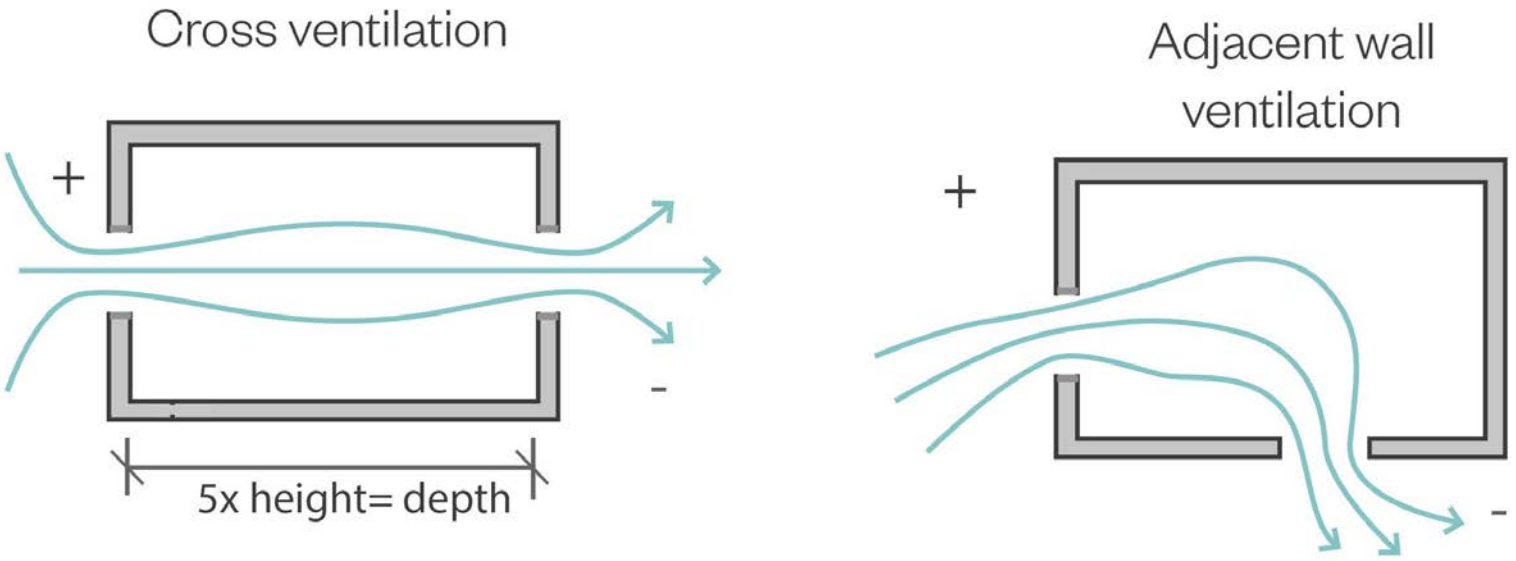
Criteria A. – Living rooms & Kitchens
Internal temperature shall not exceed comfort level (T Max) by 1 degree for more than 3% of occupied hours (or 60 hours) for the overheating period May-September

Thermal comfort levels

CIBSE TM59 is based on an adaptive comfort model, this means that the Tmax changes based on the internal temperature. The graph below shows how T Max changes based on the outside temperature. The red demonstrates the overheating risk when internal temperatures sufficiently exceed the Tmax.

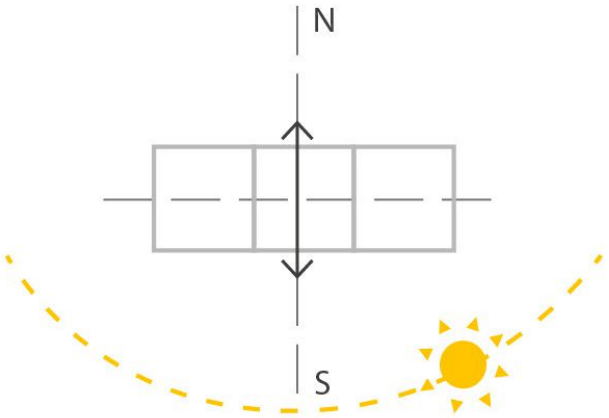


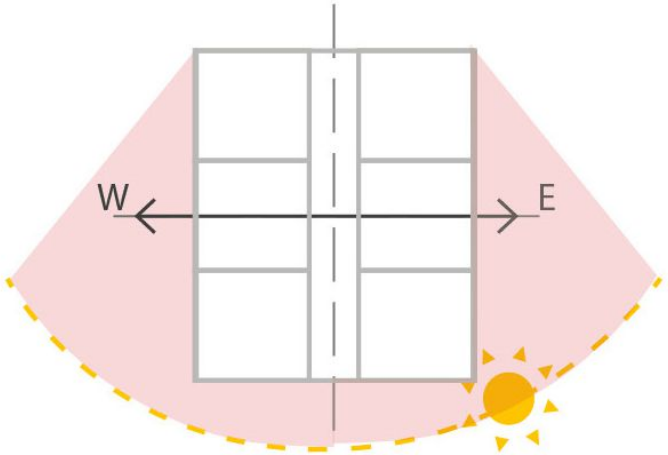
Natural ventilation should be maximised



Dual aspect dwelling which provide cross ventilation is preferable to reduce overheating risk. Adjacent wall ventilation is an alternative where cross ventilation cannot be achieved. Single aspect should be avoided as much as possible.

Dual aspect north-south facing homes allows greater control over solar gains





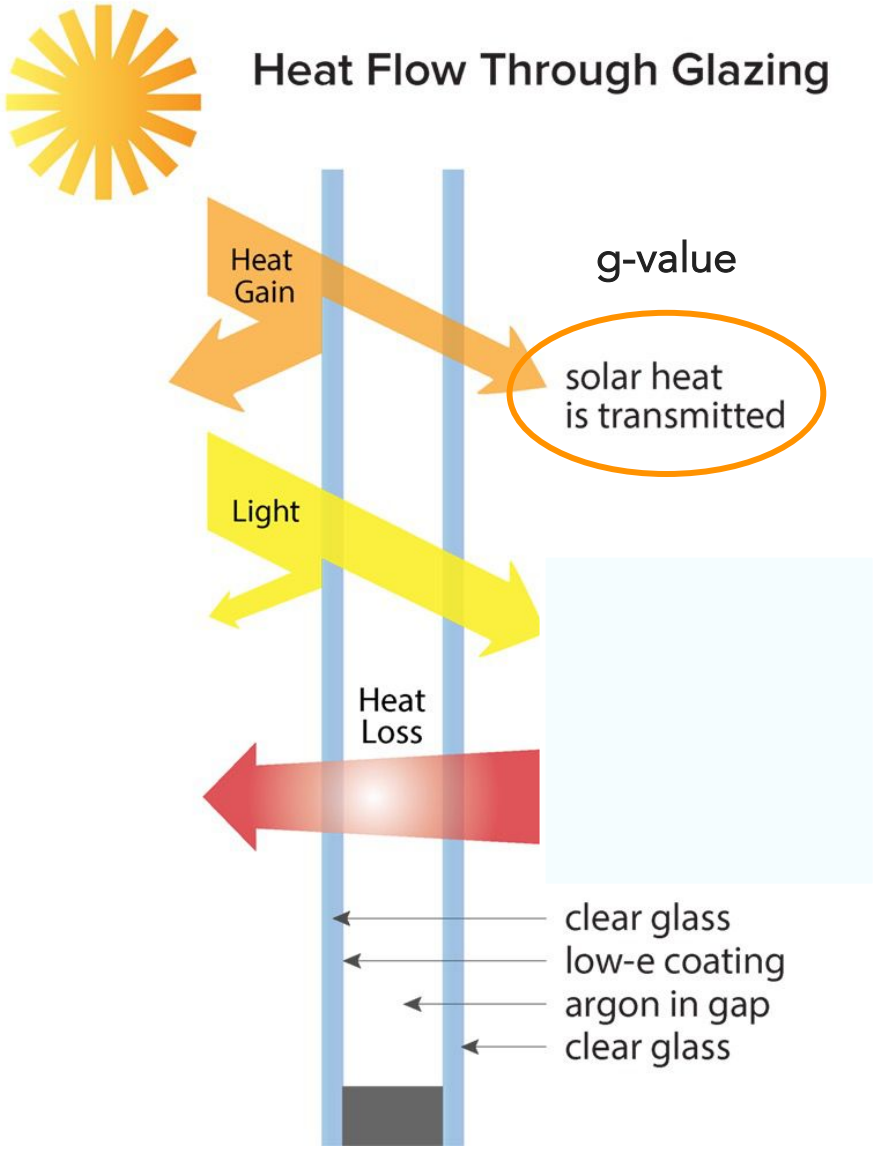
South facing dual aspect is optimum

- Dual aspect with main facades facing north and south is best to control solar gains
- External shading should be provided on south

Single aspect limits orientation

- Double banked flats may require more east to west orientation to avoid north-facing single aspect
- Heat gains becomes a larger problem

What is a window g-value? And why is it important?



All heat transmitted

g-value= 1

No heat transmitted

g-value= 0