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PART O: All you need to know about overheating regulations

For more information on our overheating consultancy service, please visit our website or get in touch. www.mesh-energy.com

Introduction

Thanks to improvements in modern building methods new and refurbished homes are better insulated and more airtight than ever. However, because regulations have historically focused exclusively on preventing heat loss and improving energy efficiency, they have failed to address the increasing number of homes that overheat in the warmer months – particularly those located in areas of high-population density.

In December 2021, new regulations were published to change that, and in June 2022 Part O Overheating regulations took effect. This means that all new residential buildings must now satisfy certain thermal regulation specifications in order to gain planning approval.

The main intention of Part O is to limit excess solar gain within a room and provide a means for which excess heat can be removed from the indoor environment and while it is not designed to guarantee thermal comfort, it is meant to protect occupant health and well-being by keeping room temperatures within reasonable parameters.

In this document we explain how overheating is defined, how you can demonstrate compliance with the new regulations and how Part O interacts with existing Building Regs.

Overheating and Part O Regulations

Who must comply with Part O?

The updated Part O building regulations apply to all new residential buildings – from apartment blocks to single dwellings – and include care homes and student accommodation.

While there are currently no rules for retrofitting existing homes, here are some things to consider:

- Part L conservation of fuel and power regulations also set standards for work on existing dwellings, focused on energy efficiency. Part O principles is likely to inform improvements under Part L.
- When significant building work is done on existing homes, such as renovations or extensions, certain aspects of Part O may become applicable if the work substantially changes relevant attributes like glazing or ventilation.
- While mandatory compliance only applies to new homes, the Part O guidelines represent good practice and principles that could inform voluntary improvements to existing homes to help reduce overheating risks.
- As the housing stock becomes outdated compared to new homes built under Part O, the regulations may increase focus on upgrades to existing stock to bring it closer to modern standards.
- Building owners may eventually feel market pressure to pro-actively improve older homes as buyer expectations shift towards the comfort and efficiency levels delivered through Part O standards.

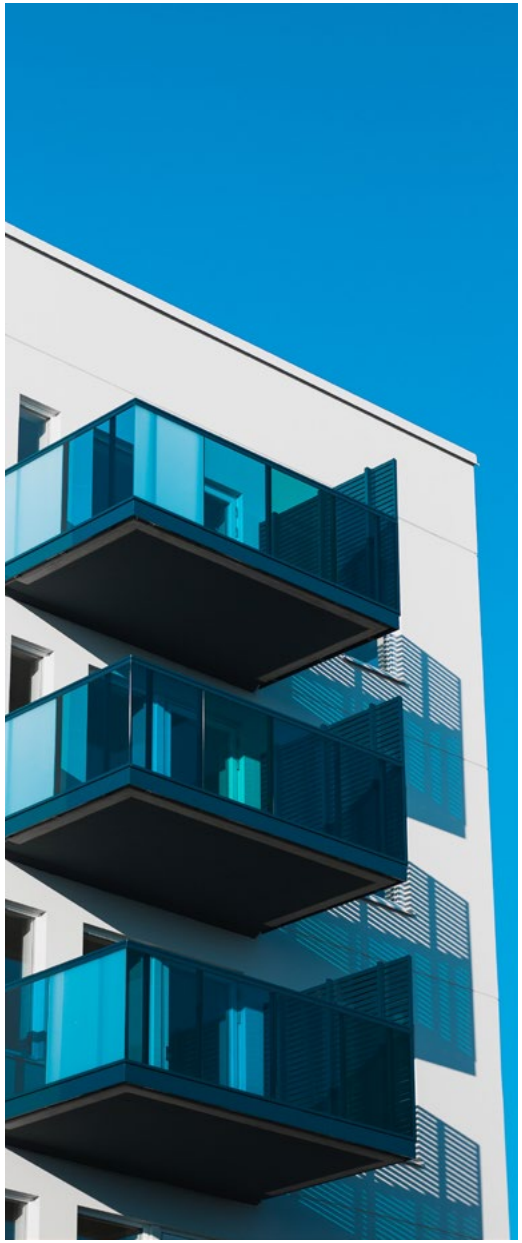
While Part O currently only mandates standards for new homes, its principles have the potential to drive broader voluntary improvements across the wider housing stock over time.

What counts as overheating?

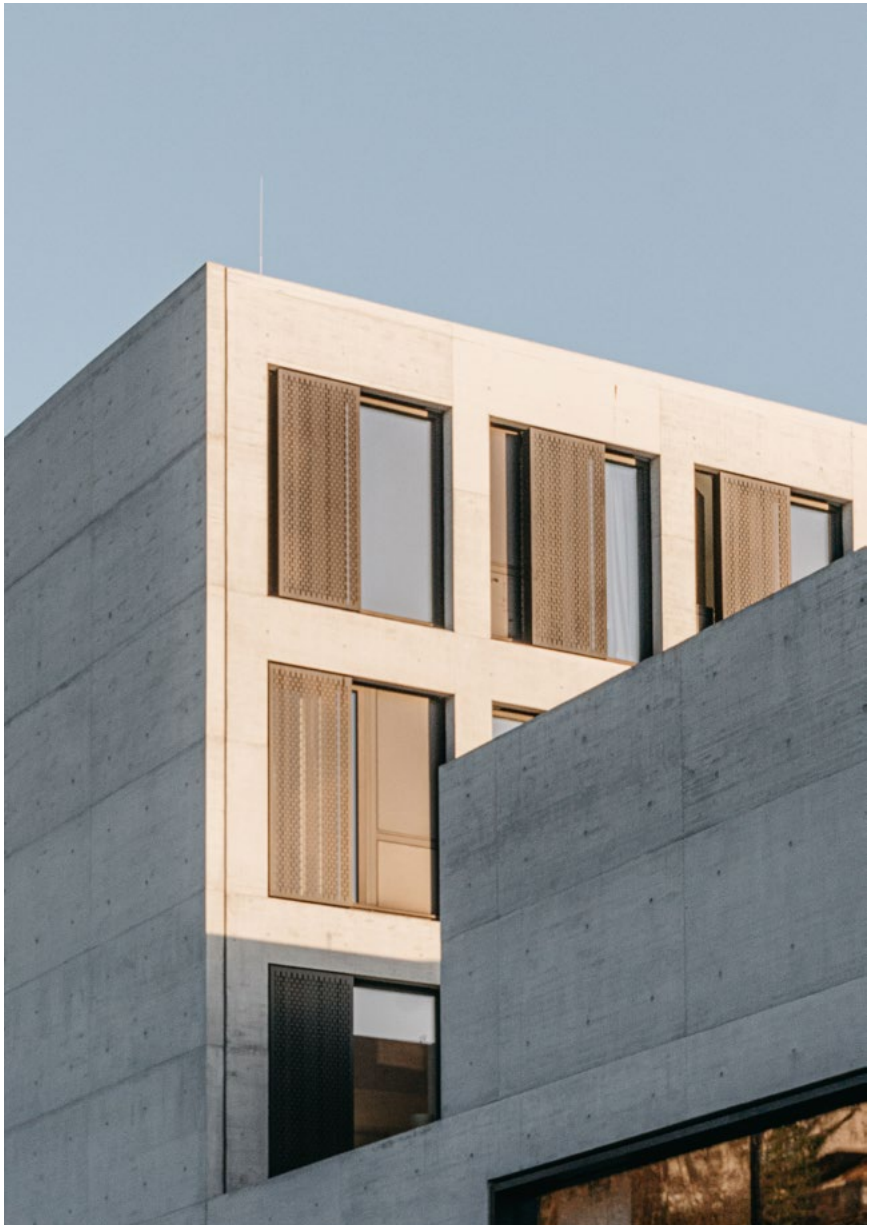
A comfortable room temperature is relatively personal and depends on several factors like what you're doing at the time, and what you're wearing. So while Part O does not specify exact temperatures, the Chartered Institute for Building Surveyors (CIBSE) lays out the following definition of overheating in their TM59 methodology:

- Internal temperatures that exceed 35°C are likely to have a detrimental impact on health.
- Sleep quality is likely to be compromised above 24°C so a reasonable target for a home is to stay below that level.
- In a naturally ventilated home, bedrooms may only be warmer than 26°C for 1% of the hours between 10pm-7am.
- The allowable temperature of rooms in a naturally ventilated home between 7am and 10pm must not be more than 1°C above the comfort temperature for more than 3% of the year.
- The comfort temperature is something of a moving target, although it's usually in the range of 20-25°C.
- For mechanically ventilated homes – one where it's not possible to open enough windows to get a breeze blowing through it – there is a simpler criteria: the temperature may only exceed 26°C (79°F) for 3% of the annual occupied hours.

Overheating is assessed on a room-by-room basis, which means every room must sit within these parameters to satisfy overheating regulations.



How do I comply with the Part O regulations?



Designers can choose between two ways to demonstrate compliance with Part O:

The simplified method

The simplified method focuses on limiting solar gains and maximising natural ventilation potential through window sizing and design.

STAGE 1

Firstly, designers must consider two questions.

- *Is the building located in a high or moderate risk area?*

  High risk areas include urban and some sub-urban areas of London, as well as some areas of Central Manchester.

- *Does the building offer cross-ventilation?*

  Cross-ventilation is the ability to open windows on opposite façades of a dwelling.

STAGE 2

Next designers must calculate the maximum amount of glazing they can include on the south, west and eastern façades of the building.

To decide this, the simplified method requires details about the glazing dimensions and opening area of every single window in the building to be calculated. The designer can then check:

- The total glazed area within the dwelling does not exceed a limit based on the floor area and orientation of the most glazed facade.
- The total area in the most glazed room does not exceed a percentage limit, based on the floor area of that room.

The limits for glazed areas also depend upon whether a dwelling has windows on opposite sides to allow for cross-ventilation.

Residential buildings in high-risk locations also need to provide shading for glazed areas that face between north-east and north-west via that south. Shading should be supplied by:

- External shutters with means of ventilation such as brise-soleil
- Glazing with a maximum g-value of 0.4 and a minimum light transmittance of 0.7
- Overhangs with 50 degrees altitude cut-off on due south-facing façades only
- Internal blinds and natural shading from trees cannot be used as part of the calculations.

STAGE 3

Having established the maximum glazed area, the simplified method then requires designers to check the area of openable windows is sufficient to remove excess heat.

The minimum allowable free area is calculated based on a percentage of floor area or glazing area, whichever is the larger.

Again, the minimum allowable free area is higher for buildings without cross-ventilation. And a distinction is made between buildings in high-risk and moderate-risk locations when establishing the minimum free area for ventilation.

We've created a free Overheating Calculator following the simplified method.

DOWNLOAD TODAY

The simplified method

Should you use the simplified method?

PROS	• Cheaper to assess • No need for specialist software • No need for an experienced modeller

CONS	• Not suitable for certain building types including:
	  • buildings with multiple residencies that share a hot water or heating system
	  • dwellings where external factors like noise and pollution must be balanced against the use of natural ventilation
	  • dwellings where the security or safety of inhabitants could be compromised by the reliance on open windows.
	• Doesn't consider nuances like shading from surrounding buildings. Sometimes buildings that fail the simplified method may pass the dynamic thermal modelling with no alterations to the design, when these things can be taken into account.
	• Places heavy restrictions on the design choices of a build.

Dynamic thermal modelling

Dynamic thermal modelling is based on the methodology developed by CIBSE in TM59 and involves the creation of a digital twin of the dwelling or development, using dynamic thermal modelling software and a standard set of data inputs from TM59.

Based on these inputs, as well as climate modelling that predicts temperature changes between 2010-2040, the model will show whether a building is compliant. Dynamic simulation software can provide insight into the expected performance of a building. Showing hour by hour where and for how long a room is overheating.

Dynamic modelling is useful for multiple residency buildings where certain dwellings are more at risk of overheating than others. For example, in an apartment block, these are likely to be those dwellings with large, glazed areas; on the top floors; having insufficient or no shading; having large south, west, or east-facing windows; being single aspect; or having limited opening windows.

In this particular case, dynamic thermal modelling will allow a designer to target solutions for specific rooms or dwellings where problems have been identified, rather than having to introduce more generic solutions across the entire development.

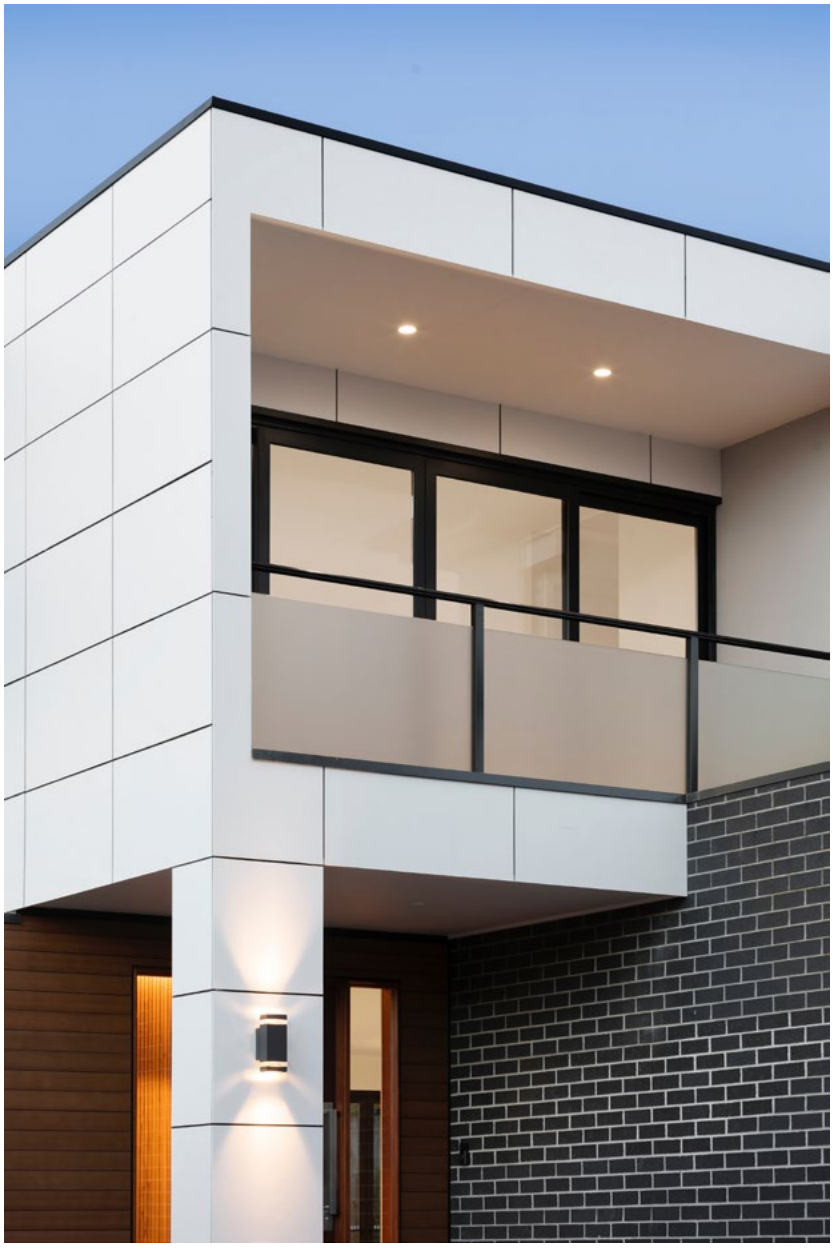
Similarly, for designers looking for more flexibility in their design choices, the dynamic thermal modelling route is a better choice. It allows for a more nuanced approach than simply dictating the use of glazing and openings. There are multiple other design factors that can be taken into consideration – to find out more, see our guide *Overheating in Building Design: Considerations and Solutions*.

A dwelling should be constructed to meet the requirements of Part O using passive means as far as reasonably practical. Mechanical cooling is not totally excluded but should only be used when all other practical options have been explored.

Should you use dynamic thermal modelling?

PROS	• More design flexibility • Engineered solution to meet the multi-faceted requirements of the project • Only a sample of units need to be assessed • Greater likelihood of a satisfactory compliant solution
CONS	• More costly • Involves more parties

Other considerations



Overheating regulations interact with existing Building Regulations, therefore strategies need to take into account the following considerations.

NOISE

External noise will impact the ability to model windows as a means of ventilation, especially at night.

Where external noise levels average over 40dB or exceeds 55dB more than 10 times between 10pm-7am, then you cannot include openable windows as part of ventilation calculations. These will have to be modelled as closed which can result in a fail for most bedrooms.

SECURITY

Where a window is accessible – like in a ground floor apartment bedroom – this must be modelled as closed at night. The only acceptable alternative which would allow accessible windows to open, are those with fixed or lockable bars or louvres.

PROTECTION FROM FALLING

Any windows used for ventilation must also include appropriate guarding to minimise risks of falling from height. In the simplified method this may result in failure as it involves restricting the opening size with fixed or lockable guards.

POLLUTION

Local sources of pollution may require limited use of windows as ventilation solutions. This will need to be analysed on a site-by-site basis but could also result in windows requiring to be closed.

Any mechanical ventilation systems must take this into consideration within their design, meaning filtration and in-take locations carefully designed.

ENTRAPMENT

Where louvered shutters, window railings and ventilation grilles are used, care should be taken to ensure body parts cannot become trapped.

- They should not allow the passage of a 100mm diameter sphere.
- Any hole allowing the passage of an 8mm diameter rod should also allow the passage of a 25mm diameter rod and should not taper, this is to avoid finger entrapment.
- Any looped cords must be fitted with child safety devices.

Interaction with other Building Regulations

Overheating regulations interact with existing Building Regulations, therefore strategies need to take into account the following considerations:

INTERACTION WITH PART B

Approved Document O gives guidance on window openings for removing excess heat from residential buildings. Approved Document B gives guidance on the size of escape windows. Where escape windows are provided to comply with Approved Document B, any extra glazing will impact the risk of overheating.

INTERACTION WITH PART F

The Part O document includes guidance on providing means for removing excess heat from residential buildings. Where openings are used, the amount of ventilation for removing excess heat is likely to be higher than the purge ventilation required for Part F. The higher amount of ventilation applies – see Section 1 or Section 2 of this approved document, depending on the method of compliance.

INTERACTION WITH PART J

Ventilation fans might cause combustion gases to spill from open-flued appliances and fill the room instead of going up the flue or chimney. This can occur even if the combustion appliance and fan are in separate rooms.

The guidance in Approved Document J should be followed when installing and testing ventilation appliances and combustion appliances must operate safely whether or not fans are running.

INTERACTION WITH PART L

Solar gains in winter can reduce the amount of space heating required to be delivered by the heating system. Reducing summer overheating by limiting glazing areas will impact winter solar gains and therefore increase the need for space heating.

Poorly insulated pipework, particularly in community heating schemes, can be a major contributor to overheating. Control of heat losses from pipework is dealt with under Part L of the Building Regulations and the guidance in Approved Document L should be followed.

INTERACTION WITH PART K & PART M

Where manual controls are provided, they should be within reasonable reach of the occupants, to comply with to comply with Approved Documents K and M.

Approved Document O, gives guidance on increased levels of protection from falling from openings compared to Part K.

INTERACTION WITH PART Q

The locking systems of windows and doors should also conform to guidance given in Approved Document Q on the security of doors and windows in dwellings.

How can Mesh help with you meet overheating regulations?

At Mesh, we work in collaboration with architects to develop practical and cost-effective solutions to guard against overheating. We cover both Part O Simplified Method and TM59 criteria and can advise on the best course of action for your project.

- ✓ You will work with a single contact from our Building Performance Team who will guide you through the process, from understanding your goals and priorities to advising you on the planning process.
- ✓ We work in collaboration with building designers to reduce overheating with a minimal impact on aesthetic ambitions.
- ✓ You will receive a comprehensive report, featuring high-level recommendations for improvement and detailed models demonstrating our conclusions.
- ✓ If mechanical ventilation is required, our in-house M&E team can provide technical feasibility solutions to bring theory to life with the most sustainable solution possible.

For more information on our overheating consultancy service, visit our website or get in touch.

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