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Building Standards Domestic Technical Handbook (extract)

Consultation proposals – Overheating Risk

July 2021

The Building Standards Technical Handbooks provide guidance on achieving the standards set in The Building (Scotland) Regulations 2004.

Further information on the Scottish building standards system can be found at: www.gov.scot/policies/building-standards/.

This document sets out a proposed new mandatory standard and supporting guidance within **section 3 'environment'** of the Building Standards **Domestic Technical Handbook**. This sets out proposals to assess and mitigate summertime overheating risk in new dwellings and similar new residential buildings.

The subject matter of these new proposals is discussed within section 5 of the consultation document 'Scottish Building Regulations – Proposed Changes to Energy Standards and associated topics', published online at: https://consult.gov.scot/local-government-and-communities/building-regulations-energy-standards-review/.

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Section 3 (environment) – proposed new standard and guidance

3.28 Mitigating the risk of summertime overheating

Mandatory Standard

Standard 3.28

Every building must be designed and constructed in such a way that:

a) **the risk to the health and welfare of the occupants from summertime overheating is mitigated; and**

b) **information is provided for occupiers on use of the building to assist in mitigation.**

Limitation:

This standard applies to:

a) **domestic buildings;**

b) **shared multi-occupancy residential buildings; and**

c) **residential accommodation comprising self-contained units accommodating up to six individuals**

Note: the consultation seeks views on the extent of application of these provisions to other types of residential buildings.

3.28.0 Introduction

Overheating in buildings has been highlighted as a key risk for the health and productivity of people and businesses in the UK. Increasing global temperatures and hot weather events put buildings at increasing risk of summertime overheating unless such risk is assessed and managed. Overheating occurs when the local indoor thermal environment presents conditions in excess of those acceptable for human thermal comfort or conditions which may adversely affect human health.

Whilst overheating risk may generally be considered an issue principally for southern regions of the UK, various research studies undertaken in recent years have identified the occurrence of overheating in a wide range of new dwelling types in both Scotland and northern England. Whilst risk can be driven by many factors (see below), the combination of better insulated homes with very low fabric infiltration and the certainty of rising average temperatures and warmer summers over the coming decades will increase the likelihood of high internal peak temperatures over the coming decades.

Factors which influence overheating risk in buildings

Extended periods of sunlight and high external air temperatures contribute to overheating. There are numerous factors of building design that influence the risk of overheating, such as Orientation of the building and glazed openings, solar gain through glazing, provision and opportunities for effective ventilation and the levels of insulation and type of building fabric. Occupant behaviour is also a factor that can significantly influence the occurrence of overheating in buildings such as use of openable windows when the internal temperature increases and providing shading through use of internal blinds or curtains.

The risk of overheating may be greater and opportunities for mitigating more limited when converting an existing building to domestic or residential use due to limitations in design choices arising from the building location, orientation openings and fabric.

Conversions - in the case of conversions, as specified in regulation 4, the building as converted shall meet the requirements of this standard in so far as is reasonably practicable, and in no case be worse than before the conversion (regulation 12, schedule 6).

3.28.1 Options for assessing and mitigating overheating risk.

A new dwelling should be assessed and measures put in place to mitigate the risk of summer overheating. This can be achieved through adopting one of the following two methods.

- A simple method. This specifies measures to adequately mitigate the risk of summer overheating (see clause 3.28.2). This approach sets out provisions to limit solar gain through glazing and provide ventilation to assist ineffective cooling.
- Dynamic Thermal Analysis modelling. This uses the dwelling's characteristics to calculate the risk of overheating, modelling the impact of the build form and mitigation measures applied (see clause 3.28.3). Modelling may be useful for conversions, more complex dwellings, those where significant areas of glazing or where solutions such as effective use of thermal mass and night-time cooling are proposed.

Action to mitigate overheating risk does have to be balanced with the provision of good daylight levels within homes and opportunities to maximise winter solar gains should also be considered, which reduce space heating load. Design solutions are available which consider both aspects, e.g. through the use of external shading designed for the summer sun path.

2.28.2 Simple method

For many new dwellings, overheating risk can be mitigated by two actions: the limiting of unwanted solar heat gain through glazing on facades exposed to the summer sun path and effective ventilation to remove the build-up of heat. The following actions should be taken.

Limiting solar gain through glazed openings

Assessment should be undertaken on all building elevations which are oriented between east (90º), through south (180º) to west (270º). Except for single aspect dwellings or those with adjacent aspect (with one or both aspects oriented outwith the described orientation), this will require the assessment of at least two building elevations.

Assessment is at room level to provide greater assurance of thermal comfort in individual apartments and other habitable spaces. Assessment should consider the area of glazed opening based upon the area of the room or space containing the glazed openings.

- If the area of glazed opening is greater than 25% of the area of the room or space served, then provide shading such as louvres or external shutters; or revise the glazing g-value to reduce solar gain in proportion to the increase in glazing area above 25%. It is proposed that the latter should be based upon the assumption of heat gain no greater than an unshaded opening, 25% of the room floor area, with a g-value of 0.6. For this purpose, the area of opening should be taken as the gross external area, inclusive of frames.

It is not the intent of assessment to preclude larger areas of glazing, simply to recognise that increased areas of glazing on risk facades should be accompanied by mitigating measures. Changes to the specification of glazing should, where practicable, maintain a high light transmittance value (0.7 or better is recommended) to minimise adverse impact on daylighting.

Ventilation to assist in cooling

Assessment should be undertaken on all dwellings based upon the number of exposed facades and arrangement of openings which provide ventilation to apartments or other habitable spaces, as follows:

- Where a building has two elevations which are parallel, with ventilation openings distributed so that neither elevation has less than 1/3 of the combined opening area, no further action is required to support ventilation for heat removal. This will be addressed by provision of purge ventilation openings which provide the level of air change sought under standard 3.14 (4 air changes per hour).
- In all other cases and where a building has only one elevation with ventilation openings (single aspect) or two adjacent elevations with ventilation openings, the minimum area of ventilation openings in apartments should be increased from 1/20th (5%, as set out in clause 3.14.3) to 1/10th (10%) of the floor area in each room or space.

Where either mitigation of heat gain or provision of passive ventilation to assist in cooling is not considered practicable, Dynamic Thermal Analysis should be undertaken.

3.28.3 Dynamic Thermal Analysis modelling

The option of Dynamic Thermal Analysis modelling provides designers with greater flexibility than the simplified method. It enables consideration of the dwelling location, construction, opening areas and orientation and ventilation against a prescribed occupancy scenario. It enables modelling of passive mitigation measures to a set

overheating criterion and will assist in demonstrating compliance where the form or arrangement of elements in a dwelling make the application of the simple method impractical.

To demonstrate mitigation of overheating risk by dynamic thermal analysis, assessment should be in accordance with CIBSE TM59 'Design methodology for the assessment of overheating risk in homes' (2017). Assessment should apply the modelling parameters set out below. Parties undertaking modelling should be competent and in use of software tools and to assess overheating risk following the procedures given in CIBSE methodology.

Assessment Criteria

The dwelling should meet the compliance criteria set out in CIBSE TM59 (2017) to demonstrate that the risk of overheating has been sufficiently mitigated, assessed for 'Type I' occupancy (see section 4.4 of CIBSE TM59), which assumes a dwelling shall meet the needs of vulnerable occupants.

The following provisions for windows and doors should be applied, in addition to guidance set out in Section 3.3 and 3.7 of CIBSE TM59:

- For a room occupied during the day (8:00 to 23:00 hours), windows, patio and balcony doors should be set to open and/or close using these parameters.
  - start opening when the internal dry bulb temperature exceeds 22 °C
  - open to a maximum angle of 30º when temperature reaches 26 ºC.
  - start closing when the internal dry bulb temperature drops below 26 ºC
  - be fully closed when temperature drops below 22 ºC.
- For bedrooms occupied at night-time (23:00 hrs to 08:00 hrs), windows should be modelled with restrictors to reflect safety and security concerns, up to a maximum opening angle of 10º. Additionally, bedroom windows should be modelled as being open at night only if the temperature at 23:00 hours is greater than 23 ºC. They should then be assumed to remain open overnight.
- Windows and doors should be modelled as closed in unoccupied rooms.
- External doors should be modelled as closed at all times.
- Internal blinds should not be used in the building design to assess compliance.

In developments of multiple dwellings, a sample of risk dwellings should be selected, following the approach set out in section 3.1 of CIBSE TM59.

Justification for inclusion of active measures

When seeking solutions to an identified overheating risk, passive mitigation measures should be prioritised. Active measures such as air-conditioning should only be considered where it is demonstrated that all reasonable passive measures have first been applied. This should include evidence of the different combinations of passive measures assessed in the modelling and why they were not sufficient, including modelled results to show due consideration of passive options.

3.28.4 Practicality of mitigation measures

Where measures are implemented to mitigate overheating risk, they should be achievable in use. As is the case for provision of ventilation more generally to a building, measures to address overheating risk should take account of the environment within which the building sits. This is particularly relevant to the use of ventilation to reduce levels of overheating.

Issues arising from both noise from the immediate environment and air pollution should be considered. Such matters are usually material considerations in the granting of planning permission for development and any proposed mitigation measures should be compatible with issues already identified at the development (for example location of a façade adjacent to a busy road).

Similarly, where issues such as security are a concern and it is not considered practical to simply open windows to assist in cooling, further assessment of overheating risk or alternative solutions may need to be considered. Where conflicting objectives are identified, this may make the case for dynamic thermal analysis more relevant as a means of demonstrating risk is assessed and managed.

Similarly any mitigation should not require occupants to circumvent measures intended to deliver a safe environment in respect of issues such as the risk of a fall from height through openings or dwelling security.

- an assessment and statement on how these matters are considered as part of mitigating any identified overheating risk should be provided as part of the building warrant application. This should reference any relevant conditions set under other permissions and the environmental factors considered in determining the approach to ventilation for cooling. A summary of such information should be included within written information provided to the building occupant.

3.28.5 Written Information

Where the mitigation on summertime overheating is reliant upon the use of building elements or services, clear written instructions on the actions needed should be provided and made available to the occupiers of the dwelling. These should:

- Identify, locate and explain any systems used in the building to mitigate overheating risk. This should include any provisions made to address site-specific and environmental constraints.
- Provide clear information on intended use, and controls and how to operate and maintain them. Where part of the solution, include appliance manuals if not already provided elsewhere.

For all dwellings, the Quick Start Guide required under standard 6.8 should also contain a section on ‘Staying cool in hot weather’, which provides non-technical advice on how to keep the dwelling cool in hot weather. Whilst the use of internal fittings such as blinds is outwith the scope of building regulations, their role in mitigating heat gain in summer months is recognised and is something that building occupants should be made aware of within the Guide.