Written evidence submitted by The British Blind and Shutter Association

Environmental Audit Committee
How can we learn to live with rising UK temperatures, and what steps should we take to adapt to their effects?

Introduction

About the BBSA

The British Blind and Shutter Association (BBSA) https://bbsa.org.uk/ is a national trade association representing businesses that design, make, retail, install and repair solar shading systems such as blinds, shutters and awnings.

The BBSA has over 570 member companies which represent around 60% of all blinds, shutters and awnings sold in the UK. In total the market is estimated to directly employ 17,000 people in the UK with annual sales of around £1.3bn.

About our submission

Our submission concentrates solely on blinds, shutters and awnings as heat mitigation strategies. We do not suggest movable (dynamic) shading products are the solution for overheating in buildings but these products can significantly reduce solar heat gain which is one of the major causes of overheating in buildings in addition to the other benefits they bring.

In our submission when we mention dynamic shading we mean shading products which can be positioned either manually, motorised or automated so they can shade the glazing used in a building.

This Select Committee's previous report *Heatwaves: adapting to climate change*[1] (published on 26 July 2018) includes much evidence on the effects of heat on human health.

In our submission we have endeavoured to provide evidence to supplement this previous report. However, some of the evidence previously quoted bears repeating given the serious health implications of heat and extreme heat. In addition some of the evidence we provide is based on research which was conducted some years ago. However, we have included this as the findings of the research are still relevant today and in many cases lessons have not been learned.

We have provided a summary to each of the questions in our submission.

Overall summary

Solar shading products are proven, passive solutions helping buildings use less energy and improving the comfort of the people who live and work in them.

This is recognised in many countries in continental Europe with regulations and tax incentives to encourage the use of shading. This is not the case in the UK where shading is often an afterthought or a distress purchase when overheating is present.

---

[1] https://committees.parliament.uk/committee/62/environmental-audit-committee/news/100427/heatrelated-deaths-set-to-treble-by-2050-unless-govt-acts/

We are concerned that there has been limited progress to reduce overheating in our buildings and this has been brought into sharp focus by the combined energy, climate and cost of living crises.

To help prevent buildings from overheating we believe there should be focus on:

Existing building stock

Most buildings have already been built.

There needs to be a long-term government supported plan to improve the heat resilience and energy efficiency of existing buildings.

Focus should be where the occupiers or users of those buildings are vulnerable or at risk of being vulnerable.

New buildings

Building regulations need to be more joined up to ensure heat resilience is designed into the building without compromising other important requirements such as access to daylight.

There are precious few mentions of overheating in the Heat and Buildings Strategy – in fact 370 times fewer mentions than keeping the building warm.

Modelling

Compliance models should include shading. The speed of development and change in compliance models is not in pace with the changes in the environment.

Air conditioning systems should only be used as a last resort and modelling needs to reflect this.

Design and planning

Those designing and constructing buildings should be incentivised to build for performance not compliance. The performance gap between design and reality is still too wide. For many this simply means higher running costs for those living and working in those buildings.

Planners should use guidance and tools on overheating to ensure compliance before planning permission is granted.

Education

Research shows that people often do not know how to use the buildings they live in to save energy and maintain comfort.

Simple, consistent messages are important and the heatwave of 2022 showed than people can follow advice.

1. What evidence exists on the relationship between heat and human health (mortality and morbidity), and which communities are worst affected?

Summary response to question 1

- Estimated 2,985 excess deaths due to heat in 2022
- The link between heat, especially extreme heat, and human health is well proven
- Mortality and morbidity increase in extreme heat – one study says 3% for every 1ºC above a threshold of 24.7ºC (for London)
- Infants, the elderly and those with underlying health conditions are at greatest risk
- Lower income groups are at a higher risk than more affluent groups
- Those in poor housing and located in cities are at the greatest risk but this is no longer a London and south east England problem
- NHS hospitals report a doubling of overheating incidences in last five years
- A third of all care facilities predicted to overheat by 2050s (for London this is predicted to be 75%)
- Economic costs of mortality rising from £2.2bn/year in 2020s to £9.9bn/year by 2050s

In July 2023 the UK Health Support Agency published annual statistics on the impact of adverse heat episodes since 2016[2].

This report states that during summer 2022, there were an estimated 2,985 (2,258 to 3,712) all-cause excess deaths associated with 5 heat episodes, the highest number in any given year.

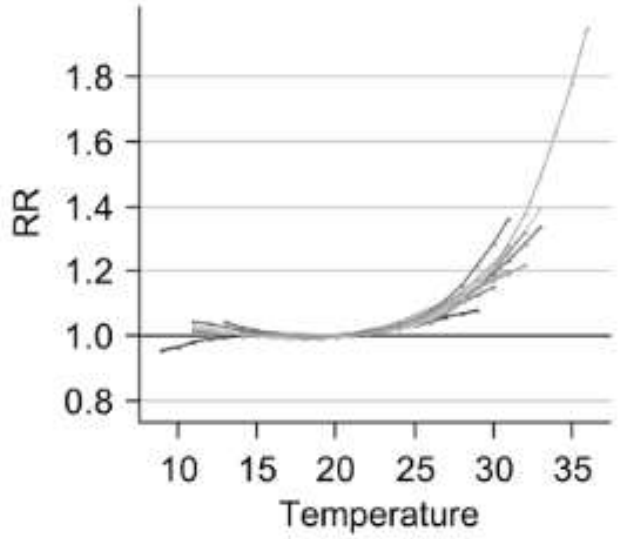
Some of the heat episodes detailed in this report showed significant excess deaths in the 65 years and over category and in one case (episode 4) significant excess deaths in the 45-65 years group.

Such was the intensity of the 2022 heatwave the report notes that during episode 4 only north east England and the east midlands did not experience significant excess deaths.

The paper, *Association of mortality with high temperatures in a temperate climate: England and Wales*[3] Armstrong et al., includes a graph which shows temperature-mortality associations in England and Wales (RR means 'relative risk' of mortality, where 1 is the normal risk and temperature is the mean summer daily maximum temperature). It is interesting to note that the temperature scale used in this 2011 report stops at 35ºC. In July 2022 a maximum temperature of 40.3ºC was recorded in England.

[2] https://www.gov.uk/government/publications/heat-mortality-monitoring-reports/heat-mortality-monitoring-report-2022

[3] https://pubmed.ncbi.nlm.nih.gov/20439353/



In the same paper the London mortality rate starts to rise when the maximum daily external air temperature exceeds 24.7ºC, and has been estimated to rise by approximately 3% for every further 1ºC increase in external temperature. In other regions, the thresholds at which mortality starts to rise are lower. For example, the threshold for the north east of England is 20.9ºC.

Who is at risk?

"Excess heat can have significant health implications, particularly for vulnerable groups, including the elderly, infants, those who are obese or have chronic illnesses, people who are socially isolated and those who live in urban environments. These groups are often less physically able to acclimatize or adapt to keep cool at home when external temperatures rise". *Overheating in Homes – The Big Picture, Zero Carbon Hub, June 2015*[4]

The Resolution Foundation published a report on 15 August 2023 entitled *It's getting hot in here - How ever-warmer UK summer temperatures will have an outsized impact on low-income households and low-paid workers*[5]*.* This report uses data from the Department for Business, Energy & Industrial Strategy and extrapolates risk factors. Some key points raised in this report are:

- 54% of the poorest fifth of English families live in homes liable to get too hot
- Two thirds of socially-renting households, six in ten whom have young children, are also liable to have homes that get too hot
- More than half of ethnic-minority families have the highest risk of their homes getting too hot nationally
- 23% of UK workers currently work in occupations at risk of heat stress, thereby facing the greatest health risks as the nation warms
- 36% of English homes can be deemed as high risk by 2070, an 80% increase on the number of homes that recorded overheating in the Government's 2021 study

Healthcare

The Climate Change Committee in its paper: *Heat and Preventable Deaths in the Health and Social care System*[6] *state:*

---

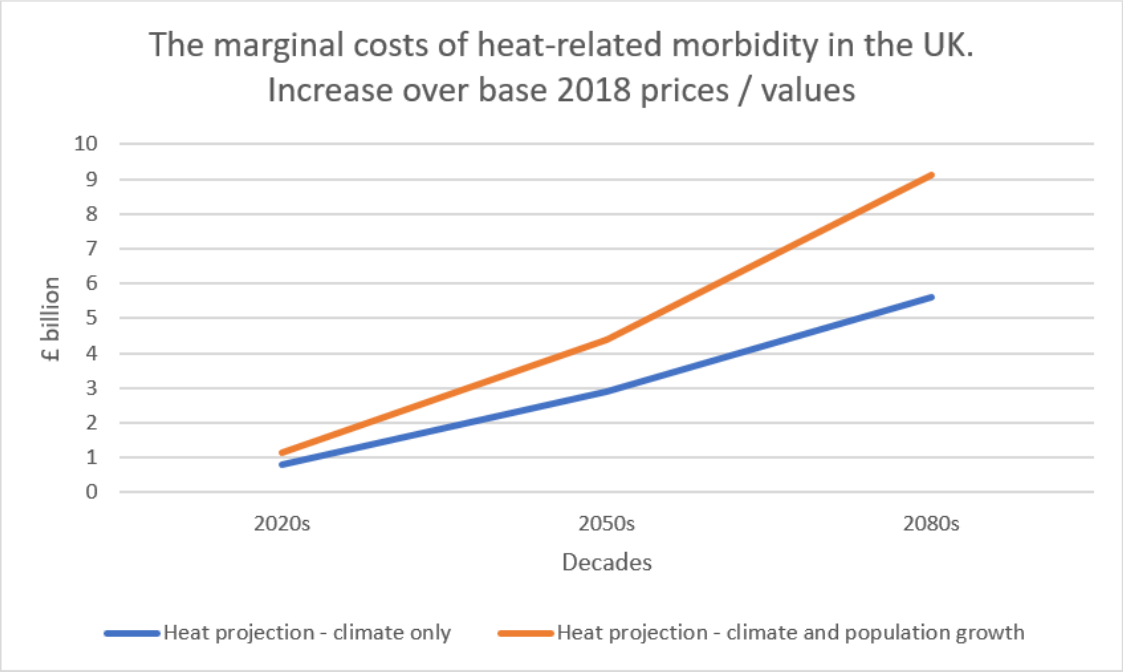
[4] https://www.shadeit.org.uk/wp-content/uploads/2016/09/ZCH-Overheating-In-Homes-The-Big-Picture.pdf

[5] *https://www.resolutionfoundation.org/publications/its-getting-hot-in-here/*

[6] *https://www.theccc.org.uk/wp-content/uploads/2019/07/Outcomes-Heat-preventable-deaths-case-study.pdf*

"With the use of the full Value of a Prevented Fatality, the estimated economic costs from the increase in heat-related mortality from climate change are very large, with costs of £2.5 billion/year (combined effect of climate and population change) in the 2020s, rising to £9.9 billion/year (climate and population change) in the 2050s. However, the sensitivity analysis that takes account of a short period of life lost (using a Quality Adjusted Life Year value, and 1 year of life lost on average) reduces these economic costs significantly, to £58 million to £83 million in the 2020s (climate / climate and population) and £213 million to £323 million in the 2050s. In practice, the economic cost may lie between these two values. It is stressed that these numbers do not include existing adaptation policy (including the HHWS [Heat Health Watch System]) or physiological acclimatisation".

In terms of morbidity this report highlights a quadrupling of the marginal costs of morbidity from £1.1bn p/a in the 2020s to £4.37bn in the 2050s. (Graph below created from data in table 5 of this report[6])



Hospitals

Energy use in the NHS is responsible for 30% of UK public sector emissions.

An analysis published in the Financial Times on 11 August 2023 *Third of England's Healthcare Facilities at risk of heatwaves by 2050*[7] found that the incidence of death of those over 65 during the period June to August 2022 in hospital was 6% above average on unusually hot days, while in care homes that figure was 9% above the average.

An article in the Evening Standard on 23 June 2023, *More than 260 'overheating incidents' in London NHS hospitals amid climate change fears*[8] quotes an analysis conducted by not-for-profit Round Our Way which found that a total of 269 overheating incidents (temperature in clinical areas above 26ºC) occurred in London hospitals in the year up to March 2022.

---

[7] https://www.ft.com/content/47732c1e-1be7-4b71-9496-ade154cfb707

[8] https://www.standard.co.uk/news/health/nhs-overheating-incidents-heatwave-london-hospitals-climate-change-b1089712.html

An article in The Health Service Journal[9] states that the number of overheating incidents in clinical areas reported by NHS trusts has almost doubled over the last five years, with directors saying ageing estates make them vulnerable to extreme weather events (*'Overheating' incidents nearly double across NHS estates* - 16 February 2023).

In 2013 Professor Alan Short of Cambridge University[10] highlighted that 90% of hospitals are of a design type prone to overheating. Prof. Short stated that retrofitting air-conditioning plants would be uneconomic, highlighting solar gain as the key cause of internal temperature increase. Prof. Short said the introduction of measures to limit heat gain, such as solar shading devices will help reduce the overheating risk.

Research by Leeds University, *Climate change, hospitals and patient well-being*[11] Iddon, C., 2014, found correlations between overheating risks and increased infection risks due to airborne pathogens.

Dr Nick Scriven, then President Society for Acute Medicine, wrote an opinion piece *Planning for summer pressures - the strain placed on the NHS by heatwaves*[12] for the British Medical Journal (BMJ) on 25 July 2019. In it Dr Scriven highlights hospitals can overheat to 30ºC when external temperatures are just 22ºC, again highlighting the issues with solar heat gain.

Care Homes

The research *Examining the magnitude and perception of summertime overheating in London care homes*[13] – Gupta et al., May 2021 brings together objective and subjective data on indoor temperatures and thermal comfort to examine the magnitude and perception of summertime overheating in two London-based care homes, one in a modern building and one in an older building.

Continuous monitoring of indoor and outdoor temperatures, relative humidity and CO_2 levels was conducted in summer 2019 along with thermal comfort surveys and semi-structured interviews with older residents and staff of the care settings.

Indoor temperatures were found to be high (>30°C) with bedroom temperatures often higher at night than daytime across both care settings. Limited window opening due to restrictors constrained night-time ventilation.

Overheating was prevalent with four out of the five monitored bedrooms failing all four overheating metrics investigated. While 35–42% of staff responses perceived indoor temperatures to be uncomfortably hot, only 13–19% of resident responses were found to do so, indicating that elderly residents tend to be relatively insensitive to heat, leaving them vulnerable to overheating without realising it.

Residents and staff in the modern care setting were less satisfied with their thermal conditions. As hybrid buildings, care settings need to keep both residents and staff comfortable and healthy during hot weather through night-time ventilation, management of heating and supportive institutional practices.

---

9 https://www.hsj.co.uk/service-design/overheating-incidents-nearly-double-across-nhs-estates/7034212.article

10 https://www.telegraph.co.uk/news/earth/environment/climatechange/10955143/Hospitals-at-increasing-risk-of-overheating-due-to-climate-change.html

11 https://www.barbourproductsearch.info/climate-change-hospitals-and-patient-wellbeing-news022395.html

12 https://blogs.bmj.com/bmj/2019/07/25/nick-scriven-planning-for-summer-pressures-the-strain-placed-on-the-nhs-by-heatwaves/

13 https://journals.sagepub.com/doi/full/10.1177/01436244211013645

The paper notes:

"Historically care homes have been designed and built with the aim of keeping residents comfortably warm all year round, particularly during the winter months. Heating systems are typically designed to operate throughout the year. This bias towards cold management over heat management is evident in the Care Quality Commission (CQC) inspection protocol, which includes checking for low room temperatures and questioning staff on how they respond to residents who feel cold, but no consideration towards high temperatures and questioning staff on how they respond to residents who feel hot."

"The correlation between air temperature and mortality has been found to be as high as R = 0.95 with one study suggesting that in London the death rate increased by 3% for every 1°C increase in daily average temperature over 21.5°C – a relatively low threshold for mortality to increase. Elderly people, especially those in nursing and care homes have been found to be most vulnerable to heat mortality. Indeed, heat-related mortality in the UK has been projected to rise by over 250% by the 2050s compared to a 2014 baseline of 2,000 deaths, with the elderly contributing to this most significantly."

Research published in the Financial Times[14] on 11 August 2023 showed that almost a third of the 14,531 hospitals, care homes and nursing homes in the UK will be in high or acute levels of heat disadvantage by the middle of the century. In London this proportion is forecast to be 75%. Earlier this year the Climate Change Committee warned "there is no policy to manage overheating risks in existing health and social care buildings."

[14] https://www.ft.com/content/47732c1e-1be7-4b71-9496-ade154cfb707

2. How can sustainable cooling solutions and adaptation strategies be implemented in such a way as to minimise overheating, reduce energy consumption and prevent overloading of the electricity grid during peak demand?

Summary response to question 2

- Solar shading is sustainable
- Solar shading is proven to reduce overheating in buildings and hence reduce energy use
- Solar shading can help prevent overloading of the electricity grid during peak demand by keeping buildings cooler
- Closed external solar shading can reduce the solar gain through glazing by up to 98%
- Shading helps reduce or even removes the need for cooling
- Buildings can overheat outside of the traditional summer period
- In hot weather internal building temperatures can exceed external temperatures

Shading has been used for millennia to shade and cool buildings and people. External shading is particularly effective at reducing overheating as it prevents the sun's rays from entering the building. Closed external shading can block up to 98% of solar gain from entering a window and when open between 90-95% (figures for an external venetian blind with slats tilted. These products are used extensively in Continental Europe to reduce overheating particularly in Germany, Austria and Switzerland).

Shading products can be motorised and automated to ensure they are in the correct position based on external weather conditions. Shading products are a passive measure as they do not necessarily require energy to operate them and those shading products that do require very little. Calculations by the BBSA show that a semi-detached home with, for example, four blinds and one awning would typically require approximately 2 kWh per year to operate. In contrast The Ministry of Housing Communities and Local Government (MHCLG)[15] have calculated that air conditioning, when compared to installing an array of passive overheating mitigation measures including shading, required more energy per annum in every case. It was found that a typical semi-detached home in London would require an additional 1,335 kWh per annum per dwelling by 2050 and the same home in Nottingham (which has a cooler climate) would require an additional 727 kWh per annum per dwelling by 2050.

The European Solar Shading Organisation (ES-SO https://es-so.com/) commissioned Guidehouse (https://guidehouse.com/) to investigate the energy and carbon savings achievable if 70% of Europe's air-conditioned buildings incorporated automated shading[16] . The modelling carried out identified there would be a 60% saving in electrical energy consumption equating to a 58% reduction in greenhouse gas emissions across Europe. This report was produced and submitted to the European Commission in preparation for the future Energy Performance Building Directive recast. The report concludes that in total across Europe automated shading could save 285 billion Euros in energy by 2050 and save 100 million tons of CO_2 emissions.

It should be noted that homes do not only overheat in summer. The BBSA commissioned a research project *A London Residential Retrofit Case Study: Evaluating passive mitigation methods of reducing risk to overheating through the use of solar shading combined with night-time ventilation*[17] De Grussa et al., which highlighted that converted

[15] https://www.gov.uk/government/publications/research-into-overheating-in-new-homes#:~:text=It%20uses%20dynamic%20thermal%20modelling,risk%20to%20an%20acceptable%20level

[16] https://es-so.com/images/downloads/Downloads%20publications/Policy_Brief_20211107_final.pdf

[17] https://journals.sagepub.com/doi/abs/10.1177/0143624419840768

apartments in north London had internal operative temperatures as high as 45°C when the external air temperature was just 21°C in October 2016. The author concluded that "Overheating events were found to have occurred in October as well as August when the T_{rm} (daily mean external air temperature) was lower which is hypothesised to be caused by low angle sun entering the building for a longer duration of time during the day."

This research, which has been cited in Climate Change Committee reports to Parliament, demonstrated that external shading reduced internal operative temperatures by 10-18°C depending on the products used. Internal shading had the benefit of reducing temperatures by between 8-13°C.

The *Evidence Review: Solutions to Overheating in Homes*[18] (2016) authored by the Building Research Establishment (BRE) for the Zero Carbon Hub highlights external shading as an effective measure against overheating, as well as solar reflective internal shading:

"The use of highly reflective internal blinds can be significantly more effective than curtains or typical Venetian type blinds. Such blinds are available for dwellings, but are much more frequently found in office buildings. If they are used in a domestic setting, then it is important for the occupants to be advised on how to make the best use of them."

"Solar radiation that falls on structures outside a window heats that element and is then lost by radiation to the surroundings and to the air by convection. The re-radiated heat is long wave and thus is not transferred directly through the glass to the internal space, but a proportion will be absorbed by and warm the glass. External shading is generally significantly more effective than internal shading."

The UK Green Building Council's *Health & Wellbeing in Homes*[19] (July 2016) includes several references to the use of solar shading to improve the internal environment in homes including:

"Too much glass can lead to internal overheating. Use of solar control coatings is a valuable way to offset this but will reduce light transmission and can impact the colour rendering of glass. Solar control coatings can also reduce the amount of passive solar gain in winter, which would normally contribute to reducing heating loads. Movable external shading provides the best balance between winter and summer needs."

Blinds, shutters and awnings are:

- Proven to reduce overheating
- Proven to reduce energy consumption
- Widely available
- Simple to operate
- Movable (dynamic) so can maximise solar heat rejection in the summer and solar heat gain in the winter
- Capable of being motorised to become automated systems to maximise the performance benefits

[18] https://www.shadeit.org.uk/resource/zch-solutions-overheating-homes/

[19] https://www.shadeit.org.uk/resource/ukgbc-health-wellbeing-homes/

3. What actions can be taken to protect those most vulnerable to the impacts of extreme heat?

Summary to question 3

- Passive measures should be considered first to not add to energy use and peak demand issues
- Most buildings have already been built
- The UK has some of the oldest housing stock in Europe and is susceptible to overheating
- Education of building users on overheating mitigation is important
- A holistic approach is needed to prevent unintended consequences and sub-optimal outcomes
- Compliance building models need to accurately reflect the efficacy of dynamic shading products
- Building regulations must be more joined up
- Planners need to consider overheating mitigation strategies more carefully with new build, when buildings change use, and be more flexible when considering solutions to existing buildings

Existing buildings

According to the UK Green Building Council[20] some 80% of the buildings that will exist in 2050 have already been built.

The UK has some of the oldest stock of buildings in Europe with 6.2 million homes were built before 1919.

For these existing buildings installing sustainable passive solutions and ensuring that the user is educated in the benefits of using them is crucial to improving the building's performance against the extremes of heat.

Movable external shading is a proven, highly effective and passive solution to overheating in buildings and is widely available.

The research *Probabilistic spatial risk assessment of heat impacts and adaptations for London*[21] Jenkins et al. (2014) used projections of urban temperatures along with assumptions on demographic changes to produce an assessment of heat impacts on urban society. The study, which focused on Greater London and the surrounding area, assessed mortality risk, thermal discomfort in residential buildings and adaptation options.

The researchers highlighted that climate change is projected to increase future heat-related mortality and "residential discomfort". However, by adjusting the 'temperature response function' by 1–2°C to simulate adaptation measures and acclimatisation, annual heat-related mortality could be reduced by around 30% to 70% (depending on the scenario used), relative to the 'no adaptation' scenario.

This highlights (a) how sensitive people are to temperature and (b) simple measures with a relatively small impact on temperatures can have a significant reduction on mortality.

---

20 https://ukgbc.org/our-work/climate-change-mitigation/

21 https://www.researchgate.net/publication/269380474_Probabilistic_spatial_risk_assessment_of_heat_impacts_and_adaptations_for_London

The Ministry of Housing Communities and Local Government (MHCLG) demonstrated how operational energy costs can diminish when the fabric of the building and shading is improved. MHCLG reviewed the cost of installing shading products and other overheating mitigation methods in new build homes in the development of Building Regulation Part O. These costs are provided in the document entitled *Research into overheating in new homes - phase 2 report*[22]. The costs were calculated per dwelling for a semi-detached home, and a dual and single aspect flat. The capital cost for installing typical internal blinds on all windows was costed at £660, £1,400, £2,500 per dwelling respectively. The cost for installing external shading options – which considered fixed and retractable louvred shutters and an awning - were £2,660, £4,260, £4,850, respectively. Both scenarios were less costly than the counterfactual case of including air-conditioning homes which cost £8,400, £6,975, £6,500 respectively per dwelling.

The same report then reviewed the additional energy requirement for installing air-conditioning compared to installing an array of passive overheating mitigation measures, including shading. In each case the air-conditioned option required more energy per annum. It was found that a typical semi-detached home in London would require an additional 1,335 kWh per annum per dwelling by 2050 and the same home in Nottingham (which has a cooler climate) would require an additional 727 kWh per annum per dwelling by 2050.

New buildings

New buildings should be designed to mitigate overheating. As in Part O, passive measures should be prioritised over active measures.

However, a holistic approach to building design is required. An unintended consequence of Part O is smaller windows to reduce the overheating risk but this reduces access natural daylight which is vital for well-being and reducing artificial internal lighting costs. Crucially, it also limits the important free energy from the sun to warm the building in the winter.

This particularly affects the elderly and vulnerable as they are less mobile to spend time outside the building.

Modelling and regulations

Building modelling, both for compliance (for example SAP) and performance must accurately reflect and recognise passive measures. This is definitely not the case for solar shading currently.

Building regulations must be more joined-up as currently there are competing requirements and unintended consequences with Part L, O, F and B.

Design and Planning

Local authorities need to consider mitigation strategies when reviewing planning applications.

The Good Homes Alliance have a simple overheating tool to help planners quickly assess overheating risks - https://goodhomes.org.uk/overheating-in-new-homes.

[22] https://www.gov.uk/government/publications/research-into-overheating-in-new-homes#:~:text=It%20uses%20dynamic%20thermal%20modelling,risk%20to%20an%20acceptable%20level

The UK Green Building Council's *Health & Wellbeing in Homes*[23] (July 2016) highlights the increasing incidence of overheating and the need for a more holistic approach to building design:

"At design stage, particularly pre-planning, specialists should be appointed early in order to influence the design of homes. It is usually much cheaper to design out issues with space planning, building services, overheating, air quality, thermal comfort, and noise, than to mitigate them further down the line. Once a scheme has received planning permission it is likely to be too late to meaningfully improve the environmental conditions in a building. The knock on effect of this on health and wellbeing can be substantial, especially for concerns like overheating."

Education

Heat mortality monitoring report: 2022[24] published on 10 July 2023 states:

"During the first ever Level 4 and red extreme heat warning to be issued [in July 2022], there were increased communications to the public and professionals of the potential risks as part of the coordinated response that may have led to increased action. Met Office user engagement research suggests that 98% of the public took some level of action to protect themselves or their families over this period."

This suggests that the general public, when faced with extreme conditions, can make adaptations to protect themselves based on the information given.

These communications must be simple and consistent.

[23] https://www.shadeit.org.uk/resource/ukgbc-health-wellbeing-homes/

[24] https://www.gov.uk/government/publications/heat-mortality-monitoring-reports/heat-mortality-monitoring-report-2022

4. To what extent do the Government's Climate Change Risk Assessment and National Adaptation Programme (as well as other related strategies such as the Net Zero Strategy and Heat and Buildings Strategy) identify and address the risks from extreme heat? (Note: The third NAP, covering the five-year period from 2023-2028, is expected to be published in the summer of 2023)

Summary response to question 4

- The third NAP largely overlooks a nationwide approach to adapt our homes and workplaces
- The Heat and Building Strategy is about heat, not overheating

The Climate Change Committee (CCC) in a news article published on 29 March 2023 *Climate change has arrived, yet the country is still strikingly unprepared*[25] highlights a "lost decade in preparing for and adapting to the known risks that we face from climate change. Each month that passes without action locks in more damaging impacts and threatens the delivery of other key Government objectives, including Net Zero".

The CCC said of the third NAP "This is a make-or-break moment to avoid a further five years of lacklustre planning and preparation for the changing climate by Defra. A strong programme is also a key element of the UK's contribution to the global effort to tackle climate change and an essential part of the UK's international leadership on climate change".

The third NAP is largely missing a nationwide approach to adapt our homes and workplaces. We would suggest that the cooling hierarchy in the London Plan[26] should be considered.

The Heat and Buildings Strategy[27] is almost exclusively about heat and not overheating. In this 244 page strategy, there are over 1,850 references to heat and heating and just five references to overheating.

[25] https://www.theccc.org.uk/2023/03/29/climate-change-has-arrived-yet-the-country-is-still-strikingly-unprepared/
[26] https://www.london.gov.uk/programmes-strategies/planning/london-plan/past-versions-and-alterations-london-plan/london-plan-2016/london-plan-chapter-five-londons-response/poli-8
[27] https://www.gov.uk/government/publications/heat-and-buildings-strategy

5. Does the current planning framework do enough to encourage heat resilience measures such as cooling shelters, water bodies, green infrastructure and shading to be integrated into urban planning? Where such measures are incorporated, how accessible and successful are they?

We have not comment to make.

6. What can be done to protect the UK's existing public and private sector housing stock from the impacts of extreme heat while ensuring that homes are sufficiently warm in the winter months?

Summary of response to question 6

- Windows are a weak point in a building's envelope which need support from shading
- Glazing is static, the weather is dynamic
- Recent research shows that in colder months movable shading can help insulate windows reducing energy lost through windows by up to 33%
- In the summer external movable shading can reduce heat gain through windows by up to 98%

External and internal dynamic shading provides insulation to windows which are a weak point in the building envelope.

External shading is more effective than internal shading at reducing overheating as it significantly reduces the amount of solar gain entering the building (up to 98%). Internal and external shading can also help prevent energy loss during the heating season.

The lower the glazing specification (for example; single glazing, first generation double glazing) the bigger the benefit. Research commissioned by the BBSA at the University of Salford's Energy House Laboratory in 2022[28] shows that shading can reduce the heat loss through a modern double glazed low-e window by up to 33%.

Today, in existing homes, double low-emissivity glazing requires a minimum thermal performance of 1.4 W/m2K as required by Part L of the Building Regulations. In the future it is likely that this performance criteria will be raised closer to the performance specification of triple glazing – approximately 0.8 W/m2K. However, many homeowners will be reluctant to upgrade windows due to the cost and inconvenience of the works needed. Blinds and shutters are a comparatively low-cost alternative that can achieve a similar energy and carbon benefit. The University of Salford research highlighted above found that combining shading with a window with a U-value of 1.4 W/m2K could improve its performance to 0.94 W/m2K (33%) – almost that of a triple glazed window. In addition, the shading can be moved to improve the energy balance of the home.

A similar study was previously carried out on a single glazed window by Glasgow Caledonian University[29] on behalf of Historic England and English Heritage demonstrated that shading products could help reduce up to 66% of heat losses through the glazing.

Installing solar control glazing is an option for reducing the overheating risk but it also reduces the winter solar heat gain benefit. The best solar control glass has a g-value of around 0.22 meaning 22% of heat is still being transmitted. External solar shading can reject up to 98% of solar irradiance in the closed position.

Shading is dynamic – it is adjustable to suit changing external conditions. Glass, on the other hand, is static.

---

[28] https://bbsa.org.uk/wp-content/uploads/2023/03/March-2023-BBSA-Initial-Report-v2.pdf

[29] https://historicengland.org.uk/research/results/reports/7273/ResearchintotheThermalPerformanceofTraditionalWindows_Timbersashwindows%E2%80%99

7. What role might reversible heat pumps (which can act as both heating and cooling systems) and other emerging technological solutions, such as the development of smart materials, play in meeting future cooling demands?

Summary response to question 7

- The annual energy load of a heat pump could be more than a traditional heating system if used in cooling mode in the summer
- Shading in conjunction with heating/cooling systems will help reduce energy demand

We are not experts in heat pump technology.

However, like other forms of active cooling and heating heat pumps require energy for operation. While they may be more efficient that traditional HVAC systems, during use for heating they pump out cold air and when used for cooling they pump out waste hot air into the environment. In urban areas this will add to the urban heat island effect.

Shading systems are passive and even when motorised/automated use a minuscule fraction of the energy of heat pumps. Shading systems will not remove the need for heating, and possibly in some buildings cooling systems, but they should be used to reduce the size of active heat and cooling systems.

In the Federation of European Heating, Ventilation and Air-conditioning Associations (REHVA guide book- *How to integrate solar shading in sustainable buildings*[30] it states:

"Solar radiation is an important issue in all building projects as it has significant impact on the internal environment and affects the design of HVAC systems. Selection of solar shading should always be one of the first steps in the design of HVAC systems, as the demand for power and the energy consumption are greatly influenced by solar shading. Shading makes it possible to prevent extra solar heat from entering the building and to avoid the need for additional cooling to remove this heat, which costs precious energy. In winter time, however, the free heat from the sun is very welcome to reduce the building's heating cost."

Put simply, solar shading helps to reduce the size and energy use of HVAC equipment if considered at the design stage of a building.

[30] https://www.rehva.eu/eshop/detail/solar-shading

8. How can cleaner refrigerants with low or zero global warming potentials support the UK's cooling needs while contributing to the national emission reduction targets?

We are not experts in refrigerants.

We understand that even some low/zero global warming gasses used in these devices are still flammable which has implications for high-rise residential dwellings due to the non-combustibility requirements of Part B of the building regulations.

There needs to be consideration of the energy load of cooling systems. The Resolution Foundation in their report *It's getting hot in here - How ever-warmer UK summer temperatures will have an outsized impact on low-income households and low-paid workers*[31] state:

"Air conditioning is also more prevalent in areas that currently experience the hottest summers – London, the South East and East of England – suggesting that more places of work in other parts of the country may soon be investing in means to keep their workers cool. However, as with increasing air conditioning use in residential buildings, such investment would bring wider infrastructure issues and increase the costs associated with the net zero transition (51%[32] of UK energy demand for cooling currently comes from office buildings)".

31 https://www.resolutionfoundation.org/publications/its-getting-hot-in-here/

32 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1019896/cooling-in-uk.pdf

9. Does the Government's Future Homes Standard adequately consider overheating in homes? If not, what additional elements should it include?

Summary response to question 9

- Most homes have already been built and more modern, air-tight homes are more prone to overheating
- Need to consider unintended consequences and sub-optimal outcomes

Most homes have already been built and there is not a cohesive strategy to upgrade the existing housing stock.

Many homes being constructed now are still being built to old iterations of building regulations due to the transitional arragements loophole (only recently closed) that allowed developers to construct homes to building standards that applied when planning permission was granted. Some will have low levels of insulation and air-tightness meaning they are not energy efficient and will have to be retrofitted to meet net-zero targets.

The Future Homes Standard is a step in the right direction, however there is a risk of conflicting regulations and unintended consequences. We are already seeing this, for example with Part O and smaller windows being installed in new build homes to meet overheating requirements. This has implications on daylight and wanted winter solar heat gain. Recent research conducted by Pilkington (July 2023) involving 100 architects showed 20% have used smaller windows to meet overheating requirements in Part O. In total, 14% had resorted to air conditioning but only 7% to solar shading systems.

The government's response to questions raised in the Future Homes consultation on the impact on daylight was:

"We recognise the concerns raised about daylight and overheating. The Future Buildings Standard consultation includes proposals for a new overheating requirement within the Building Regulations. There are no minimum daylight requirements within the Building Regulations, which is why we do not have guidance on this matter".

Denmark, and other countries in continental Europe, has light transmission requirements in its regulations as there needs to be a balance between light, wanted heat gain in the winter to reduce heating costs and protection from too much solar gain in the summer.

10. How effectively is the Government working across departments and with local authorities to ensure a coordinated approach is taken to heat resilience?

We do not have enough experience to answer this question.

However, we would comment that different departments control the development of compliance models for commercial and domestic properties.

For industry there is the added complication of variances in requirements across countries in the UK and indeed within a country – for example the London Plan.

11. Does the UK need a dedicated Heat Resilience Strategy? What lessons can be learned from other nations when it comes to national strategies for heat resilience?

Summary response to question 11

- Need to consider existing building stock
- Focus has, and still is, on heating, not overheating for buildings
- Not enough focus, guidance or regulation on overheating requirements

The Resolution Foundation in their report published 15 August 2023 *It's getting hot in here - How ever-warmer UK summer temperatures will have an outsized impact on low-income households and low-paid workers*[33] state:

"So, on top of forging a path to net zero that does not unfairly burden those on lower incomes, we also need to consider how to adapt to higher temperatures. For homes, this means considering heat – as well as cold – during retrofit. For workplaces, it means learning from countries that have long had higher temperatures, including legal rights for maximum workplace temperatures, and better adapted buildings"

"We shouldn't assume that net zero retrofit will be a silver bullet for high temperatures: studies have shown either no observable link[34] between improving fabric efficiency and overheating risk (the presence of individual insulation measures did not impact measured overheating, and any trends based on EPC ratings are explained by property types), or that the links between insulation and overheating risk are variable and depend on numerous other factors[35], such as ventilation. Still, it makes sense to address both at the same time – especially as households are much less likely to resist change if workers only need to enter a property once".

In the UK there are more excess deaths due to cold than heat as shown in the latest Government Actuary's Department's *Mortality Insights from GAD - April 2023*[36] but there seems to be too much focus on heat retention, not heat rejection. This is evidenced by 'heat' and 'heating' being referenced 370 more times than 'overheating' in the government's Heat and Building Strategy.

The Health and Safety Executive has determined minimum working temperatures but not maximum ones[37].

Part O of the Building Regulations endeavours to combat overheating in dwellings although this has unintended consequences as detailed earlier. No such building regulations apply to existing dwellings or non-dwelling buildings in terms of overheating.

In healthcare settings where temperature regulation is paramount, the Care Quality Commission (CQC) inspection protocol includes checking for low room temperatures and questioning staff on how they respond to residents who feel cold, but no consideration towards high temperatures and questioning staff on how they respond to residents who feel hot.

---

33 https://www.resolutionfoundation.org/publications/its-getting-hot-in-here/

34 https://repository.lboro.ac.uk/articles/journal_contribution/Dwelling_and_household_characteristics_influence_on_reported_and_measured_summertime_overheating_a_glimpse_of_a_mild_climate_in_the_2050_s/14748093

35 https://www.theccc.org.uk/publication/addressing-overheating-risk-in-existing-uk-homes-arup/

36 https://www.gov.uk/government/publications/mortality-insights-from-gad-april-2023/mortality-insights-from-gad-april-2023

37 https://www.hse.gov.uk/temperature/employer/index.htm

France now requires all commercial buildings to have external shading fitted. This requirement is likely to be extended to domestic buildings.

ENDS

August 2023