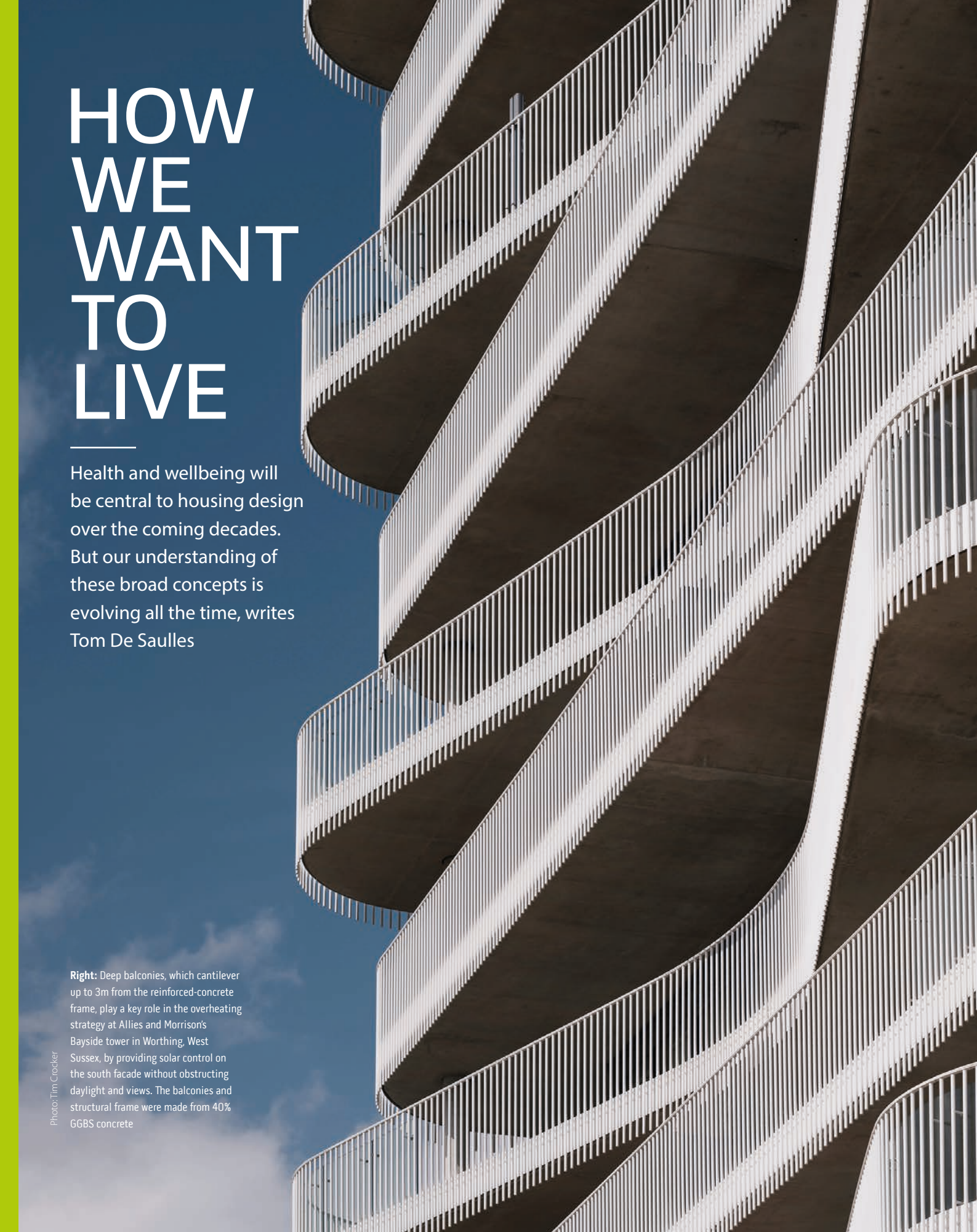
HOW WE WANT TO LIVE

Health and wellbeing will be central to housing design over the coming decades. But our understanding of these broad concepts is evolving all the time, writes Tom De Saulles



Right: Deep balconies, which cantilever up to 3m from the reinforced-concrete frame, play a key role in the overheating strategy at Allies and Morrison's Bayside tower in Worthing, West Sussex, by providing solar control on the south facade without obstructing daylight and views. The balconies and structural frame were made from 40% GGBS concrete

Photo: Tim Crocker

What do we want from our homes? It may sound like a straightforward question but for many people the answer will have changed considerably since the Concrete Industry Sustainable Construction Strategy was first launched in 2008 – and it is likely to change again as we head towards 2050. Even in the past few years, the rise in energy prices, extreme weather, working from home and the changing needs of an ageing population have posed new questions about how we design living spaces.

But new challenges can also obscure the fact that much of what we want from our homes hasn't changed at all – in fact, it has been hardwired in over generations. A dwelling's primary requirement is still to provide a secure and robust living environment where occupants feel safe. Likewise, many of the key elements of the emerging health and wellbeing agenda are based on well-established principles, focusing on thermal comfort, light, air and materials.

The best housing over the coming decades will be built in a way that adapts to our changing lifestyles and changing climate, but without losing sight of the issues that have always shaped the way we want to live. This lies at the heart of the refreshed Sustainable Construction Strategy – one of our key commitments is to continue to provide a safe and comfortable built environment (see page 2).

But it is a complex challenge – here, we explore some of the areas that are likely to force their way up the agenda, and that designers can't afford to ignore.

Health and wellbeing

Issues around health and wellbeing have been gaining prominence in building design over the past decade. Although this has largely focused on the workplace, driven by the WELL Building Standard, it is clearly an important issue in housing too – not least because of the growing overlap between work and living. According to the Office for National Statistics, working from home has increased nearly fivefold since 2015, with a dramatic rise driven by the Covid lockdowns.

This shift in focus to the domestic arena gives an opportunity to consider aspects of health and wellbeing that are often overlooked. Environmental noise, for example, is the second biggest environmental cause of health problems after air pollution, according to the World Health Organisation. Among the effects of constant exposure is sleep disturbance and stress.

"ENVIRONMENTAL NOISE IS THE SECOND BIGGEST ENVIRONMENTAL CAUSE OF HEALTH PROBLEMS AFTER AIR POLLUTION"

In housing, this is likely to become an increasingly urgent issue. The trend is already for development to concentrate in urban areas and this is only likely to intensify. Government data suggests that the population will grow – albeit at a slower than current rate – by 4 million people over the next 20 years. At the same time, we will be grappling with challenges around biodiversity, transport, energy and water and food security, all of which will drive further densification.

The challenge is to ensure that denser development doesn't become noisier development. The minimum Part E (Resistance to the passage of sound) airborne sound resistance for the dividing walls and floors between new-build homes is currently 45dB. This can easily be achieved using heavyweight materials, due to their inherent mass, stiffness and damping properties. Concrete and

Photo: BACA Architects

Below: Flood-resilient housing by BACA Architects in Shipston, West Midlands. All of the houses use cavity-wall construction, with a concrete block inner leaf. The concrete ground floors are raised on a reinforced-concrete frame, leaving an accessible void under the buildings. Internal walls forming the staircases and halls are also blockwork

masonry separating wall and floor solutions are detailed in Part E and also in the Robust Details scheme, which offers a practical alternative to the pre-completion sound testing that is otherwise required by Part E. Specific requirements for finishes and any additional acoustic insulation are also set out in Part E and Robust Details.

Overheating

Overheating is already thought to affect up to 20% of England's housing stock, and is a growing threat to both health and wellbeing – as borne out by the unprecedented heatwave during the summer of 2022 and the equally record-breaking temperatures in June 2023. Sudden spikes in temperature and prolonged periods of excess heat are difficult for occupants to cope with, especially if they have an underlying health condition. The elderly are particularly at risk, with projections showing a three-fold increase in heat-related mortality by the 2050s.

In the housing sector, there is a new section of the Building Regulations – Part O – to address overheating. The best approach is to employ a variety of design measures, prioritising the removal of excess heat through solar control and ventilation. Designers should also consider building form, orientation and the use of thermal mass, all of which can help with Part O compliance.

To take advantage of thermal mass, it is important that heat absorbed during the day is removed overnight, so the building fabric can repeat the cycle the following day. This is achieved with night-time ventilation, using the cool night air to draw heat out of the fabric of the dwelling, as well as enabling the benefit of comparatively cool air to be carried forward to the following day.

It is worth highlighting a potential conflict between acoustic design and night-time purging, with the danger of external noise being transmitted through ventilation openings. However, new requirements set out in Part O help to tackle this problem through the use of sound-attenuating windows and vents. Thermal mass also has the potential to lessen the impact of noise and pollution during the day by reducing the need to open windows.

Good sources of overheating guidance include the Future Homes Hub Part O 2021 technical guide and the Concrete Centre publication, Designing to Avoid Overheating (2022).

Security

Like external noise, security is an often overlooked aspect of wellbeing, despite becoming increasingly significant in an age of high-density city living, often in shared spaces. According to the famous hierarchy of needs proposed by 20th-century psychologist Abraham Maslow, safety ranks second only to our physiological requirements as a behavioural motivation.

The Secured by Design police initiative gives specific recommendations to improve the resilience of walls to withstand criminal attack in certain parts of a dwelling. Guidance is also provided on robust wall construction between individual accommodation for students, key workers and other "single" room accommodation with shared facilities. In such instances, it is identified that "the security of a development can be severely compromised if lightweight framed walls do not offer sufficient resilience to withstand a criminal attack". The walls either side of any security door are also identified as areas requiring robust performance, and specific requirements are provided on how to meet the necessary standard using framed construction.

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Concrete and masonry walls can provide secure and robust enclosures, able to withstand criminal attack with little or no additional measures. Other ways in which the building fabric can be used to enhance home security include specifying concrete floors below and/or robust walls between shared attic spaces in apartment blocks, and masonry or concrete facades in vulnerable locations such as road sides.

Flood resilience

The risk of flooding is also likely to play a greater role in our perception of security. Floods are believed to cause around £740 million of damage each year in the UK, an increase of 1.4% since 1990, according to the New Scientist.

British standard BS 85500 can help identify when flood-resilient and resistant construction is appropriate, and offers guidance on how to achieve it. A key recommendation of BS 85500 is the use of a range of concrete and masonry structures, as they retain their structural integrity in flood conditions. Concrete has the strength to keep water at bay, with few construction joints to let the water through. It is also resistant to rot or fungal growth if water does get in and can be easily washed and disinfected.

Reinforced concrete or concrete blocks can be used, for one or both of the leaves in conventional cavity-wall construction, or as a single structural leaf in a solid masonry solution. Alternatively, an insulated concrete formwork (ICF) system can be specified, which typically employs rigid polystyrene as both insulation and formwork. The insulation properties are unaffected by moisture, making

ICF appropriate for most flood situations.

Concrete floors are also the preferred solution when it is not possible to place the ground floor above the predicted flood level. This should be in the form of a reinforced-concrete slab, at least 150mm thick.

The demands placed on the design of new homes will continue to increase over the coming decades. Alongside carbon and energy targets, health and wellbeing will be central to this. But health and wellbeing is a broad concept, one that cannot be easily delivered without high levels of thermal, acoustic, security and flood performance. These benefits will only become more important as the climate changes, and as we continue to adapt to more urban, more home-based lifestyles. Indeed, the ability of our homes to adapt with us may be the most critical design challenge of all.

Photo: David Grandorge

Above: Adam Khan Architects' Central Somers Town housing and community centre, which has been shortlisted for the 2023 Neave Brown Award for housing. The designers worked to 2050 climate levels, which meant a thorough approach to overheating: external roller blinds and internal side opening windows allow simultaneous ventilation and solar protection. Thermal mass – achieved by using blockwork external and internal walls – enables this passive cooling strategy

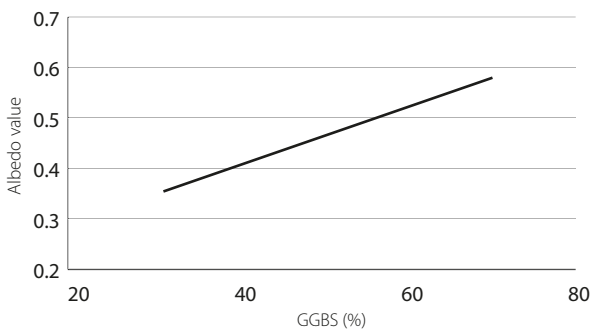
HOW GGBS CAN HELP COOL THE CITY STREETS

Temperatures exceeded 40ºC in July 2022 and saw the UK's first level 4 health heatwave warning. Heatwave preparedness is a growing issue for local and national government and is the basis of a recent policy brief from the Grantham Research Institute on Climate Change and the Environment, which details recommended actions for heat-related policies in the UK. Included in these is a range of urban measures, one of which is the use of cool pavements and streets.

Conventional paving materials can reach peak summertime temperatures of 48-67°C, while light-coloured, high-albedo finishes reflect solar gains back into the sky, giving a surface temperature that is around 20°C lower. Research in the US, where the use of cool pavements and roofs is more established, suggests that every 10% increase in solar reflectance could decrease surface temperatures by 4°C. It is estimated that if pavement reflectance throughout a city were increased from 10% to 35%, the air temperature could be reduced by around 0.6°C, increasing to 0.8°C if used in combination with other mitigation measures such as trees, green roofs and vegetation.

Light-coloured surfaces have an albedo value of around 0.8, meaning 80% of the sun's heat is reflected, while darker surfaces with values closer to zero result in greater heat absorption. Ordinary concrete has an albedo value of around 0.2-0.4. This is higher/better than asphalt, which has a value of 0.1-0.15, but not as high as concrete that has a high GGBS content or is made with white cement, which can give values up to 0.8. Concrete with a high albedo finish can be beneficial for both paving and building exteriors, helping to reduce the build-up of heat in the urban environment.

CONCRETE ALBEDO WITH VARYING GGBS CONTENT



Source: Boriboonsomsin and Reza, 2007