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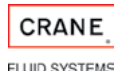
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Peak performers

It's back to school this month, with children returning to the classroom to remember and build on the knowledge they gained the previous year. At the start of the autumn term, schools use informal 'baseline' checks to see where students are starting from after their summer break. Children are then monitored to check they are progressing at the expected rate, and skilled teachers catch and fix misunderstandings in real time to ensure no knowledge gaps appear as the term develops.

The concept of benchmarking, continuous monitoring and real-time feedback lies at the heart of Energy Synergy. Developed by contractor Willmott Dixon, this performance service evaluates a building at the design stage using CIBSE TM54 energy modelling, tracks equipment via sub-metering, and uses the operational data to eliminate energy gaps and optimise long-term efficiency.

Fittingly for this analogy, Willmott Dixon has been using Energy Synergy in a number of schools, where evidence of carbon and cost savings resulted in the service winning a Building Performance Evaluation Award for Practice at the CIBSE Building Performance Awards. Bassaleg School, in South Wales, exemplifies what can be achieved. Actual energy use is 21% less than predicted at design stage, which has resulted in annual energy savings of 327,204kWh and savings of 65.11 tonnes CO₂e.

On page 38, we look at how Energy Synergy has been applied to a school that opened in Wales this month. Ysgol Gynradd Glyn-Coch was part of the pilot for the UK Net Zero Carbon Buildings Standard, which sets energy and carbon targets for net zero-aligned buildings. Its design followed a Passivhaus methodology, which Willmott Dixon said enabled it to meet the standard's pilot energy efficiency targets. Installed metering verified the design-stage targets and an intelligent AI dashboard checked that performance was optimised.

This summer's series of heatwaves has focused attention on making the built environment more resilient. After TM59 was published earlier this year to account for a warming climate, lead author Susie Diamond (page 43) tells the *Journal* what else is being planned to protect buildings and their occupiers from the future's relentless heat, from an additional test for heatwaves to a modelling metric for trees.

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Contributors



Julie Godefroy
 Analysis of the 2026 Building Performance Awards reveals that 71% of the entries were all-electric



Enda Seyama-Heneghan
 The chair of ANZ YEN on working on Bondi Beach and connecting with young engineers



Erkan Soydan
 Why vertical transportation systems around the world are ripe for renewal rather than replacement



Tim Dwyer
 CPD on how pipe insulation contributes to operational performance and thermal comfort

Protect healthcare sites from heatwaves, says RCN

Nursing union describes parts of the NHS as 'inhumane' places to work

An urgent programme is required to heat-proof facilities across health and care services in response to climate change, the UK's main nursing union has urged.

As the country entered its fifth heatwave of the year in mid-August, the Royal College of Nursing (RCN) warned that extreme heat is making parts of the NHS an 'impossible and inhumane' place to work and receive care.

It said nursing staff calling its helpline have reported colleagues collapsing on shift and experiencing heat-related seizures, and pregnant staff working in temperatures above 30°C.

The calls also reveal a widespread lack of functioning air conditioning, fans or ventilation. Windows often do not open, while leadership in several places refused requests for air conditioning or to relax uniform rules to allow staff to cope better.

Older and more vulnerable patients are being left in hot, stuffy rooms, while surgical patients are recovering in temperatures exceeding 30°C.

Medicines, blood products and clinical equipment are also having to be relocated to prevent overheating and maintain safety standards, according to the union.

Professor Nicola Ranger, RCN general secretary and chief executive, said: 'Climate change is a serious threat to people's health and the services they rely on. That's why we need action – not in two or three years, but now – to prioritise and accelerate investment to upgrade facilities, adapting to the climate crisis as temperatures rise.

'Employers must also abide by their legal duties to make workplaces safe, by mitigating the risks to staff from the heat. This includes installing air conditioning, improving ventilation, ensuring water and heat-appropriate uniforms are available, and guaranteeing that risk assessments are a core part of business planning.'

Recently appointed Health Secretary Yvette Cooper said she has ordered the NHS to start drawing up summer plans to deal with heatwaves, as it has traditionally done for winter crises.

8% of heat network customers can't turn off central heating

One in 12 households connected to a heat network is unable to turn off their central heating, even during the summer, according to new Citizens Advice (CA) figures.

The consumer charity's research, published on 6 August, found that 8% of the 453,000 households connected to heat networks in England and Wales rely on such old systems that they are unable to turn off their heating when

they don't need it. This affects around 37,665 households, housing more than 90,000 people.

According to the research, 44% of Britons feel they lack the control to stop their homes overheating. They include people living in buildings with old, gas-run heat networks, which CA says are among the most at risk of overheating because of hot pipework intensifying indoor temperatures.

Octopus heat pump sales jump in July

Octopus recorded its best month to date for heat pump sales in July 2026.

The company said its sales were 71% higher than for the same month last year, and July was the sixth consecutive month of growth.

Since the government increased

the Boiler Upgrade Scheme grant for people with oil boilers to £9,000 in April, Octopus has had almost three times as many customers switch from oil and liquefied petroleum gas boilers to heat pumps.

Rebecca Dibb-Simkin, chief

product and marketing officer, said:

'The heat pump revolution is accelerating. We've never seen demand like this – thousands more households choosing to go electric to save money and insulate themselves from global price shocks.'

Awaab's Law to be extended to heat networks

Landlords will have to address extreme cold and heat

Heat networks are to be covered by a law that gives tenants the right to challenge dangerous conditions in their homes, *Inside Housing* magazine has reported.

Phase 2 of Awaab's Law comes into force on 30 November, having been introduced under the previous, Conservative, government in response to the death of two-year-old Awaab Ishak in 2020. He died from a severe respiratory condition resulting from prolonged exposure to mould in his family's flat in Rochdale.

Under the law, landlords must address new hazards linked to excess cold and heat.

According to *Inside Housing's* report, the government has confirmed

that landlords owning a heat network will also be responsible for addressing any significant or emergency hazards arising from it.

Gareth Jones, managing director at heat network consultant FairHeat, posted on LinkedIn that the extension is a 'significant development' that will bring 'greater focus to the performance and reliability of existing heat networks'.

Awaab's Law imposes new legal requirements on landlords to investigate and fix hazards within prescribed timescales, including carrying out emergency repairs within 24 hours.

They face fines from local councils and potential prosecution if they fail to comply with the law.

Adaptive comfort pioneer Michael Humphreys dies

Professor Michael Humphreys, pioneer of adaptive thermal comfort, has died aged 89.

His groundbreaking field research with Professor Fergus Nicol at the BRE and Oxford Brookes University proved thermal comfort depends on climate, clothing and human adaptation, refuting rigid fixed-temperature models. This work transformed sustainable building design, underpinning major international standards, including CIBSE TM52 and TM59, EN 16798, and ASHRAE Standard 55.

Elected a CIBSE Honorary Fellow in 2016, Professor Humphreys reshaped how engineers approach naturally ventilated buildings worldwide. His visionary legacy remains central to modern, energy-efficient built environments.

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FLUID SYSTEMS

Trust backs Scottish Building Standards Passivhaus proposal

Proposals to align Scottish Building Standards more closely with the Passivhaus ultra-low emissions benchmark have been welcomed by the Passivhaus Trust.

Responding to the Scottish government's consultation on changes to energy and environmental standards in building regulations north of the border, the trust backs a proposal that Passivhaus certification be recognised as an alternative means of complying.

Its response also welcomes the stronger focus on actual building performance, with use of absolute energy targets, including space-heating demand and delivered energy targets.

UK solar panel fires escalate

The rate of solar panel fires in the UK is rising faster than the rate of installations, according to new analysis from insurer QBE.

Based on freedom of information requests to fire services, the company says incidents involving solar panels climbed to 212 in 2025, up from 91 in 2022 – a rise of 131%. Over the same period, installations of solar panels rose from 1,268,795 to 1,933,148, an increase of 52%.

QBE says the mismatch suggests safety, installation quality and maintenance are not keeping up with the speed of adoption.

BDR Thermea buys GI Holdings

Baxi's parent company, BDR Thermea, has completed the full acquisition of one of Italy's leading commercial and industrial heating, ventilation and air conditioning manufacturers. GI Holding's brands include Clint heat pumps and chillers, KTK Klimatechnik process cooling, Novair air quality solutions and Montair data centre cooling.

Draft London Plan sets energy efficiency standards

Energy use intensity targets aimed at new-build projects

London mayor Sir Sadiq Khan has proposed minimum energy standards that major new developments in the capital must meet. His *Draft London Plan*, published for consultation in July, sets out proposed baseline standards for space heating and energy use.

Space heating demand for all major schemes should not exceed 20kWh·m⁻² per year, while the minimum energy use intensity baseline is set at varying levels for six types of new-build development: residential, office, primary school, industrial, hotel and student accommodation. These range from 40kWh·m⁻² per year (residential) to 120kWh·m⁻² per year (hotels).

Any development falling outside of these categories must establish performance using recognised industry benchmarks, such as the UK Net Zero Carbon Buildings Standard (UK NZCBS), as noted in the policy guidelines.

The plan's GRH1 policy on energy efficiency also stipulates that major developments should produce, store and use renewable energy on site, while annual in-use energy demand should be monitored and reported for



Timber Square in London was a UK NZCBS pilot

at least five years post-construction.

The plan strongly opposes air conditioning, which it says should be an absolute last resort, in a bid to thwart the growth of urban heat islands. It supports data centres in clusters of such developments where opportunities for heat recovery exist and both electricity and water are available.

In a blog on the *Draft London Plan*, Cundall sustainability associate Cyril Knabe-Nicol, writes that the proposed changes signal a 'decisive shift' in the capital's sustainability strategy: 'This is more than a policy update. It marks a transition from demonstrating compliance to proving performance.'

EPCs over-predicting energy performance for 1.8m homes

A study into the gap between Energy Performance Certificate (EPC) predictions and how homes perform in practice has found that approximately 1.8 million homes could be shifted into Band C or above.

The research – carried out by Energy Saving Trust, using one of the largest datasets of measured building performance – shows that current energy models often do not reflect how homes really perform.

While many perform better than expected, results vary widely, the study found, exposing the limits of relying on modelled data alone to assess

performance and target interventions. It concluded that the impacts could be 'substantial' on retrofit activity, if the performance gap observed in other comparisons of in-use heat transfer coefficients and EPCs is representative of the real gap across the housing stock.

Applying the performance gap observed in studies to Britain's entire housing stock suggests that around 15% – approximately 1.8 million homes – would shift to Band C or above.

However, flattening the distribution of EPC ratings for domestic buildings means there would also be an increase in homes with 'very low' ratings.

McCluskey retains Warm Homes brief in reshuffle

Minister keeps remit despite job change within DESNZ

Martin McCluskey has retained responsibility for implementation of the Warm Homes Plan (WHP) and non-domestic building decarbonisation in Andy Burnham's new government.

The Prime Minister's first reshuffle replaced McCluskey as energy consumers minister, but kept him in the Department for Energy Security and Net Zero (DESNZ) with the new post of minister for local energy and jobs.

It means he will keep his previous responsibilities for delivering the WHP, decarbonisation of public sector and non-domestic buildings, clean heat and clean heat networks. McCluskey is replaced as energy consumers minister by Polly Billington.

Burnham also appointed Miatta

Fahnbulleh to take over from Ed Miliband as Secretary of State for Energy Security and Net Zero.

Fahnbulleh is a former energy consumers minister, having served under Miliband at the DESNZ after Labour's landslide election victory in 2024. There, she oversaw preparation of the WHP, but was then replaced by McCluskey in a reshuffle by former PM Sir Keir Starmer.

In one of his first acts as Prime Minister, Andy Burnham also announced that the 5% VAT rate on electricity bills is being removed temporarily. This should save the typical customer around £45 per year, while incentivising the switch to electrified technologies.

Verification opens for UK NZCBS

Building owners can now submit performance data to verify that their facilities are aligned with the UK Net Zero Carbon Buildings Standard (UK NZCBS).

The verification process opened last month for the standard, which obliges buildings to fulfil a number of requirements, including: removal of fossil fuels; the introduction of onsite renewable electricity generation; and limits on upfront embodied carbon and energy use.

The evidence requirements include 12 months of in-use energy data and the as-built, upfront embodied carbon data, which must be verified by an independent third party.

Bureau Veritas is currently the sole accredited verifier and appointed verification administrator for the standard.

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Neil, Technical Director



Chris Skidmore made an Honorary Fellow

Award recognises his ongoing work in support of net zero

Chris Skidmore, the politician who signed the UK's Net Zero pledge into law, has been named as the latest recipient of CIBSE's Honorary Fellowship.

The former Conservative minister for energy and clean growth was presented with the honour by CIBSE President Dave Cooper at a ceremony at the Institution's London headquarters.

Skidmore is the 71st recipient of the honour since it was first awarded in 1970 to recognise individuals who have made 'an exceptional contribution to the built environment, engineering, society or areas aligned with CIBSE's mission'.

The citation recognised his ongoing work in support of net zero. This includes, in 2019, signing into law the UK's commitment to achieving net zero by 2050, making it the first major economy to establish such a legally binding target.

'Chris Skidmore's contribution to public policy, particularly in establishing the UK's net



CIBSE President Dave Cooper presents Chris Skidmore with the Honorary Fellowship

zero framework and advancing practical pathways for delivery, has had a significant and lasting impact,' said Cooper.

'His work has helped to define the strategic direction of national climate policy, as well as influenced thinking well beyond the United Kingdom.'

Skidmore – who served as MP for Kingswood, in South Gloucestershire, for 14 years, until stepping down in 2024 – told guests at the presentation that he was 'deeply humbled and honoured' by the CIBSE award.

Training

Navigating the new era of building safety

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 - **Introduction to the principal designer and principal contractor roles**, 28 September (remote), 24 November, London
 - **Commissioning Code M, commissioning management**, 8 October (remote)
- Book today at bit.ly/4w1IOXZ**

Training spotlight

Operational performance and energy compliance

- DEC theory and ORCalc software training, 29 September, London
- Understanding CIBSE TM39: Building metering and monitoring, 14 September, remote; 18 November, London; 16 December, remote

Technical and electrical essentials

- Mechanical services overview, 24 September, London
- Standby diesel generator systems, 9 September, London

Check out our on-demand courses at bit.ly/4w1AKLX

Historic structure and standard-setter shortlisted for SFE façade awards

Global event on 4 November will also crown Young Façade Engineer of the Year

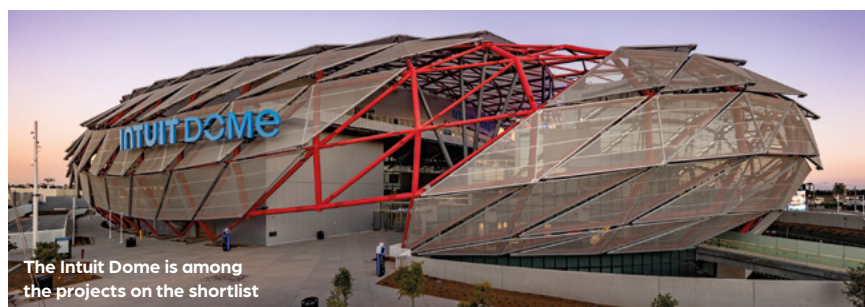
High-profile, unique and innovative projects demonstrating technological advances in façade design have been shortlisted for the SFE Façade 2026 Design and Engineering Awards.

The diverse range of projects, from Europe, the Americas, Asia and Australasia, showcase new techniques for designing and constructing sustainable buildings, as well as sensitive refurbishment projects that raise the bar on reuse and renovation of façades.

Established by the Society of Façade Engineering (SFE), and sponsored by Hilti, Buro Happold and Meinhardt (UK), the awards feature a number of new categories this year.

Notable shortlisted projects for 2026 include the Intuit Dome in California, entered by Walter P Moore in the new Project of the Year – Arenas, Stadia and Infrastructure category. The 1.14 million sq ft facility houses an 18,000-seat arena and was designed around the idea of a basketball going through a net.

Birmingham's Three Chamberlain Square has been shortlisted in another



new category, Project of the Year – Commercial. Entered by FMDC, the 189,000ft² Grade A office space establishes new benchmarks for façade-led sustainability in the West Midlands, achieving Breeam Outstanding and NABERS 5-star ratings – regional firsts.

Also among the finalists is Hangar One, entered by Arup, which appears in the Project of the Year – Refurbishment Heritage category. At 350m long, 100m wide and 60m tall, the 1933 airship hanger is one of the largest freestanding historic structures in the world. The project involved recladding and

strengthening it for long-term use.

Six engineers are also recognised in the shortlist for the Young Façade Engineer of the Year. They are: Arnau Colom, Bellapart; Shorenna Gudzhbidze, Staticus; Calvin Huang, Prism Façades; Jennie (Wanqing) Li, Meinhardt; Anurag Sonar, Eckersley O'Callaghan; and Marti Wolowik, Buro Happold.

Winners will be announced at the awards ceremony at Old Billingsgate, London, on 4 November.

To view the full awards shortlist, visit: www.cibse.org/facadeawards

In September and October

Building Safety Conference

17 September, London

Examining how competence, building performance, operational management and the net zero transition must support safer outcomes across the building life-cycle. Speakers include Dame Judith Hackitt and Thouria Istefhan, chief construction adviser.

SoPHE Technical Conference

1 October, London

With discussions on circular public health engineering, water safety planning, engineering judgement and delivery performance, the conference will focus on creating safer, more resilient systems.

CIBSE Young Engineers Awards

8 October, London

The awards celebrate innovative thinking, hard work and exceptional skill from graduate and undergraduate engineers and apprentices across the building services profession. They also recognise employers who develop and nurture the next generation of talent.

CIBSE MENA Decarb Conference and MENA Awards

27 and 29 October

Expert speakers will bring their expertise in decarbonisation to the conference, while the awards will highlight projects and professionals who are setting new standards in sustainability, safety and performance.

Get your entry in for the SDE Awards

The Society of Digital Engineering (SDE) Awards 2026 are open for submissions. There are two new categories – Sustainable Impact and Best Use of AI – reflecting the growing role of digital technologies in supporting sustainability objectives and the rapid adoption of AI across the built environment.

The awards are open to organisations of all sizes, as well as individuals who are making a significant contribution to digital engineering worldwide.

Winners will be announced at the SDE Awards ceremony in London, on 19 November.

● **The closing date for entries is 16 October. Visit the awards webpage: bit.ly/CJSDEA26**

Enter now for this year's Building Simulation Awards

Nominations are now open for the 2026 CIBSE Building Simulation Awards, organised by the CIBSE Building Simulation Group.

These annual accolades have two categories.

The CIBSE Building Simulation Award focuses on the use of building simulation projects and aims to encourage innovation in building simulation techniques. Entries should provide information on a project that has a simulation or modelling aspect.

The CIBSE Building Simulation Young Modeller Award recognises the outstanding contributions of young engineers, apprentices and sustainability consultants working in building performance simulation.

Finalists will be invited to present their projects online to the judging panel and an audience.

The winners will be announced on 18 November, at an event at CIBSE head office in London.

● **The closing date for entries is 16 October. For more information, visit bit.ly/CJSimAw**



Zahra Jahed Bozorgan won the CIBSE Building Simulation Award 2025

Lectures focus on performance gap

CIBSE's Special Interest Groups are hosting four lectures to explore the question 'Who owns the performance gap between design intent and operational reality?'

The events will take place from 1pm to 5pm at CIBSE HQ, Saffron Hill, London, as follows: 5 November – Oversizing and undersizing equipment; 12 November – Heat networks; 18 November – Building simulation, followed by the Building Simulation Awards; 1 December – Post-occupancy evaluation and series wrap-up.

WiBSE launches online talks to inspire and connect women

A new series of online talks, titled Building Voices, has been launched by Women in Building Services Engineering (WiBSE).

Designed to inspire, connect and empower women across the industry, the talks will encourage open conversations with the people shaping our profession, and provide advice for others on navigating careers.

Covering a broad range of themes, from volunteering to leadership, the talks will be around 10–15 minutes long.

The schedule for the new series is:

- 9 September, 12.30–12.45: A day in the life – Jessica Glynn, associate director, Atelier Ten
- 23 September: Why you should volunteer – Skyler Ward, building services engineering degree apprentice, Hoare Lea
- 7 October: Non-linear careers – Rachael Gilbert, mechanical engineer, Troup Bywaters + Anders

The first talk features WiBSE chair Jessica Glynn



- 21 October: Finding your people – Apeksha Mohan, energy and sustainability engineer, KJ Tait.

Sessions will also be available to watch on demand. To register for the talks, visit: bit.ly/CJKYKWeb.

Calling WiBSE speakers from all career levels. If you are interested in supporting this initiative, contact skylerward@hoarelea.com or jessica.glynn@atelierten.com

Remembering technical author Steve Irving

Industry leader was prodigious writer of CIBSE guides

CIBSE was sad to learn of the death, in July, of Stephen (Steve John) Irving FCIBSE. Steve was the recipient of a CIBSE Silver medal, an elected Fellow of the Royal Academy of Engineering since 2002, and was awarded an Aecom Fellowship in 2011.

A regular contributor to CIBSE conferences and technical seminars, he contributed to many CIBSE publications. Among those he authored were: *TM 32 Guide for the use of the carbon emissions calculation method*; *TM21 Minimising pollution at air intakes*; and *AM10: Natural ventilation in non-domestic buildings*. He was a section author for *AM11: Building energy and environmental modelling*.

Steve studied chemical engineering before joining Oscar Faber (now Aecom) in 1978 as senior engineer/analyst. He

was appointed MD of Faber Computing for Engineering and Technology (Facet) in 1981, and later became director of Oscar Faber Applied Research, where he was active with government contracts within Faber Maunsell Applied Research. Other roles included project manager for international research projects for the International Energy Agency, and project director for Office of the Deputy Prime Minister framework research contracts.

He was technical coordinator for revisions to Part L of the Building Regulations (Conservation of fuel and power) in 2002, 2006, 2010 and 2016, and a member of the Foresight Housing Panel.

Steve will be remembered across the industry for his technical expertise and leadership.

Technical Policy committee: new name for a renewed purpose



CIBSE wants to encourage specialists to contribute to guidance, says **Robert Redfern**

CIBSE's technical expertise underpins the guidance we produce

and the advice we give to government, regulators and industry, and allows our members and wider stakeholders to have confidence in our work.

To ensure that expertise continues to shape the future of the built environment, the CIBSE Board has approved a new name for the Technology committee. It is now called the Technical Policy committee, reflecting its remit of overseeing technical activity and its increasingly important policy and advocacy work.

The Board has also approved updated terms of reference, providing greater clarity on the committee's responsibilities, such as overseeing policy development, reviewing consultation responses, supporting external technical engagement, and ensuring CIBSE's outputs remain evidence-based and authoritative.

We're keen to hear from members, including those already supporting CIBSE's Special Interest Groups, Regions and Societies, who want to help shape the Institution's technical policy outputs. If you'd like to contribute to the Institution's technical policy outputs, email technical@cibse.org

● **Robert Redfern is chair of CIBSE's Technical Policy committee**

Register launched for WLC assessors

The Whole Life Carbon Assessors (WLCA) Register has been launched by CIBSE Certification, to recognise competence in assessing carbon and reducing WLC.

It will be a central hub for professionals verified in WLC assessment, offering professional credibility, technical support and industry recognition. It builds on the WLCA Training Programmes. Once participants pass the assessment based on Rics WLCA Standard 2nd Edition methodology, they may apply to be on the register.

Other benefits of being registered include access to technical support and industry experts, marketing toolkits and a listing on CIBSE's website.

For more information, visit: bit.ly/CJASea

A 100-year-old climate warning



Wildfires are one of the most dramatic consequences of climate change. Mitsubishi Electric's **Rachel Lekman** says we can't ignore warnings that have been voiced for at least 100 years

The devastation caused by this summer's wildfires must give even hardened climate sceptics pause to think: 'If only people had warned us.'

Well, forget alarms raised in the 1992 *World scientists' warning to humanity* document, or the 2006 film *An inconvenient truth*, by Al Gore: we were warned more than a century ago!

A short report published in New Zealand's *Rodney and Otamatea Times* on 14 August 1912 has recently re-emerged. It states:

Coal consumption affecting climate: the furnaces of the world are now burning about 2,000,000,000 tons of coal a year. When this is burned, uniting with oxygen, it adds about 7,000,000,000 tons of carbon dioxide to the atmosphere yearly. This tends to make the air a more effective blanket for the Earth and to raise its temperature. The effect may be considerable in a few centuries.

USA Today reported the article in 2021 and concluded it had first been published in March 1912, in *Popular Mechanics* magazine, and then republished in several other newspapers, including in New Zealand.

There may also have been a warning in 1896, in the fifth series of the *Philosophical Magazine and Journal of Science*, which published extensive writings under the title: 'On the influence of carbonic acid in the air upon the temperature of the ground.'

In his 39-page article on geological climatology, the author asks: 'Is the mean temperature of the ground in any way influenced by the presence of heat-absorbing gases in the atmosphere?'

While this complex, detailed paper makes no direct correlation with climate change, it could serve as the earliest warning that man's activities had the potential to significantly alter the Earth's temperature.

So, we were warned!

It's not too late, though, and there is still time to do something about it by replacing gas heating with renewable heat pumps. With the widest range available in the UK, Mitsubishi Electric can help decarbonise just about any building.

● **Rachel Lekman is consultant channel manager at Mitsubishi Electric**



S&P supports Manly Trust Skills Hub

CIBSE has thanked S&P UK Ventilation for its generous donation to the CIBSE Building for the Future fundraising campaign.

The company's sponsorship of one of the CIBSE training rooms, located in the Manly Trust Skills Hub, is supporting professional development and helping engineers build critical skills.

Alex Finch, managing director at S&P UK Ventilation, said 'We are delighted to formalise our partnership with CIBSE, an organisation that plays a vital role in advancing building services engineering and promoting excellence across the built environment. We share CIBSE's commitment to improving building performance, supporting decarbonisation and developing the next generation of engineers.'

The Manly Trust Skills Hub includes a modern conference space, training facilities and flexible, collaborative workspaces.

● **Support the campaign at**
bit.ly/CJBFTF25

TM39 training dates

More training dates have been released for CIBSE TM39.

Upcoming dates are:

14 September, remote

18 November, London

16 December, remote

● **Download the guide at**
bit.ly/CJTM39

Technical guide launched for heat transfer coefficients

New CIBSE TM71 is a guide to HTC measuring methods

CIBSE has published new guidance setting out a clear framework for understanding, measuring and interpreting heat transfer coefficients (HTC) in buildings.

The new technical memorandum, *CIBSE TM71: Measuring heat transfer coefficients in buildings*, was developed with support from Innovate UK, and supports a growing shift towards evidence-based assessment of real-world building performance.

The guidance brings together definitions, data requirements and practical recommendations for measurement and interpretation. It is intended to strengthen the industry's ability to move beyond theoretical assumptions and towards measurable, verifiable performance outcomes.

HTCs are widely used in building design and assessment, particularly for sizing heating systems, planning retrofit interventions and informing energy models. However, they are typically calculated rather than measured.

For a long time, the main method available was co-heating tests, but a number of other approaches have been developed in recent years. The new guidance describes the methods available – helping users choose the most appropriate for their context – standardises reporting, ensures comparability between the results of



different methods, and highlights how in-situ measurement of HTC can provide a more accurate understanding of actual building performance. It also explains how measured values can be used alongside, or in place of, calculated values to improve decision-making.

In addition, comparing calculated and measured HTC values can help identify gaps in design assumptions, construction quality or modelling inputs, offering a valuable check on building performance and delivery quality.

By formalising approaches to measuring and interpreting HTCs, the publication supports a broader industry shift towards improved accountability and building performance verification.

CIBSE TM71 is available at:
www.cibse.org/knowledge

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Dove, Martyn	Nottingham, United Kingdom
Dowdall, Colin	Newcastle upon Tyne, United Kingdom
Drummond, Eamonn	Orpington, United Kingdom
Dunne, Mike	Bolton, United Kingdom
Elsarraj, Mohammad	Manchester, United Kingdom
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Ho, Lok Hin	Tsim Sha Tsui, Hong Kong
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Hruzik, Abigail	London, United Kingdom
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leong, Lok Kan	Yuen Long, Hong Kong
Ip, Ka Ki	New Territories, Hong Kong
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Jenkins, Jonathon	Llanelli, United Kingdom
Jones, Nathan	Loughton, United Kingdom
Kamel, Pola	Audenshaw, United Kingdom
Keane, Mark	London, United Kingdom
Keenagaha Gedara, Chamara Wijewardhana	Weston-Super-Mare, United Kingdom
Kelly, Timothy Adam	Westthoughton, United Kingdom
Khim, Navany	Dublin, Ireland
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Education facilities face complex challenges

Keeping people comfortable, productive and healthy while reducing energy consumption and meeting ambitious sustainability targets isn't a simple task. At EcoAir Box, we understand this evolving landscape and set out to engineer solutions to support the next generation of educational facilities.

Educational comfort goes far beyond stable temperatures. It's about creating clean, fresh, well-balanced indoor environments that promote focus, wellbeing and productivity.

Our ModulR R-Series air source heat pumps (ASHPs) were designed to support the diverse demands of educational establishments, from high-occupancy, open-plan classrooms to server-heavy spaces, or even onsite laboratories.

Our bespoke-designed ASHPs enable unrivalled flexibility, with packaged controls that integrate seamlessly into existing systems with

air handling units (AHUs), ground source heat pumps (GSHPs) and other site systems.

Integrating our heat pumps with our advanced AHUs with intelligent inbuilt controls creates a single, connected system that delivers heating, cooling and ventilation with exceptional efficiency and precision.

Our ASHPs produce ultra-low noise, so your HVAC system will never distract or disrupt. Our ASHP only produces 42dB (at 10m in free field conditions with a single ASHP).

We use R290 (propane) as a refrigerant, so our heat pumps are safer to be in proximity to children than conventional gas boilers or other heat pumps: R290 has a global warming potential of only 3 and is non-toxic in low concentrations.

We help you meet your decarbonisation targets. Our fully electric solution is highly efficient, with fifth-generation Axial fans and our in-

house designed plate heat exchanger that offers up to 90% heat recovery. Not to mention optimised flow temperatures for energy savings.

Our R290 ASHP was designed to be as compact as possible for a smaller footprint, while also being remotely operational. Our team of experts is on hand to dial in and troubleshoot whenever necessary. What's more, our solutions can be powered entirely by renewable energy, cutting out harmful fossil fuels.

As educational facilities are often located in older, narrower buildings, standardised ASHPs may struggle to even reach the plantroom. That's why each ASHP we design and manufacture is unique to the customer, built around your specific requirements. For particularly hard-to-access plantrooms, we also offer onsite rebuild, where our construction team will attend site to rebuild the equipment in the final plantroom for you.

We're passionate about educating people on the importance of decarbonisation. With estimates that the UK HVAC industry makes up around 40% of all UK carbon emissions, we urgently need to change how we're heating and cooling our buildings. We offer a CIBSE-certified CPD, 'An introduction to decarbonising with heat pumps', through which you can learn more about heat pumps and why they are important.

● To book a CPD, please get in touch at cpd@excool.com, and for general enquiries, get in touch at info@ecoairbox.com



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NEW YXM RANGE



CIBSE conferences look to the future

Events focus on the effect net zero and technology will have on design, delivery and operation of new buildings



Turning net zero ambition into action, and how technology can play its part, were the topics that took centre stage at recent conferences hosted by CIBSE.

AI, digital engineering, and intelligent building systems and their influence on how buildings are designed, delivered and operated were the focus of the Technology and Innovation Conference, held at CIBSE's HQ in London, and sponsored by Autodesk, Mitsubishi Electric, Trimble, EDSL and IES. Leading voices from across the building engineering profession shared how technology and research are shaping a more sustainable built environment.

Speakers highlighted the opportunity and challenge facing the sector: while innovation is accelerating, many practitioners are still navigating how to adopt new tools safely, effectively and in line with an increasingly complex regulatory landscape.

Presentations and discussions explored how AI and machine learning are applied in real engineering workflows, from generative design and predictive simulation to automated compliance checking and AI-enabled building operation. Sessions examined the importance of data governance, ethics, and responsibilities around AI.

A speaker at the Technology and Innovation Conference



Other discussions focused on: digital tools and platforms supporting modern engineering practice, including modelling and automation solutions; carbon accounting workflows, such as CIBSE TM65; energy benchmarking dashboards; and emerging cloud-based commissioning and diagnostics technologies.

A key theme was decarbonisation, and how innovations such as HVAC and controls optimisation, renewable technologies, and scalable retrofit approaches are accelerating the UK's progress towards net zero.

The event also addressed the future skills agenda, exploring professional development pathways, cross-disciplinary collaboration, and the

role of universities, start-ups and research and development in shaping the next generation of engineers.

A week later, the Royal Society in London hosted the UK Net Zero Carbon Buildings Standard (UK NZCBS) Conference, where industry leaders, practitioners and stakeholders shared early experiences of implementing the first cross-industry benchmark defining what constitutes a net zero carbon building in the UK. Collaboration is key, said Dr Julie Godefroy, CIBSE's head of net zero policy, opening the event, which explored how the standard can be used in projects, portfolios and categories.

Standard bearing

In his keynote, UK NZCBS chair David Partridge reflected on the standard's role in providing greater clarity and consistency for the industry, before CEO Katie Clemence-Jackson provided an update on the latest developments.

The conference, sponsored by Mitsubishi Electric, Qvantum, Rinnai and Optimise AI and Strebel and Swegon, explored areas that will determine UK NZCBS's success.

Amrita Dasgupta, head of ESG and net zero at Greengage, led a session exploring how the standard aligned with existing standards and initiatives. It featured contributions from: Fabrizio Varriale, place and space analyst at RICS; Will South, director at Etude; and Jess Hrivnak, practice technical adviser (sustainability) at RIBA.

A segment on verification discussed how confidence in net zero claims can be strengthened through robust processes, reliable data and transparent evaluation. The session – including input from Chris Jockel, associate director at Bureau Veritas, Sam Wallis, director of energy and net zero strategy at Envision, and Simon Wyatt, partner at Cundall – highlighted the importance of evidencing net zero performance via real-world outcomes.

In the final session, chaired by Partridge, contributors – including Ruth Marsh, head of sustainability (South) at Waterman Group, and Ellie Burkill, senior sustainability consultant at XCO2 – discussed the standard's adoption, reinforcing that everyone has a part to play, from designers and engineers to clients, contractors and operators. ●

Measurable progress

Data from the 2026 Building Performance Awards underlines the rapid rate of electrification, with all-electric projects making up 71% of entries compared with 47% last year. **Julie Godefroy** looks at this and other trends in her annual analysis

The CIBSE Building Performance Awards (BPA) are increasingly becoming more than a celebration of good projects: collectively, the entries provide a valuable snapshot of how buildings are performing and how the industry is responding to the challenges of energy, carbon and building performance.

Every year, CIBSE reviews the previous year's entries. This informs updates to the categories, criteria and data-collection forms introduced in 2021, and is an opportunity to review building performance across the projects.

This year's analysis confirms that the quality and scope of building performance data keep increasing, with fewer areas of data uncertainty and wider coverage of building performance. The majority of entries now provide data that is complete and reliable enough to estimate the building's energy use intensity (EUI) with reasonable confidence, even when onsite generation is present (see infographic, right).

This is a marked improvement from a few years ago, when photovoltaics (PVs) often led to some uncertainty about the amount of renewable energy generated on site and/or used by the building, preventing a full EUI from being established.

District heating, however, continues to prevent a complete assessment of the building's energy use and associated carbon impact.

This is because, typically, only heat delivered is



The redevelopment of the University of Auckland's B201 building (submitted by Beca) was the 2026 CIBSE Building Performance Champion

known, not full energy used to generate and distribute that heat or the carbon content of the heat.

Of the 22% of entries for which EUIs were not based on reliable information, two-thirds were because of ambiguous data from district energy systems. CIBSE has been advocating for the upcoming heat network register to include this information, so that the full impact of networks can be publicly available.

New categories for the 2026 BPA Awards

The following categories were introduced at the 2026 awards, to encourage and reward innovation, and to recognise efforts beyond individual buildings:

Building Performance Evaluation: Practice – winner: Willmott Dixon for its Energy Synergy service, which monitors operational energy and aims to close the performance gap.

Building Performance Evaluation: Products and Innovations – winner: Swegon's WISE demand-controlled system, which enables energy savings while allowing users to follow actual performance.

Portfolio of the year – winner: SRE, for the Bourn industrial estate, which impressed judges with its long-term carbon trajectories and tenant engagement on operations and low embodied carbon fit-outs.

Building performance: key statistics

As in the previous year, the entries (for both new and existing buildings) tended to have much lower energy use than the average building stock. While only a high-level comparison is possible, some projects approached or met the UK Net Zero Carbon Buildings Standard (UK NZCBS) v1 energy use limits, despite having been designed many years before its publication. This is particularly the case for new-build offices, often informed by NABERS ratings.

Renewable energy generation showed a wide variation across projects, with some very limited installations and others meeting or exceeding the UK NZCBS targets.

An increasing number of projects reported having carried out an embodied carbon assessment for the whole building (see infographic, right). The assessment of building services is still a weak point, but this should improve in future years as Project of the Year entries are operational buildings and, therefore, reflect design practices from several years ago.

Where reported, the embodied carbon impact varied widely, with some projects well below or above the UK NZCBS limits. It is hoped, by providing a reference point for most sectors and project types, the UK NZCBS will encourage wider reporting, as well as lower impacts.

The entries also show a huge variety of refrigerants. R32 (GWP 675) was the most common and is where the UK NZCBS limit is set. However, nine other refrigerants were used across all entries, ranging from CO₂ (GWP 1) and R1234ze (GWP 7), to refrigerants with much higher impact, such as R410a (GWP 2088).

Water use has only recently become part of the 'Essential information' on the entry form, so limited data is available. It is notable, however, that among the office projects where it could be estimated, daily usage was very similar in most projects, between 9 and 11 litres per person, except one outlier at nearly 24 litres per person.

Looking ahead

The evolution of entries over time suggests two encouraging trends. First, building performance data is becoming more complete and reliable, allowing more meaningful comparisons between projects. Second, attention has shifted from new buildings to existing ones, and from individual buildings to portfolios. Increasing attention is being paid to previous blind spots, such as embodied carbon, and to issues previously 'too hard to tackle', such as liaising with tenants on energy use and fit-out resource use.

There are still important gaps, including data on district heating performance. Refrigerant choices also demonstrate the continued importance of looking beyond operational energy when tackling whole life carbon.

As the awards evolve, the value of the data collected should grow. The aim is not simply to identify the best-performing projects, but to understand what they can tell us about the wider direction of the industry – and where further improvement is still needed. ●

● **Julie Godefroy is CIBSE head of net zero and chair of CIBSE Building Performance Awards**

Summary of UK entries on awards shortlist



35%

Projects using Soft Landings or similar activities (last year: 20%)



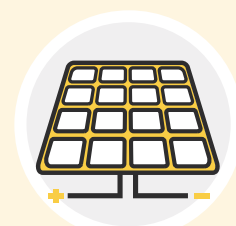
64%

Projects using energy performance modelling such as DfP, TM54 or PHPP (last year: 60%)



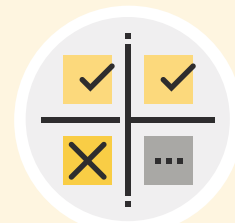
50%

Projects stating energy performance targets at design stage – for example, NABERS (last year 47%) of which 71% were contractual/linked to funding



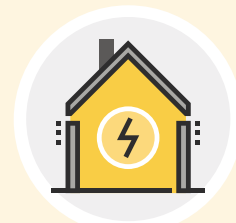
50%

Projects using onsite renewables. The figure was 83% for new builds – all PVs (last year: 67% overall; 57% new build). Average output – around 74kWh·m⁻² per year



78%

Projects stating they had a form of post-occupancy evaluation (for example, IEQ monitoring) beyond just energy use (last year: 93%)



71%

Projects that are all-electric (last year: 47%), including where gas was removed. The remaining were either on gas or heat networks



78%

Entries for which energy use intensity was considered to be based on reliable and complete information (last year: 45%)



57%

Entries with an embodied carbon assessment of whole building, though some had not assessed building services (last year: 40%)

Hidden beneath the wave



Business meets pleasure at the Sydney Fish Market, with restaurants and a cooking school alongside the city's busy commercial fish market. **Andy Pearson** looks at the challenge and opportunity of designing centralised services that cater for the needs of both diners and seafood wholesalers

The new Sydney Fish Market, on the city's western waterfront, reimagines the traditional commercial fish market as a public destination. By revealing the market's inner workings and daily choreography of auctions, and the bustle of wholesale and retail trading, the landmark building both separates and reconciles the conflicting demands of a functioning commercial fish market with those of a public retail and dining destination.

Beneath its expansive, undulating roof, the new market is simultaneously a food-processing space, refrigerated storage facility, wholesale auction, seafood cooking school, office space, retail market and restaurant complex.

The challenge for the design engineers was that the building services had to facilitate this multitude of uses and diverse servicing demands. Instead of peppering the building with numerous independent systems, however, the design team took the bold decision to centralise all the major services, to exploit the efficiencies and resilience offered by an integrated thermal system.

'When you consider sustainability, amenity, cost, resilience and space efficiency holistically, a centralised solution made sense,' says Michael Calcoen, technical director, buildings, at Mott MacDonald, who in his previous role

Project team

Client: Infrastructure NSW

Technical adviser: Mott MacDonald

Architect: 3XN GXN Architects, in association with BVN Architecture

Sustainability lead: GXN

Mechanical engineer: Aecom, Equilibrium/Climatech (joint venture)

Electrical engineer: Aecom, Stowe Australia

Drainage: Aecom/CJ Arms, Harris Page & Associates

Vertical transportation: Aecom

Civil engineer (general): Mott MacDonald, AT&L

Civil (roof): Aecom, CSS

Structural engineer: Mott MacDonald, WSP

Transportation engineer (market): PTC

Transportation engineer (site surrounds): Arup

Facade consultant: Apex, Prism

Sustainability consultant: Stantec, EMF Griffiths

Wind consultant: Windtech

Acoustics/vibration consultant: SLR

as principal mechanical engineer at Aecom led the building services team during the pre-tender design phase.

The result is a building in which efficient services underpin every aspect of the market's operation and environmental control systems support the openness of the architectural aspiration. It is also a scheme in which recovered heat and water become resources.

The competition-winning design by 3XN GXN Architects, in association with BVN Architecture, is built into Blackwattle Bay, so it is surrounded on three sides by water. It was constructed by Multiplex under a design-and-build contract, with Mott MacDonald appointed as technical adviser to the client, Infrastructure NSW.

Its 20,000m² basement floor – mostly car park – is hidden beneath the waves. This is also the level on which the main electrical switch rooms, water-storage tanks, greywater treatment plant and communications rooms are located.

Above this is the lower ground floor, the operational heart of the building. It is here in the early hours of the morning that the commercial fish market teems with activity. Fish are unloaded from boats moored at the market's wharves, or are trucked in and stacked in serried rows of blue boxes. These are brimful of iced,

wet fish, ready for inspection by buyers under high-quality, full-spectrum lighting prior to the start of the Dutch auction. It is on this floor, too, that the 2,400m² of -22°C freezers and 1°C cool rooms are located, along with multiple ice-making machines.

By contrast, the upper ground floor is a public space. Stepped, outside terracing leads pedestrians from the waterfront up to the numerous wet-fish retailers and diverse restaurants serving the same produce cooked. It is also on this floor that full-height glazed screens enable early risers to view the drama of the commercial auctions taking place in the buyers' room below, from 5am to 7am.

The building even includes a fish cookery school, which – along with the market offices – is housed on the mezzanine floor above. This is also the floor where the main plantroom, housing centralised cooling and heating plant, is located, tucked beneath the giant roof.

Together as one

When developing the design, the engineering design team moved away from the original brief of numerous, individual, decentralised services for each tenant. Instead, by consolidating the cooling and heating into centralised systems, Amec was able to increase resilience and provide a more energy efficient and flexible system for the wholesalers and retailers.

'It took a lot of time and effort to get the building's various stakeholders and users to buy into the benefits of a centralised heating and cooling plant,' explains Calcoen.

At the heart of the engineering systems is a central refrigeration plant based on three custom-built, ammonia (R-717) chiller systems. Each chiller system is dedicated to one of three cooling circuits: a -30°C brine circuit, providing about 800kW of cooling; a -10°C brine circuit, also providing about 800kW of cooling; and a 6°C chilled-water circuit, providing about 4,600kW of cooling.

"The design team took the bold decision to centralise all the major services"

The -30°C brine circuit serves induced draft air coolers that keep the various giant freezers at -22°C; the -10°C brine circuit serves induced draft coolers for the 1°C chillers; while the 6°C chilled water circuit primarily serves air handling units (AHUs) and fan coil units (FCUs) throughout the building.

Ammonia was selected as the refrigerant for this industrial-scale refrigeration plant, for the specific load profiles and low-temperature requirements, 'because it ticked all the boxes in terms of system resilience, energy efficiency, heat-recovery capability and sustainability', says Calcoen. All refrigerant in the building is contained in the one plantroom.

While each circuit has a dedicated chiller, the condenser circuits are combined, and reject heat to cooling towers and through roof modules, with discrete air intake and discharge integrated into the roof architecture.

High-grade heat is recovered 24/7 from de-superheaters and compressor oil coolers. The refrigeration plant runs continuously, with the recovered heat accumulated in large buffer tanks, where it serves the heating hot water, domestic hot water and warm defrost circuits.

In addition to the freezers, the -30°C brine circuit serves the numerous ice-making machines that freeze water to meet the market's demand of approximately 50 tonnes of ice per day. Ice making is a mixture of centralised and decentralised systems, with automated storage and delivery.

Two types of ice are made: flake ice and

A section through the fish market

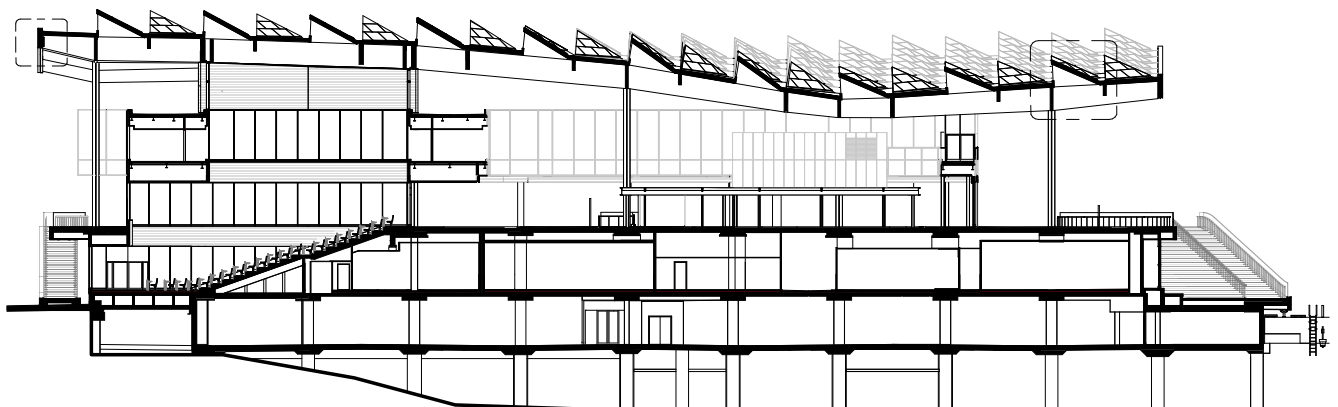




plate ice. Despite their best efforts, Calcoen says the designers were unable to persuade the users to rationalise ice production and opt for a single type of ice, because each type of ice has a different use.

Flake ice is fine-textured, making it ideal for wholesalers to pack around the boxed fish to keep it fresh. Plate ice is thicker, so takes longer to melt, making it the ice of choice for retailers looking to enhance their displays.

Both chilled water and glycol at 1°C are supplied to bespoke AHUs serving the operational floor. The glycol circuit is a secondary circuit specifically to serve the AHUs on the lower ground floor and is connected to the -10°C brine circuit.

The AHUs are designed to maintain the space temperature at 14°C, to keep produce fresh and minimise ice melt. Calcoen says the AHUs are critical to maintaining humidity levels low enough to prevent mould growth and maintain food safety. As such, the air handling arrangement includes desiccant dehumidifiers and dual cooling coils.

The initial coil is intended to pre-cool the outside air using chilled water, while the second

Retail units on the market's upper ground floor

glycol coil further reduces the supply air temperature to around 5°C.

Throughout the 14°C spaces and seafood processing areas, air distribution is through fabric ducting, which is easy to clean and maintain. 'The fabric can be simply unzipped, removed, washed and refitted,' says Calcoen.

Another major condensation challenge was from services running between different thermal zones.

'A sprinkler pipe passing from a space maintained at 14°C or colder to a space at ambient will be cold enough for condensation to form on its surface,' explains Calcoen.

To manage this, each service penetration was assessed, to inform insulation and trace heating requirements.

In addition to cooling, the ice machines' and freezers' induced draft air coolers are connected to a defrost circuit, to limit the buildup of ice on the heat exchangers. The defrost circuit primarily uses heat recovered from the chillers. Similarly, heat recovered from the refrigeration plant is used to preheat the domestic hot water and to provide space heating via the AHU and FCU coils.

The heating hot water plant consists of gas-fired condensing hot water generators in an N+1 configuration, with a total capacity of 1,400kW, that satisfy the space-heating requirements of the building.

'Initial operational feedback from the current winter season suggests these systems are rarely used because the heat-recovery systems are performing effectively,' explains Calcoen, who adds that while the facility was designed when gas-fired heating was the norm, consideration is being given to electrifying the heating in the future.

A mix of AHUs and tenant-provided FCUs supply heating, cooling and fresh air to the office spaces, cooking school, retail units and restaurants on the upper ground floor and mezzanine. The restaurants also have the option of opening the façades and turning off the air conditioning, to let the sea breezes keep the diners cool when conditions suit.

In summer, when temperatures can reach 35°C in Sydney, ventilation openings are kept closed, with air conditioning used to maintain a

"The project has succeeded in achieving 'a 45% reduction' in potable water consumption"

design temperature of between 21°C and 24°C.

'Thermal comfort modelling confirmed that this approach provides comfortable conditions for the majority of the year, though it cannot guarantee perfect conditions during extreme weather events,' explains Calcoen.

To maintain high air quality, restaurant kitchen exhausts discharge above the roof canopy, through specially designed roof-louvre modules. Kitchen exhaust systems include electrostatic precipitator filters and carbon filters, to eliminate grease and odours before they are discharged over the white roof surface. Cleaning systems incorporate an automatic hot-water wash-down cycle, using heat recovered from the central chiller plant.

Water, water everywhere

Drainage and water conservation were other services to benefit from a centralised system approach. Water is present almost everywhere in the market: it drips from the boxes of melting ice preserving the fish; it is used to defrost frozen fish; and it is used throughout to hose-down floors and food-preparation surfaces, to keep them clean and hygienic.

Aware of the high volume of water used by the old fish market, Infrastructure NSW set the designers the target of reducing the new market's water consumption by 50%. Floor drains collect the washdown water, which is only moderately contaminated, and delivers it to a 150,000 litres per day greywater treatment plant.

In addition, rainwater falling on the roof canopy drains to two large roof sumps. Rainwater from the eastern sump is collected and recycled. This, along with the treated greywater, is used for washdown, cooling tower make-up, toilet flushing and irrigation. Calcoen says the project has succeeded in achieving 'a 45% reduction' in potable water consumption against water use at the old fish market.

Water was also an issue in the goods hoists. With the building arranged vertically, dripping boxes of iced fish are transported between floors. To manage the ice melt water run-off, specialised hoists were provided with under-car waste-water storage tanks.

Construction was completed in November 2025, with the building handed over to Sydney Fish Market for final fit-out and testing before opening to the public on 19 January 2026. Impressively for such a large building with a diverse range of uses, it achieved a 5 Green Star sustainability rating from the Green Building Council of Australia, showing that it is possible to reimagine a fish market as a public destination and flagship environmental project. ●



The roof is comprised of 407 prefabricated pyramidal cassettes

The diagrid roof: form, function and sustainability

The new Sydney Fish Market's 20,000m² undulating roof canopy is formed from 407 prefabricated pyramidal roof cassettes, supported on a structural glulam diagrid.

The architect wanted the roof to appear to float above the building, unencumbered by gutters and downpipes, and with no services visible from above or below. To drain the roof, Calcoen says iterative modelling was used to shape the canopy so that direct rainwater runs-off to one of two giant sumps, located above one of the building's four concrete core structures.

The cassettes also serve as angled mounts for the 10,000m² of photovoltaic panels that generate up to 5% of the building's daily energy consumption (they have produced more than 250MWh in the first nine months).

In addition, the cassettes incorporate triangular south-facing glazed elements, to allow natural light into the building while shielding it from harsh direct sunlight. Lighting sensors allow daylight harvesting by preventing the operation of artificial light when natural light is sufficient.

The roof also includes integrated lighting within the cassettes. More than 300 programmable RGBW luminaires are integrated into the roof's geometry, to allow the building to respond to different events throughout the year.

Importantly, the lighting design respects the bay's ecology, with glare control, refined optics and limited output, to meet dark-sky principles and prevent light spill over the harbour.



Data, decarbonisation and dealing with wildfires

Building services engineers in Australia and New Zealand have to design for an extraordinarily diverse range of climate-related issues, with wildfires and droughts key considerations. CIBSE ANZ chair **Mark Davie** MCIBSE offers his insight into challenges and opportunities in the region

Building services engineers in Australia and New Zealand face the dual challenge of meeting extreme cooling demands while hitting ambitious decarbonisation targets in a booming data centre sector.

In addition, volatile climate-related issues – from bushfire smoke and extreme storms to drought and seismic risks – require continual innovation, as the regions see growth around retrofits, electrification and embodied carbon.

To bridge critical skills gaps, CIBSE ANZ is upskilling the workforce, backing early-career professionals through its Young Engineers Network and fostering the expertise needed for resilient infrastructure.

Emerging sectors

Data centres are currently the standout building sector in ANZ. Australia's deployable capacity is on track to more than double this decade, and we're seeing that demand in every state. Not just in Sydney and Melbourne, but in emerging markets such as Perth, driven by its mining and tech base and proximity to Asian subsea cable landing points. This is translating into sustained work for our mechanical and electrical engineers.

Energy infrastructure and defence-related construction are the other strong performers, supported by public investment in health, education and utilities.

Perth is an emerging data centre hotspot driven by a mining and tech base and proximity to Asian subsea cable landing points

New Zealand's market has been through a rougher patch, but rate cuts and easing inflation are starting to stabilise conditions.

Across both countries, we're seeing more concentrated growth in fewer, larger, more technically complex projects.

The data centre challenge

Balancing the extreme cooling and power demands of data centres with the region's carbon- and water-reduction targets is one of the more difficult issues with which CIBSE ANZ members are grappling.

The shift in the direction of AI workloads has pushed up rack densities sharply, driving a move towards liquid cooling. This helps on the water side compared with older, evaporative systems, but adds complexity in electrical infrastructure and heat-rejection design.

Top-performing engineers address power and water efficiency as an integrated design

CIBSE ANZ's 'Moral grey zone' panel event series on professional ethics



problem, linking data centre precincts directly to renewable energy zone upgrades instead of simply increasing load on the existing grid.

Closing the skills gap

M&E engineers with genuine data centre design experience are in short supply.

We need more engineers who are comfortable working across decarbonisation, embodied carbon assessment and life-cycle analysis – a skill that is now becoming central to how buildings are procured.

CIBSE ANZ's role here is to keep the pipeline of technical knowledge flowing to members through six regional chapters.

Environmental challenges

Australia's climate range is enormous, so no one design solution travels well across the region when it comes to environmental challenges.

Layer on top of everything else exposure to bushfire smoke events, increasingly intense storms and, in New Zealand, seismic design requirements, and engineers in the region are designing for a wider envelope of extremes than most of our counterparts overseas.

The other constant challenge is water. Both countries have had serious drought periods in recent years, so any services strategy that leans hard on evaporative cooling or heavy potable water use draws real scrutiny.

Decarbonising existing stock

Retrofit is arguably the harder decarbonisation problem for local engineers compared with new build, because you're constrained by existing plant and floor-to-ceiling heights, and a building that has to stay operational throughout.

Focus has shifted to heating electrification, alongside the staged replacement of ageing chillers and air handling units with higher-efficiency equipment, timed to coincide with end-of-life replacement rather than wholesale strip-outs.

Reusing structures and services can be the most carbon-efficient option, as initial embodied carbon is fixed early and difficult to mitigate later.

Dealing with toxic smoke from bushfires

Fire seasons have shifted the tension between ventilation and outdoor air toxicity into a standard design priority. Commercial buildings typically increase outdoor intake filtration, recirculate air when feasible, and use positive pressurisation in advanced facilities to limit envelope infiltration.

Well-sealed commercial buildings with good mechanical ventilation and high-Merv or Hepa filtration genuinely protect occupants. But the



Heavy filtration is key to addressing threats from bushfire smoke

research is also clear that leakier buildings and homes offer far less protection, so building envelope quality matters just as much as the mechanical response.

Engineers must balance heavy filtration and air recirculation with the resulting energy penalty during extreme conditions, proving that resilience and energy efficiency must be designed together.

NABERS and embodied carbon

NABERS remains the benchmark that drives operational performance improvement across the commercial sector and it's now extending its influence into embodied carbon.

Australia awarded its first NABERS Embodied Carbon rating in December 2025 and the tool is already being referenced in policy, including the NSW Sustainable Buildings SEPP and the Australian government's sustainable procurement policy.

The National Construction Code's 2025 update also points to the NABERS methodology as the preferred framework for embodied carbon assessment – though, at this stage, it sits as guidance rather than a mandatory requirement.

Supporting ANZ young engineers

CIBSE ANZ is supporting younger professionals in securing their chartered engineer credentials. The Young Engineers Network is the backbone of this – it's free to join, open to those who are in the first 10 years of their career, and gives members a structured peer network and access to CIBSE mentoring.

Graduates are connected with mentors who have been through chartership themselves, host events specifically aimed at demystifying the process, and make sure our chapter technical events count towards the CPD evidence members need for their application.

The Young Engineers Awards celebrate emerging talent driving innovation in building services across the region. This public recognition is, in itself, a strong motivator for graduates to stay the course towards chartership. ●

Lessons learned the hard way

Engineering leaders who spoke at a recent CIBSE ANZ seminar on real-world design challenges share engineering insights and lessons from their projects

Sharing lessons learned on real-life projects is one of the best ways to pass on technical knowledge. Last month, CIBSE's Australia and New Zealand (ANZ) Region did just that in its seminar 'Lessons learnt the hard way'. The hybrid event featured six experts and we asked four of them about the barriers they saw to high-performing buildings.



Hannah Blossom,
director of sustainability
at Cundall in Melbourne
Where do high-ambition
net zero targets collide with building
performance during project delivery?

Many projects set ambitious net zero goals, but business cases are still driven by traditional measures of cost and programme. Unless carbon outcomes are embedded from the outset, they are often treated as aspirations.

This is evident in retrofits. We know how to decarbonise existing buildings, but these measures can be difficult to justify within available budgets.

Regulatory requirements can also create barriers where major upgrades trigger expectations of full compliance that may be unachievable.

More pragmatic regulatory and

investment frameworks that reward substantial emissions reductions could unlock far greater decarbonisation.



Mark Davie MCIBSE,
buildings mechanical
practice leader,
WA & NT at Aurecon

What systemic barrier in the building services culture makes engineers hesitant to share operational mistakes, and how can this be overcome?

The biggest barrier is the fear that admitting mistakes will damage your career. We need to shift from asking 'Who is responsible?' to 'What happened, and what can be learned?'

We need to create a space in which people feel safe to speak up, challenge decisions and share what went wrong. That is how we turn individual mistakes into collective learning.



Chris Arkins FCIBSE,
director at
Steensen Varming

What is the most common reason you encounter for operational failure?

Many operational challenges arise from a disconnect between stakeholder expectations, operational requirements and how the facility is ultimately

commissioned, and later maintained.

Engineers need to bring an expertise that extends beyond their own discipline. Equally important is commissioning, which should be planned from the outset of a project.

The best results come from understanding the building, the people and the institution.



Steve Hennessy FCIBSE,
consultant at WT
Partnership; co-author
of *The Soft Landings*

framework Australia and New Zealand
If a consultant changes only one habit on their next handover after hearing your talk, what should it be?

Too often, we assume that, as designers, we know the right answer. The Soft Landings framework encourages a different mindset: curiosity over certainty. What did we do, what can we learn and what can we do better?

Real improvement comes from challenging our assumptions. Listening to those who live with the outcomes of our decisions is not always easy, but acting on what we hear is one of the most powerful ways to deliver better results.

For more information:
www.cibse.org/anz

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Future-proof fire safety

New Technical Notes from the Centre for Window and Cladding Technology help link traditional construction regulations with modern designs

Designers of complex modern façades are struggling to make them conform to traditional fire safety regulations – so, to help, the Centre for Window and Cladding Technology (CWCT) has published two new Technical Notes (TNs).

Fire-stopping is integral to fire strategy, and is required where compartment floors and walls meet the façade, to maintain compartmentation and limit internal fire spread. However, curtain walling is more complex because most such walls are non-fire resisting and run continuously past floor slabs, meaning fire stops may be bypassed by internal or external fire spread.

The statutory fire safety guidance in Approved Document B (ADB) is based on traditional construction, making it increasingly ineffective and irrelevant in contemporary façades with built-up walls or curtain walls. As a result, CWCT has published TN115 – *Fire performance of façades – application to built-up walls*, and TN116 – *Fire performance of façades – application to curtain walling*, to join existing notes TN113 and TN114, which were highlighted in 'Take note: fire-safe façades', *CIBSE Journal*, March 2025 (bit.ly/CJFSF25). See panel below for full TN titles. The new additions provide fire safety guidance for contemporary buildings while meeting the intention of the original regulations.

TN115 proposes three approaches to curtain wall fire-stopping:

- Test in accordance with BS EN 1364-4

and use the fire-stop within the direct field of application of the test

- Test in accordance with EN 1364-4 and use the fire-stop within an extended field of application; can use guidance given in EN 15254-6
- Detail the fire-stop based on a fire engineering assessment; this would take account of other mitigating measures, such as use of sprinklers and the evacuation strategy.

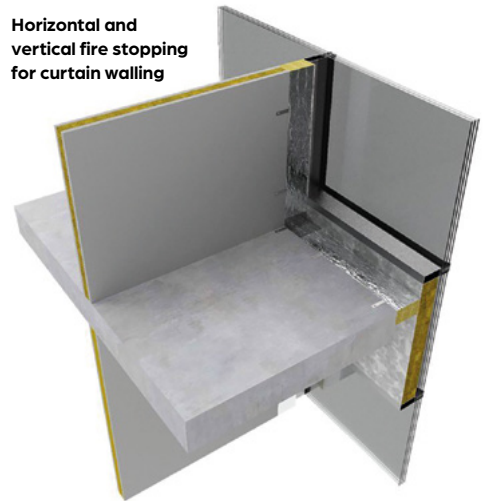
At the time of writing, the third option is most likely to be required, particularly for complex curtain walls. This is largely because of a lack of available test evidence, and CWCT encourages more testing to be carried out to support options 1 and 2.

Cavities in built-up walls can provide concealed routes for rapid fire and smoke spread, because of the stack effect, trapped heat and limited fire-fighting access. These risks are typically mitigated by the installation of cavity barriers, and TN116 provides detailed guidance on their location, performance and installation.

To maintain adequate drainage and ventilation of cavities, 'open-state' barriers are used horizontally. These maintain a clear cavity in normal use and expand to block it in the event of fire.

Concerns have been raised about cold smoke spread prior to activation, and CWCT concludes that, in well-constructed modern façades, this risk is limited and recognised by UK guidance, including BS 9991 and

Horizontal and vertical fire stopping for curtain walling



the Scottish technical handbooks.

TN116 also addresses the limitations of existing test methods for assessing cavity barrier performance in rainscreen systems. While product-level testing to standards such as BS EN 1364-6 and BS EN 1366-4 is required, CWCT cautions that these tests may not fully represent real façade behaviour, particularly where cladding panels or fixings may fail early in a fire, which is likely where lightweight cladding panels are used.

Large-scale system testing to BS 8414 is discussed as a supplementary tool, but with clear reservations. TN116 reinforces conclusions from the Grenfell Tower Inquiry that BS 8414 should not be used in isolation to demonstrate compliance, but form part of a holistic assessment by a competent fire engineer.

The complex fire safety requirements of modern façades need to be understood by all parties before starting a project. Simply following the prescriptive guidance in ADB may not be sufficient, and a more holistic approach is required.

The required performance for the façade will often depend on the building's context, and early collaboration between fire and façade disciplines is recommended to ensure requirements are appropriate and achievable. ●

CWCT fire performance and façade Technical Notes

The two new releases join CWCT's existing suite of core guidance:

- TN113: Fire performance and façades – Introduction
- TN114: Fire performance and façades – Use of combustible materials
- TN115: Fire performance of façades – Application to built-up walls
- TN116: Fire performance of façades – Application to curtain walling

The Technical Notes are available at www.cwct.co.uk

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Elevating sustainability

Modernising vertical transportation rather than replacing it offers a cost-effective, low carbon path to meeting sustainability regulations and enhancing long-term asset value, says **Erkan Soydan** MCIBSE, MSoVT

Rather than following the traditional take-make-dispose model, the circular economy prioritises reuse, upgrading, and extending the life of existing assets to reduce waste and carbon footprint, and improve long-term value.

In the UAE, the trend towards refurbishment is becoming more evident. The vast majority of the country's existing building stock was developed after 2000, meaning many assets are now entering a phase where system upgrades, rather than wholesale redevelopment, are becoming increasingly relevant.

This shift is supported by regulatory and policy frameworks that incorporate sustainability requirements into the built environment. Dubai's Green Building Regulations – now the Al Sa'fat rating system – and Abu Dhabi's Estidama Pearl Rating System reinforce the need to consider performance, efficiency and the life-cycle across building systems.

There is an opportunity to apply circular economy principals to vertical transportation systems.

Instead of removing and replacing entire lift systems, partial modernisation and refurbishment can improve performance significantly while retaining a large proportion of the existing installation. This approach can reduce disruption to occupants, shorten downtime, and avoid unnecessary replacement of components that remain structurally and technically sound.

Refurbishment, rather than full replacement, can offer greater agility, allowing buildings to respond more quickly to changing tenant expectations, technology developments and regulatory requirements. Targeted upgrades can be phased over time, so avoiding large, single-point capital expenditure.

Refurbishment also enables greater use of local and regional supply chains.



“Not all components need to be replaced simultaneously”

Unlike new lift installations, which often rely heavily on centralised manufacturing and long international logistics chains, modernisation projects draw more extensively on local expertise, specialist contractors and regional suppliers.

This supports a more tailored, market-specific approach aligned with UAE building typologies and operational realities.

From a cost perspective, while the upfront capital cost difference between partial modernisation and full replacement can sometimes appear modest, the lifetime cost profile often tells a different story. Retaining serviceable components and avoiding premature replacement can improve whole life cost efficiency and enhance long-term asset value.

Can refurbishment take off?

Despite these advantages, partial lift modernisation is still adopted less frequently than full replacement. One contributing factor is the lift industry's increasing reliance on standardised,

full-replacement solutions, which are often simpler to procure and easier to manage from a contractual and warranty perspective.

Over time, the availability of highly experienced lift modernisation specialists has declined, making complex refurbishment projects appear more challenging to deliver with confidence.

Lift manufacturers are well positioned to enable a more sustainable and commercially balanced approach. This requires greater emphasis on life-cycle planning, modular system design and standardised modernisation packages that make refurbishment more predictable, scalable and attractive for clients.

Rather than designing lift systems around a nominal 20- to 25-year lifespan, the industry could consider 40- to 50-year asset strategies, supported by planned interventions such as minor modernisation every 10 years and major modernisation every 20 years. Recognising that not all components need to be replaced simultaneously is key to reducing waste.

A shift to refurbishment requires changes in mindset and business models, but it offers clients clearer long-term planning, improved cost certainty and more resilient assets. ●

● **Erkan Soydan is managing director and founder of Soydan VT Consultancy; committee member, CIBSE Society of Vertical Transportation; and chair of CIBSE MENA VT**

The shortlist for the CIBSE Middle East & North Africa Awards has been revealed. The awards include two new categories covering the vertical transportation sector: Consultancy of the Year, and Manufacturer and Supplier of the Year. To see the shortlist, visit: www.cibse.org/mena



Setting the benchmark

Willmott Dixon's double CIBSE award-winning Energy Synergy service uses TM54 to ensure design predictions are aligned with operational reality. **Ian Farrell** looks at how the service has been applied in school projects, including Ysgol Gynradd Glyn-Coch, which was part of the UK Net Zero Carbon Buildings Standard pilot

Reflecting its vision of better-performing buildings for society and the environment, CIBSE expanded its annual awards this year to include two new categories: Building Performance Evaluation – Practice; and Building Performance Evaluation – Product or Innovation of the Year.

Contractor Willmott Dixon won both the Building Performance Evaluation – Practice and the CIBSE Next Generation of Building Performance Award with its Energy Synergy building performance management service.

Designed to monitor operational energy and close the performance gap between design and in-use operation, judges hailed Energy Synergy as an excellent example of building performance monitoring and said it demonstrated best practice in a 'reliable, replicable and scalable way'.

The system now monitors 50 projects and those with 12 or more months of data show an average 15%

better-than-predicted performance compared with TM54 projections.

Bassaleg School, South Wales, shows what can be achieved. Actual energy use is 21% less than predicted at design stage, which has resulted in annual energy savings of 327,204kWh, savings of 65.11 tonnes CO₂e, and a £98,161 reduction in energy bills.

Under the hood

Energy Synergy monitors all aspects of energy performance, including heating, ventilation, small power and DHW. The process is integrated into a BMS to capture energy-use data, typically over a three-year, post-occupancy period. The service enhances customers' BMS rather than replaces it, and clients retain full ownership and control of data.

There are three stages to Energy Synergy. Stage 1 is CIBSE TM54 performance modelling, where engineers work with CIBSE-affiliated consultants to develop

achievable energy benchmarks.

Stage 2 is BMS integration and comprehensive metering. Sub-metering, and measurement and verification after construction, are key to closing the performance gap.

Stage 3 is the creation of an AI-supported dashboard, which allows users to identify inefficiencies and optimise performance. Hollycroft Primary School, Leicestershire, benefited from this monitoring when data revealed a mechanical failure in a pump, which was causing inadequate hot-water circulation. By isolating this specific component failure, the school avoided a wider performance decline and restored occupant comfort.

Among the other projects using Energy Synergy is Ysgol Gynradd Glyn-Coch primary school in South Wales, which is planned to be completed in February 2027.

This 300-pupil, two-storey building, designed by architect Stride Treglown, brings together pupils from two existing

schools, and includes a nursery and community hub.

The school was part of the UK Net Zero Carbon Buildings Standard (UK NZCBS) pilot scheme, under which contractors and engineering teams tested the standard's draft framework on real-world projects.

The UK NZCBS is a framework that provides unified, verifiable performance limits aligned with the UK's 1.5°C carbon budgets. It covers 15 building types, including education buildings (see panel, 'Limits and targets for schools').

The school is being built to the Passivhaus standard and will be certified. The methodology focuses on energy efficiency, exceptional thermal comfort and superior indoor air quality through fabric-first design principles. The design features an air source heat pump for space heating, while ventilation with heat recovery is provided by two AHUs and four mechanical ventilation with heat recovery units.

Under Version 1 of the UK NZCBS, Passivhaus certification is recognised as a 'deemed to satisfy' route at practical completion for direct space heating – Passivhaus's core threshold of 15kWh·m⁻² per year satisfies the UK NZCBS limit – and energy-use intensity (EUI). The school's space heating demand is predicted at 13kWh·m⁻²·yr and is currently on track to be lower still.

Passivhaus's strict quality assurance ensures that the predicted design EUI in the Passivhaus Planning Package (PHPP) energy modelling service closely matches the actual

"The performance gap between design and in-use operation is not inevitable"

metered EUI on the site.

'As the school was already targeting Passivhaus certification, this gave us a comfortable buffer against the standard's operational energy limit,' says Doug Drewniak, principal sustainability manager, building performance, at Willmott Dixon.

The building comfortably achieved the 2025 NZCBS embodied carbon (EC) limit for schools of 530kgCO₂·m⁻² and also the Wales Government's 2030 EC target of <350kgCO₂·m⁻² (as a Sustainable Schools Challenge Project).

It was a challenge however – for example, more structural steel than expected was required to support the roof plant loading and large classroom spans. This meant the upfront EC figure increased, as did the thermal bridging value in PHPP, resulting in a small operational energy penalty.

Drewniak said the project benefited significantly from having a single consultant/coordinator leading the process and requiring assessments.

'Issues were overcome by our excellent consultant Mark Morant, from Arda Consulting.

Another 'operational reality' was the higher energy demand linked to the Welsh Government's Universal Primary Free School Meals policy. The compact

Passivhaus form meant there was not enough room on the roof to install the PVs that would have offset the extra energy needed to provide hot dinners. A collaborative solution was found by installing panels in a south-facing canopy, says Drewniak.

Lightening the loads

TM54 was the bridge between design and in use, according to Drewniak. While PHPP models the envelope to ensure minimal heat escapes, TM54 models how human behaviour, equipment and occupancy schedules consume energy within that completed building.

The real challenge of UK NZCBS is not the fabric, but the extra loads from catering, ICT, external lighting and community use outside of school hours, adds Drewniak, who says using TM54 to predict energy use in realistic scenarios enables an achievable target to be set. 'Without allowing for operational factors or realistic building-use scenarios, there's a real risk of a performance gap.'

The second step in Energy Synergy is to create a metering process that measures and manages energy performance in use, and verifies that the TM54 design-stage target is being met. Operational data from this system can be submitted to the UK NZCBS portal to verify that a building is net zero aligned.

'At Willmott Dixon, we've been running TM54 as the benchmark behind Energy Synergy for years. To now have a standard that is driving in-use performance feels like our approach has been vindicated', says Drewniak, who would like as-built data used to inform design modelling in Energy Synergy.

'Closing the feedback loop is big on our agenda, especially if we can leverage AI to assist that process,' he says. Through Energy Synergy, Willmott Dixon has demonstrated that the performance gap is not inevitable. ●

Limits and targets for schools in the UK NZCBS

- **Upfront embodied carbon:** Caps emissions from raw material extraction, transport and construction up to practical completion (Modules A1–A5). Schools cap is 530kgCO₂e·m⁻² GIA for 2025.
- **Energy use intensity school limit:** 45kWh·m⁻² per year GIA for 2025. Includes heating, lighting, hot water and plug loads.
- **Fossil fuels:** zero onsite combustion for heating, hot water or cooking.
- **Envelope efficiency:** the standard has strict mandates to ensure low energy demand for space heating (typically ≤ 15–20kWh·m⁻² per year).
- **Renewable generation:** there is a minimum requirement based on roof footprint (typically ≥ 80% usable roof footprint).
- **Refrigerants and water:** Caps refrigerant global warming potential (GWP), at 677kgCO₂e·kg⁻¹ per system, and refrigerant leakage rates, and sets operational water benchmarks litres per person per day.



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BAXI

Disruptive influence

Without careful placement, air source heat pumps in schools can push noise levels past acceptable limits. University of Salford PhD researcher **Katie Salter** breaks down the acoustic findings from a study at a Manchester school

Air source heat pumps (ASHPs) are increasingly being chosen by schools to replace fossil-fuel heating.

Although this supports UK net zero commitments, there have been cases when ASHP noise has become disruptive in classrooms.

A good acoustic environment is essential for children's learning. Chronic high noise levels are linked to lower results and higher reported noise annoyance by pupils and teachers.

This case study of an ASHP installation at a secondary school in Manchester¹ shows how careful ASHP siting can reduce noise emissions to classrooms.

Two pumps were installed in a courtyard, between two and five metres from classroom windows that often need to be open for cooling and ventilation while other parts of the school require heating. Providing effective screening for large ASHPs is difficult because of the physical size, directivity and low-frequency content of sound emissions.

Furthermore, the placement of the ASHPs, enclosed by reflective surfaces on three sides (and the ground), could create low-frequency resonances and mid- to higher-frequency flutter echoes and reverberation.

In the UK, schools must comply with the maximum indoor ambient noise levels (IANLs) set out in Building Bulletin 93 (BB93) (6); see Table 1. Noise from ASHPs is included in the IANLs.

Sound pressure levels (SPLs) at approximately 10cm from the



five ground-floor and five first-floor classroom windows were measured with the ASHPs in four operational states – from only two fans and one compressor working in one ASHP, to all four fans and compressors operating in both ASHPs.

The second part of the study played pink noise (a rainfall-like sound with balanced energy across octaves) through a loudspeaker to simulate the ASHP SPL at the classrooms in the current and an alternative location.

In the current ASHP location, the SPLs measured at the windows ranged between 60 and 69dB(A) in the quietest operating mode, and 73 and 79dB(A) in the loudest mode. Even assuming a best-case 15dB reduction across the open window, the SPLs inside the rooms do not meet the BB93 criteria.

In the alternative ASHP location,

the calculated SPLs range from 41 to 56dB(A) in the quietest operating mode and 56 to 64dB(A) in the loudest mode. In the quieter modes, at least eight of the 10 classrooms are likely to meet the BB93 criteria.

In the higher operating modes, most classrooms still exceed the criteria, but by a smaller margin.

This provides scope for other mitigation options to become more effective, such as allowing ASHPs to operate at a lower capacity during teaching hours.

In the current location, even restricted ASHP operation during teaching hours would not meet the BB93 criteria if windows are open.

The study demonstrates the importance of placement for minimising noise issues, highlighting that this should be assessed at an early stage, including reviewing the criteria for noise in schools given in BB93 (6) and local authority requirements.

The usage requirements and context should be reviewed in detail, including: understanding the heating, cooling and ventilation requirements throughout the school, and the implications of this for ASHP operation and scheduling; the required hours of operation of the ASHPs; and the use requirements of rooms close to the heat pumps.

ASHPs should be located as far as possible from classrooms. Use should be made of natural screening by school buildings, with less sensitive spaces on the side close to ASHPs. ●

● **Katie Salter is a PhD student at the Acoustics Innovation Institute, University of Salford. Read a longer summary of her paper, with references, at [cibsejournal.com](https://www.cibsejournal.com)**

References:

¹ Salter, K et al. (2026) *Heat pump noise in schools: influence of heat pump placement on noise exposure*. CIBSE Technical Symposium 2026, Loughborough University, 26–27 March

Table 1: Upper limit for the indoor ambient noise level, adapted from BB93 (6)

Type of room	Upper limit for the IANL, $L_{Aeq, 30 \text{ mins}}$ dB		
	New build	Refurbishment	Refurbishment with natural ventilation
Classroom	35	40	45
Science laboratory	40	45	45

A visualisation of Menasha Maplewood Middle School in Wisconsin. Source: C+N photography candnphoto.com



Passing the net zero test

A focus on commissioning, controls and performance outcomes is essential to making schools net zero ready, says **Tim Dwyer**

A case study presented at the ASHRAE Annual Conference demonstrated that achieving net zero-ready performance depends as much on commissioning, controls integration and operational optimisation as on the selection of low carbon technologies.

This was the central message of a presentation by HGA building performance specialist Drew Dillmann, at the 2026 ASHRAE Annual Conference. Referring to the recently completed Menasha Maplewood Middle School, in Wisconsin, USA, he described how geothermal heating, distributed heat pumps, dedicated outdoor air systems, photovoltaics (PVs) and battery storage were used to create a 'net zero ready' building.

The 20,700m² school opened in autumn 2025 and accommodates around 1,000 pupils. Although it incorporates a comprehensive range of renewable technologies, the project did not begin with a net zero target.

Instead, the design team first concentrated on minimising energy demand through an efficient building envelope and integrated building services. Only after tenders were returned below budget, and additional

funding incentives became available, was the opportunity taken to enhance the project to become net zero ready.

This illustrates an important engineering principle. The most cost-effective route towards net zero begins with reducing demand before considering renewables.

Rather than relying on large renewables to compensate for inefficient buildings, the project demonstrates the value of optimising the building before addressing the remaining energy requirement. The effectiveness of this demand-first approach is reflected in the projected annual energy use intensity (Figure 1), which is significantly lower than the average for comparable schools.

What does 'net zero ready' mean?

Although the term 'net zero ready' is being used increasingly, its meaning is not always clear. Rather than describing a building that already achieves net zero operational carbon, it refers to one that has been designed so that net zero operation can be achieved without major changes to the building fabric or engineering systems. Typically, a net zero-ready building minimises energy demand, incorporates efficient

low carbon heating and ventilation, provides the infrastructure needed for future renewable generation and energy storage, and retains sufficient flexibility to accommodate future technologies without extensive retrofit.

The approach allows projects to respond to changing funding opportunities and technology costs while maintaining a clear pathway towards net zero operation.

The school building combines a number of complementary technologies. Around 160 geothermal boreholes provide the primary heat source for 156 distributed water source heat pumps. Ventilation is provided by nine dedicated outdoor air systems, while there is a 1.15MW rooftop PV array, of around 2,750 panels. Battery storage and standby generation complete the integrated energy system.

However, Dillmann repeatedly emphasised that building performance depends as much on system integration as on selecting efficient technologies. The building management system (BMS) coordinates geothermal operation, heat pumps, ventilation, photovoltaic generation and battery storage as a single integrated energy system. The photovoltaic array

generates renewable electricity to help meet building demand, while the battery energy storage system is controlled independently to reduce peak electrical demand, improve resilience and optimise energy costs by charging from surplus solar generation or off-peak grid electricity and discharging when demand is highest. Achieving this level of integration requires sophisticated control strategies that continue to evolve with operational experience.

Perhaps the strongest message of the presentation was that commissioning should not be regarded as an activity that begins once construction is complete. Energy modelling informed decisions on

envelope performance, waste energy recovery and sizing from the outset; control sequences were reviewed during design; owner's project requirements were continually refined; and commissioning activities were planned from the earliest project stages. Rather than seeing commissioning as a final activity, it was embedded in design, procurement and construction.

This philosophy continued through construction. Equipment start-up, balancing and controls integration were coordinated carefully, while manufacturers' commissioning documentation was reviewed well before systems were energised. Dillmann noted that issues not resolved

during design inevitably surfaced during construction, where they became more difficult and costly to rectify.

The project also highlighted the relationship between prefabrication and commissioning. Factory-assembled plant and packaged systems can improve manufacturing quality, reduce site installation time, and allow hydraulic and electrical testing before delivery. They also provide documented factory test records that contribute to the project's digital quality information.

However, prefabrication is no substitute for commissioning. Factory-tested assemblies must still be integrated with the BMS, commissioned alongside other building services and optimised under real operating conditions. Functional performance testing remains essential to verify that the complete building operates as intended. Care is also needed when specifying packaged systems with proprietary controls, to ensure they remain compatible with the overall control strategy and allow sufficient flexibility for commissioning and future optimisation.

Performance in use

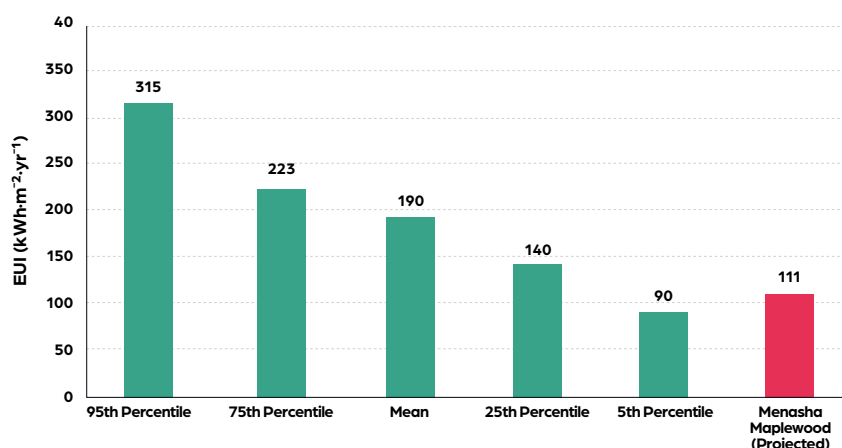
Dillmann told delegates that practical completion represents the beginning, not the end, of the optimisation process.

The first year of operation is described as a period of continuous learning. Control settings are adjusted as occupancy patterns become established, weather conditions vary and operational data become available. Rather than viewing these adjustments as defects, they are treated as valuable information that helps improve system performance.

Battery operation provides a particularly good example. While batteries contribute to resilience during Grid outages, their greatest value often lies in reducing peak electrical demand and maximising the use of onsite renewable generation. Determining the optimum charging and discharge strategy requires operational experience, rather than design calculations alone.

Measurement and verification therefore become central elements of the project. Continuous monitoring allows actual energy performance to

Comparison of annual energy use intensities for similar K-12 schools in Climate Zone 5A

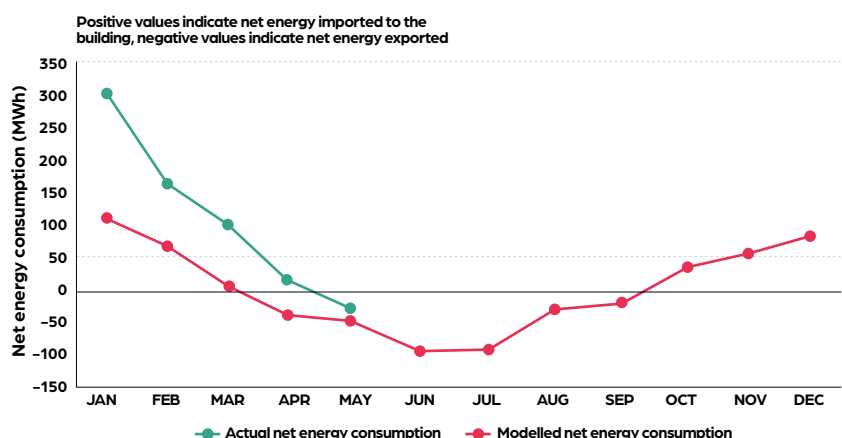


Footnotes and source notes

Source: Adapted from ASHRAE Annual Conference 2026 presentation by Drew Dillmann, HGA
Note: 1 kBtu-ft⁻² = 10.764 kWh-m⁻²; values rounded to nearest whole number

Figure 1: Projected annual energy use intensity of the Menasha Maplewood Middle School compared with similar K-12 schools in ASHRAE Climate Zone 5A.

Comparing actual and modelled net energy consumption



Source: Adapted from ASHRAE Annual Conference 2026 presentation by Drew Dillmann, HGA

Figure 2: Comparison of actual and modelled monthly net energy consumption during the initial months of operation. Comparing measured performance with design predictions provides valuable feedback for commissioning and operational optimisation.

be compared with design predictions, identifying opportunities for further optimisation while providing valuable feedback for future projects.

Figure 2 compares the measured net energy consumption during the first five months of operation with the values predicted by the design model.

Although only partial-year data were available, the comparison illustrates how operational monitoring can be used to verify performance, identify trends and support the ongoing refinement of control strategies.

The need for integrated design, effective commissioning, measurement and ongoing optimisation remains fundamental to achieving reliable building performance.

CIBSE Commissioning Code M emphasises that commissioning is a managed process extending from design through installation, testing, handover and post-occupancy evaluation, rather than simply a

“Issues not resolved during design inevitably surfaced during construction”

final construction activity.

Similarly, the Soft Landings framework promotes continued involvement of the design and construction teams after occupation to help ensure buildings achieve their intended operational performance.

The emphasis on comparing predicted and measured energy performance closely aligns with the principles of CIBSE TM54, which seeks to reduce the well-documented performance gap between design intent and operational performance.

Dillmann concluded by stressing that achieving net zero-ready performance depends on continuous collaboration throughout design, construction and

operation. Independent commissioning, measurement and verification were presented not as optional project enhancements, but as essential tools for ensuring that buildings continue to perform as intended throughout their operational life.

Delivering high-performance buildings is no longer simply about specifying innovative technologies; it is about creating an engineering process that connects design, construction, commissioning and operation into a continuous cycle of improvement.

That lesson applies equally to schools, commercial buildings and many other projects seeking to deliver reliable, low carbon performance. ●

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Stress testing homes for overheating

The latest CIBSE TM59 challenges the industry to design climate-resilient homes without relying on energy-intensive cooling. **Alex Smith** talks to lead author **Susie Diamond** about the update

The inclusion of ceiling fans is perhaps the most eye-catching of the 2026 changes to *CIBSE TM59*:

Overheating risk in dwellings – A design stage methodology.

Ceiling fans are a low-energy mitigation tool capable of curbing the need for cooling by raising thermal comfort thresholds by up to 2.1°C. TM59 lead author Susie Diamond MCIBSE is a champion of the technology. 'They are quiet, don't use a lot of energy and can be easily integrated into a light fitting,' she says.

CIBSE TM59 is the industry's standard framework for assessing overheating risk in residential buildings using dynamic thermal simulation. By evaluating parameters such as solar gain, air movement and occupant behaviour early in the design process, it enables teams to implement low-energy, passive cooling without resorting to energy-intensive cooling.

The new TM59 introduces a compliance checklist that Diamond says is key to the update. It serves as standardised quality assurance and augments the reporting framework.

'This picks up some of the common errors that are easy to make, such as using an incorrect north axis on drawings,' she says. 'I think it will be quietly influential.'

The checklist makes clear the differences between TM59 and Approved Document Part O, which was introduced in 2022 to mandate that new residential developments in England prevent summer overheating. The government has yet to update AD O to align with TM59:2026.

Other updates include the use of 2050s rather than 2020s weather, and the weather file dataset has expanded from 16 to 28 geographical zones.

Modellers must now demonstrate a clear step-by-step design progression to enforce a 'passive-first' hierarchy. Diamond notes this should reduce designs with floor-to-ceiling windows, a key cause of solar heat gain.

Stage 1 of the assessment tests the building's inherent architecture assuming ideal conditions (windows can open freely without acoustic, security or pollution barriers).

Stage 2 applies real-world restrictions – for example, closed windows because of noise or security, or partially constrained 50% window openings – and introduces low-energy mitigations.

Under a Stage 3 cooling assessment, active cooling is allowed as a last resort if the design fails (schemes *must* pass Stage 1 passively, regardless of whether there is cooling in the design proposal).

What's next?

There is now a standardised home-office occupancy profile to reflect daytime internal heat gains.

'The pandemic made working from home more mainstream and home offices are more common in new housing,' said Diamond.

The update also introduces more realistic window and door controls, with operative temperature now used to trigger windows opening rather than air temperatures.

The bedroom night-time criterion replaces the old hourly exceedance rule (>26°C for >1% of hours) with a mean night-time temperature threshold. The overnight average must stay below 27°C, with no more than four exceedance nights per summer.

Overheating assessments are now mandatory for shared circulation spaces and corridors (accounting for

pipe heat loss and internal gains).

Diamond notes that work on TM59 is ongoing, adding that she aims to develop an optional heatwave resilience test using DSY2 or DSY3 files (short intensive heatwave and long sustained heatwave) allowing behavioural changes such as closing windows when it is very warm outside.

She is collaborating on a simplified modelling metric and protocol for trees that would match tree species to basic shapes (triangle, pole or spherical) and foliage permeability to account for passive shading.

The impact of urban heat islands is a focus for future iterations, says Diamond – they can make central city areas up to 6°C warmer overnight.

Finally, a CIBSE guide to ceiling fans will provide technical guidance on integrating low-profile fans in residential developments in response to research on bedroom comfort levels by Loughborough University. ●

Access TM59 at bit.ly/CJTM5926

Watch the recent TM59 webinar:

www.cibse.org/growyourknowledge

Model behaviour

With the upcoming Future Homes Standard requiring airtight, well-insulated buildings, mechanical ventilation is set to become standard. **Xinyi Zhang** and **Richard Fitton** examine how these systems fare when using the Home Energy Model compliance tool

From March 2027, new homes in England will need to meet the Future Homes Standard (FHS). They will have to be more airtight and insulated than required under the 2021 Building Regulations. As a result, mechanical ventilation will no longer be a choice, but a necessity.

The FHS notional dwelling assumes decentralised mechanical extract ventilation (dMEV) and many housebuilders will install mechanical ventilation with heat recovery (MVHR) to improve energy efficiency.

At the same time as the transition to the FHS, the tool used to demonstrate compliance is changing. The Standard Assessment Procedure (SAP), a steady-state method working on monthly averages, is giving way to the Home Energy Model (HEM), which simulates a dwelling on a half-hour basis.

SAP will remain the compliance method when the FHS first takes effect. HEM phases in after a minimum three-month period, with both methods accepted for at least 24 months.

The obvious expectation is that a half-hourly method models homes better. However, the results from our research complicates this expectation¹.

The comparison is based on The Future Home (TFH), a zero carbon-ready house tested in the Energy House 2.0 climate chamber, University of Salford². TFH is a three-bedroom, dwelling with multiple HVAC configurations. This comparison uses its dMEV setup, matching the FHS notional dwelling. SAP 10.2 was compared with the consultation version (v0.28) of the HEM FHS wrapper, which divided the dwelling into two thermal zones, as SAP does, and used the Manchester weather file.

The two methods reach high agreement under steady state. Fed the same U-values, thermal bridging and air permeability from measurement, SAP and HEM return heat transfer coefficients within 1% of each other



(105.3W/K⁻¹ against 104.3W/K⁻¹). They agree on how much heat this house loses under steady-state conditions.

Ventilation is another area where SAP and HEM agree in this case study. Ventilation electricity is almost identical: 52kWh under SAP, 40kWh under HEM, both accounting for around 2% of regulated energy. But this reading misses where ventilation fits in the energy balance.

The real difference sits in space heating: HEM's space-heating demand is around 24% higher than SAP's, and the electricity to meet it around 62% greater because of HEM's timestep-level representation of the heat pump.

HEM's internal gains are 7.98% higher and solar gains 26.49% higher than SAP's; both would normally reduce space-heating demand, not

increase it. Part of the gap comes from assumption difference: the HEM FHS wrapper heats the rest of the dwelling to 20°C, against SAP's 18°C. This kind of difference is visible and can, in principle, be normalised. What remains after normalisation points to the loss side is a structural difference that better input data cannot remove.

Ventilation and infiltration heat loss is a result of two quantities at each timestep: airflow rate and the indoor-outdoor temperature difference. SAP calculates this from monthly averages, an effective air-change rate scaled by the monthly mean wind speed, multiplied by the monthly mean temperature difference.

HEM adjusts the air-change rate at each timestep based on local wind speed; the current release extends this

Getting wrapped by FHS

The Home Energy Model is the underlying simulation engine, while the Future Homes Standard wrapper is the set of standardised assumptions and compliance rules that govern how the model is used for regulatory assessment. As a result, some simplifications seen in compliance calculations arise not from limitations of HEM, but from FHS methodology requirements. For example, HEM could potentially model using data representing local weather, solar radiation and wind conditions. However, if the FHS wrapper specifies a standardised weather file for all compliance calculations, the engine uses that file instead.

to a full pressure balance following BS EN 16798-7, which considers calculation methods for the determination of airflow rates in buildings, where wind pressure, stack effect and the mechanical system together determine the total air-change rate at each timestep.

This matters; in a UK winter, windy and cold periods arrive together. When flowrate and temperature difference rise simultaneously, the heat loss over a month is greater than monthly averages would predict. SAP can only see the latter and better input data would not fix it.

How much of the 24% space-heating gap this mechanism accounts for is not quantified here and will be included in ongoing work, but its direction is certain: it pushes SAP's demand below HEM systematically.

For MVHR, there is a greater difference between HEM and SAP. Both treat heat-recovery efficiency as a fixed input, but HEM applies that efficiency against the actual half-hourly temperature difference. It adjusts the mechanical flowrate for actual pressure conditions at each timestep – a stated departure from BS EN 16798-7, which assumes mechanical flows are fixed.

It calculates duct heat losses from duct length, insulation and whether the unit sits in the thermal envelope. It returns half the fan electricity back to the dwelling as heat, on the basis that the supply fan warms incoming air while the extract fan's heat leaves.

SAP represents none of these directly. It applies a fixed efficiency, using a set of in-use factors.

Because recovered heat, duct losses and fan gains are whole-dwelling quantities, these differences carry through to the compliance figure. For MVHR, the move to HEM is a methodological improvement, not just a resolution change.

How modelling affects the compliance figure is decided by the wrapper as much as the engine. The engine can take any number of thermal zones and read any location's weather, but the wrapper fixes both (see panel 'Getting wrapped').

The consultation version used here divided the dwelling into two zones using Manchester weather. The FHS wrapper fixes the dwelling to a single zone, with

air assumed to circulate freely, and applies the same standardised weather file to all dwellings regardless of location. The engine has the capability, but the wrapper makes the simplification.

Beyond engine and wrapper, there is one thing neither method addresses: how ventilation distributes air and heat between rooms. HEM's engine solves ventilation for the dwelling as a whole, which is a documented methodological choice and does not move air between zones.

The FHS wrapper goes further, collapsing the dwelling to a single, freely mixed volume with no heat transfer between zones. Room-to-room air distribution is key to what a ventilation strategy does in a building, and it is absent from both methods.

These results point in three directions. First, where SAP and HEM differ on this zero carbon-ready house, the difference is about the dynamic treatment, because the two agree in steady state to within 1%.

Second, the ventilation and infiltration difference is real, but embedded in the space-heating gap, driven by the co-occurrence of wind and cold that monthly averaging cannot capture. Third, for MVHR the move to HEM is an improvement in ventilation modelling, but what showed in the compliance figure is decided by the FHS wrapper

as much as the engine's resolution.

Two questions remain. The first is how the methods compare under an MVHR configuration, where HEM's more detailed modelling of duct losses, pressure effects and fan energy would produce a more obvious difference.

The second concerns what neither methods account for: heat transfer between zones. This is being examined through a comparison of SAP, HEM and a dynamic simulation tool applied to a glazed thermal buffer space, where the ability to transfer heat across zone boundaries is the key point determining the energy contribution.

Early results suggest the bias is systematic and directionally predictable, and its extent is the subject of continuing work. ●

Read more at bit.ly/CJEN2Sal

● **Xinyi Zhang is a PhD researcher and Professor Richard Fitton a technical director at Energy House Labs, University of Salford**

References:

- 1 Fitton R, Zhang X et al (2025) 'Comparisons between the UK SAP and HEM for a zero carbon-ready home.' CIBSE Technical Symposium bit.ly/CJZFHEM25
- 2 Fitton R, Zhang X et al (2026) 'Energy house 2.0: The design, build, commissioning, performance and early findings of a large-scale building physics test facility' *BSE&T* 47 (2) 247–262. bit.ly/CJEN226

SAP versus HEM: key differences

Aspect	SAP	HEM
Calculation basis	Monthly average energy balance	Half-hourly dynamic simulation
Time resolution	Monthly	30-minute timesteps
Weather data	Monthly averages	Hourly/half-hourly weather series
Building response	Simplified steady state	Dynamic thermal response
Occupancy	Standardised schedules	More detailed occupancy and appliance profiles
Heating systems	Seasonal efficiencies and correction factors	Explicit system operation at each timestep
Ventilation	Monthly average airflows and heat losses	Time-varying ventilation and infiltration
Solar gains	Monthly averaged	Dynamic solar gains
Overheating	Separate assessment	Integrated within the model
Future flexibility	Difficult to extend	Designed as a platform for future developments

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External shading: what works in the real world?

A Loughborough University study evaluating how shading systems reduce indoor temperatures is providing evidence to support wider adoption of passive cooling measures, says the university's **Niloo Todeh Kharman MCIBSE**

Can external shading really reduce indoor temperatures by more than 6°C in the UK? Initial results from a series of full-scale experiments on Loughborough University's twin houses suggest they can. Testing during the summer months of 2025 and 2026 demonstrated that several external shading systems reduced peak indoor operative temperatures and overheating hours significantly.

Overheating has become one of the most pressing challenges facing homes in the UK. Climate projections indicate that heatwaves will become more intense and more frequent, while much of the existing housing stock was designed primarily to retain heat, rather than keep it out. Improving summer performance without increasing reliance on active cooling is therefore a growing priority for designers and policy-makers.

External solar shading has emerged as one of the most effective strategies for limiting unwanted solar heat gains before they enter a building. While the principle is well understood, however, there remains little measured evidence showing how different shading systems perform under real-world conditions.

A series of experiments has been undertaken at Loughborough University, using a pair of identical test houses. The research forms part of the Energy Resilience and the Built Environment Centre for Doctoral Training programme, and is supported by sponsorship from the British Blind and Shutter Association, with additional in-kind support from CIBSE.

The two south-facing, 1930s semi-detached houses represent the UK's most common housing type, accounting for around 25% of the stock. They are identical in their construction, layout and refurbishment. Using one as an unshaded reference and the



other as a test dwelling fitted with external shading enabled each shading system to be isolated and evaluated under real-world conditions.

To ensure the houses behaved as realistically as possible, matching internal heat gains were generated using synthetic occupancy based on profiles recommended in CIBSE TM59 (2017). In both houses, electric site lights, controlled by smart systems, replicated heat from occupants, lighting and appliances. Night-time ventilation was also incorporated by opening bedroom windows during sleeping hours.

Shading devices evaluated included external roller blinds, external venetian blinds, awnings, Dutch canopies and concertina shutters. The experiments ran over multiple months, exposing each system to conditions from mild spring weather to intense summer heat. High-resolution environmental monitoring recorded indoor operative temperatures, outdoor air temperature, solar radiation and wind speed.

The initial results are clear: external shading can make a substantial difference. During heatwave periods, some shading devices reduced peak

indoor operative temperatures by more than 6°C compared with the unshaded reference house. For several shading devices, overheating hours reduced by more than 50%. In bedrooms, night-time ventilation reduced the duration of elevated temperatures after hot days.

The findings reinforce the importance of controlling solar heat gains at source and providing opportunities for excess heat to escape as outdoor temperatures fall. The results revealed that not all shading systems are equal. Geometry, openness, projection, slat angle and operation all influence performance.

By generating high-quality real-world datasets for future modelling studies and developing methods to compare shading systems, this research provides practical evidence to support wider adoption of passive cooling measures across the UK housing sector.

An abstract has been submitted to the CIBSE Technical Symposium 2027, where full results will be presented. ●

● **Niloo Todeh Kharman is a doctoral researcher, Building Energy Research Group, Loughborough University**

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Pipework insulation: looking beyond compliance towards optimising performance

This module explores how pipe insulation contributes to energy efficiency, operational performance, thermal comfort and building resilience

Pipework insulation is often regarded as a solved problem. Select the insulation thickness, comply with recognised insulation standards, such as BS 5422¹, together with local building regulations, and move on to the next design decision. That assumption is becoming increasingly outdated.

For many years, pipe insulation was specified primarily to limit winter heat losses, prevent freezing and satisfy regulatory requirements. However, the context has changed dramatically. Modern buildings require far less space heating than they did only two decades ago, are considerably more airtight, and increasingly rely on communal heating systems and heat networks that operate continuously throughout the year.

At the same time, concerns about overheating have become a major design consideration. While solar gains and glazing are usually considered first, another source of unwanted heat often remains hidden above suspended ceilings, within service risers and inside communal corridors, in the form of distribution pipework. As buildings become better at retaining heat, designers must consider not only where heat is needed, but also where it is unintentionally released.

This article examines why pipe insulation is no longer simply a compliance exercise, but an important contributor to operational energy performance, thermal comfort and building resilience.

Growing importance of pipework heat loss

Looking back 20 years, the thermal performance of the building envelope dominated annual heating energy consumption. Buildings lost heat readily, insulation standards were relatively modest and heating systems generally operated only when space heating was required. Against this background, heat emitted from service pipework represented only a small proportion of the building's energy balance.

Successive revisions to national energy-efficiency regulations – exemplified in England by Part L of the Building Regulations – alongside improvements in insulation, airtightness and glazing performance, have significantly reduced heating demand in domestic and non-domestic buildings. At

the same time, communal heating systems, district heat networks (district energy systems) and centralised domestic hot water (DHW) generation have become increasingly common. Unlike space-heating circuits, DHW circulation often operates continuously throughout the year.

The absolute heat loss from a metre of insulated pipe may be little different from 20 years ago, but the amount of useful heat required by the building has reduced dramatically. Figure 1 provides a simplified conceptual illustration of how distribution losses become proportionally more significant as building heating demand is reduced.

These changes also affect occupant comfort. Heat released from continuously operating pipework is no longer easily dissipated through building fabric. Instead, it accumulates within corridors, risers, ceiling voids and service cupboards, contributing to unwanted summertime heat gains.

Pipework as a continuous heat emitter

Every heated pipe continuously transfers energy to its surroundings. Unless that heat is required within the occupied space, it represents avoidable energy consumption that has first been generated, distributed and paid for. Whether carrying DHW, low-temperature heating water or a district heating supply, heat flows from the fluid through the pipe wall and insulation before being dissipated to the surrounding environment.

This transfer occurs through three mechanisms: conduction through the insulation; convection from the insulation surface to the surrounding air; and thermal radiation to adjacent surfaces. Together, these determine the overall heat loss. Unlike a flat wall, adding insulation to a pipe also increases the external surface area from which heat can be lost. As the insulation becomes thicker, the thermal resistance increases, reducing heat flow, but the larger external diameter slightly increases heat loss by convection and radiation. These competing effects explain why increasing insulation thickness delivers diminishing returns. Beyond a certain point, further increases in thickness produce relatively small reductions in heat loss, introducing the concept of economic insulation thickness. Many countries



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publish guidance for specifying insulation thicknesses. In the UK, designers commonly refer to BS 5422. The 2023 revision to BS 5422 represents a significant evolution in thinking. Rather than simply seeking the lowest lifetime financial cost, the standard now adopts an environmental methodology that incorporates operational energy use, carbon emissions and the wider social cost of carbon when determining appropriate insulation thicknesses. The standard remains an essential design tool. However, modern buildings require engineers to think beyond simple compliance.

Heat loss depends principally upon:

- Fluid temperature
- Pipe diameter
- Insulation thermal conductivity
- Insulation thickness
- Surrounding air temperature
- Surface emissivity and local air movement.

Increasing insulation thickness reduces heat loss, but the relationship is not linear. The first increments of insulation deliver the greatest benefit, while progressively thicker insulation produces diminishing returns. Doubling insulation thickness certainly does not guarantee halving heat loss, as illustrated in Figure 2.

The concept of economic insulation thickness therefore remains important. However, the optimum thickness is no longer determined by installation cost and energy savings alone. As recognised in BS 5422, wider economic and environmental considerations apply, while engineers must also consider overheating risk, occupant comfort and overall operational performance.

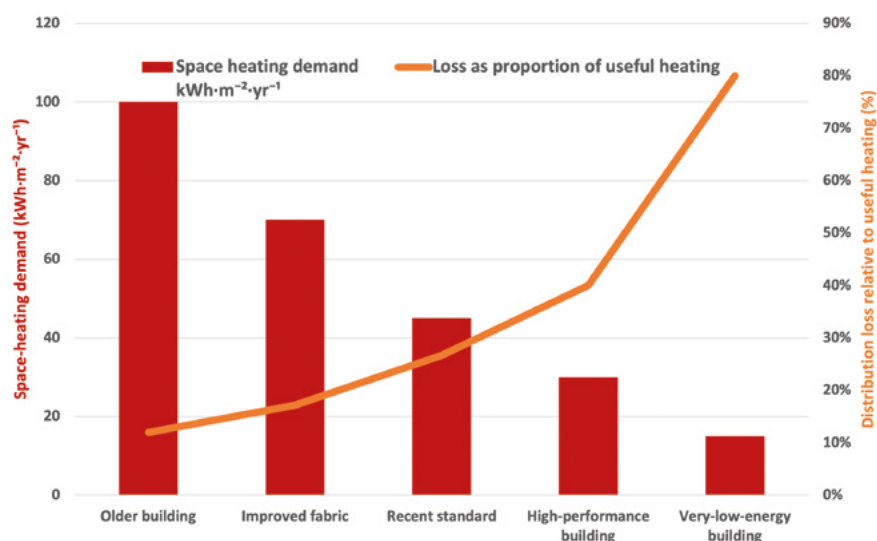


Figure 1: Conceptual illustration showing how constant annual distribution heat losses (assumed here to be 12kWh·m⁻²) become an increasing proportion of operational energy use as useful space-heating demand falls. The values are illustrative and are intended solely to demonstrate the underlying principle

Distribution losses and unwanted heat gains

The growth of communal heating systems has fundamentally changed the way heat is distributed within residential buildings.

Primary distribution pipework frequently operates continuously to maintain DHW availability. Every metre of heated pipe therefore becomes a permanent source of background heat. Guidance for communal heat networks, including the London Heat Network Manual², specifically identifies corridor overheating as an important design consideration, recommending insulation

not only to reduce energy losses, but also to minimise unwanted heat gains.

Several design features can contribute:

- Long horizontal distribution runs
- Permanently circulating primary circuits
- DHW return loops
- Poorly insulated valves, strainers and flanges
- Bypass arrangements
- Continuously heated service risers.

Communal corridors often have no opening windows, limited ventilation and no cooling provision. Heat released into service cupboards and ceiling voids gradually migrates into circulation spaces, lift lobbies and neighbouring apartments.

Pipework heat loss is rarely the sole cause of overheating. Solar gains, occupancy and ventilation usually dominate peak summer temperatures. Nevertheless, distribution pipework provides a continuous heat source throughout the year and should therefore be considered alongside other overheating mitigation measures. During winter, some of this heat may provide incidental space heating. During warmer months, however, it becomes an unwanted internal heat gain that can contribute to overheating or increase cooling demand.

Pipe insulation: only part of the solution

Thicker insulation is often the first response to overheating concerns. While improving insulation almost always reduces distribution losses, it should not be viewed as the only solution.

Heat emissions depend upon insulation thickness, water temperature, pipe length, operating hours and installation quality.

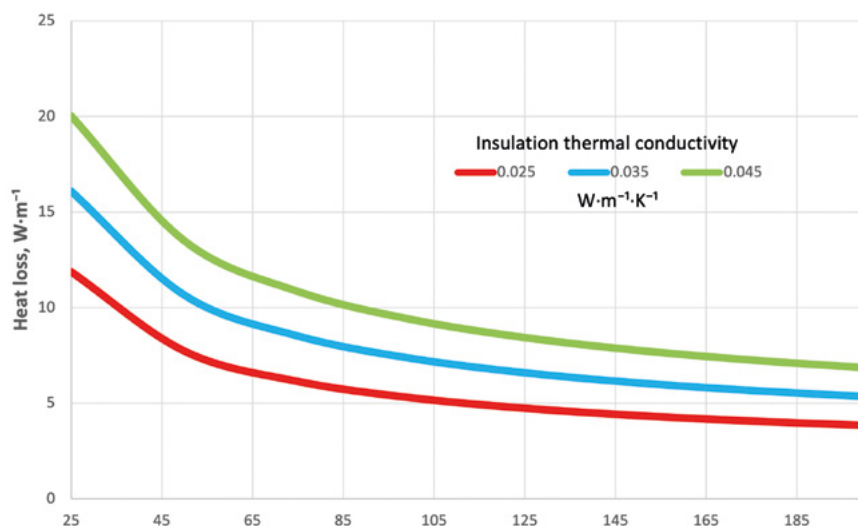


Figure 2: Indicative heat loss, W·m⁻¹, for horizontal 63mm outside diameter steel pipe at 70°C surrounded by an environment at 20°C with insulation of thermal conductivities 0.025, 0.035 and 0.045 W·m⁻¹·K⁻¹, calculated with an assumed combined external heat transfer coefficient of 8 W·m⁻²·K⁻¹

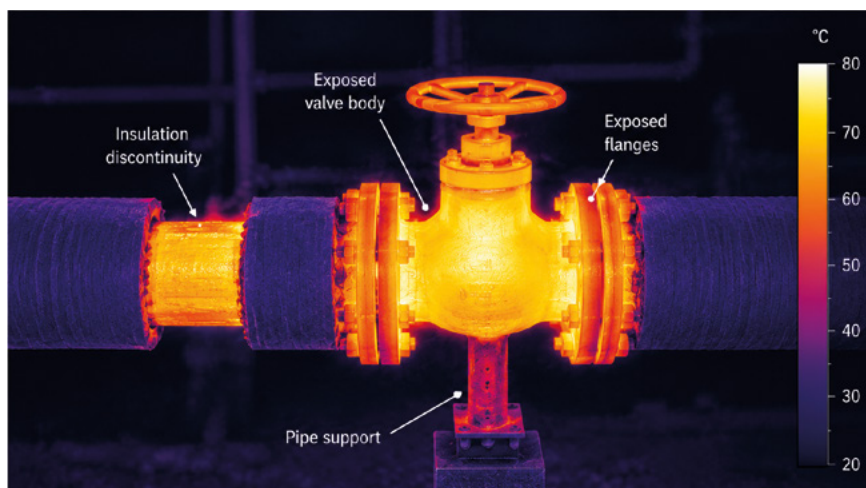


Figure 3: Illustrative infrared image showing the disproportionate heat losses that occur at exposed valves, flanges and insulation discontinuities. Such thermal bridges can contribute significantly to distribution losses, despite the surrounding pipework being well insulated

Effective design therefore considers the complete system.

Potential measures include:

- Reducing operating temperatures
- Demand-controlled DHW recirculation
- Shortening distribution routes
- Improving pipe routing
- Reducing unnecessary bypasses
- Lowering return temperatures
- Decentralising plant where appropriate.

The objective is not simply to specify thicker insulation, but also to minimise unnecessary heat transfer throughout the distribution network. The greatest reductions in heat loss may be achieved by reducing the amount of hot pipework in the building, rather than simply insulating it more heavily.

Low-temperature heating transformation

Lower-temperature heating systems offer benefits extending well beyond improved heat pump efficiency. Because pipework heat loss depends largely upon temperature difference, reducing flow temperatures reduces heat loss from every metre of pipework. Less heat is lost from the distribution system and less unwanted heat enters occupied spaces.

Lower temperatures also improve heat pump coefficient of performance (COP) and reduce distribution losses within communal heating systems and district heat networks.

Achieving these benefits depends upon maintaining a healthy system temperature difference. Good hydraulic design, commissioning and balancing enable lower return temperatures and improved system efficiency.

These principles are increasingly reflected in emerging heat network performance frameworks. In the UK, for example, the Heat Network Technical

Assurance Scheme (HNTAS)³ introduces an important performance indicator, the volume weighted average return temperature (VWART), which measures average return temperature across the network. Lower VWART values generally indicate more efficient heat transfer and reduced distribution losses.

Pipe insulation, hydraulic design, commissioning and operating temperature should therefore be viewed as complementary elements of the same strategy, rather than separate design decisions. The most effective pipework is not simply the best insulated, it is the pipework that carries the minimum amount of heat, at the lowest practical temperature, for the shortest practical distance.

Installation quality

Even the best specification delivers little benefit if insulation is poorly installed. Exposed valves, strainers, flanges, unions and compression fittings are common sources of heat loss, as illustrated in Figure 3. Likewise, insulation compressed beneath support brackets, damaged during maintenance or cut short around hangers creates thermal bridges that increase heat transfer. Although fittings typically represent only a small proportion of the total pipe length, their larger surface area and frequent lack of insulation mean they can contribute a disproportionately large share of the overall heat loss.

Designers should therefore consider insulation continuity at supports, the use of removable insulation jackets for valves and strainers, and robust site inspection. They should also recognise that insulation is routinely removed during maintenance, so specifying durable, reusable jackets

helps ensure that insulation is reinstated after servicing.

Looking beyond compliance

Pipework insulation is becoming an operational performance issue rather than simply a specification exercise. Post-occupancy evaluation, Soft Landings⁴ and digital building analytics increasingly allow engineers to verify system performance after handover, identifying excessive return temperatures, continuously operating circulation pumps and abnormal distribution losses.

Across many countries, guidance on overheating, operational performance and heat network efficiency increasingly encourages designers to consider how buildings perform in use, rather than simply at the design stage. In the UK, examples include Approved Document O⁵, CIBSE TM59⁶ and HNTAS. Future climate projections further strengthen the case for reducing unwanted internal heat gains wherever practicable.

Good insulation remains essential, but the highest-performing buildings will not necessarily be those with the thickest insulation. They will be the buildings that minimise unnecessary heat transfer through good system architecture, low operating temperatures, intelligent controls, high-quality installation and effective commissioning. The most efficient distribution system is the one that transports only the heat that is required, only where it is needed and only for as long as necessary.

Pipework insulation is no longer simply a necessary compliance exercise. It is an integral part of delivering buildings that are energy efficient, resilient and comfortable to occupy throughout their entire operational life. ●

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Module 268

September 2026

1. Why have distribution pipework heat losses become proportionally more important in modern buildings?

- ☐ A Building heating demand has fallen significantly while pipework losses have reduced less dramatically
- ☐ B Building Regulations no longer require insulated pipework
- ☐ C Modern pipe insulation has higher thermal conductivity
- ☐ D Pipe diameters have increased in most buildings
- ☐ E Water temperatures are now much higher than previously

2. According to the article, why do thicker insulation layers provide diminishing reductions in heat loss?

- ☐ A Heat transfer through the pipe wall increases
- ☐ B Increasing insulation thickness also increases the external surface area from which heat is lost
- ☐ C Insulation becomes less effective as it ages
- ☐ D Pipe temperatures fall below ambient
- ☐ E Radiation losses disappear completely

3. Which of the following measures is most likely to both reduce distribution heat losses and improve heat pump efficiency?

- ☐ A Increasing expansion vessel size
- ☐ B Increasing flow temperature
- ☐ C Increasing pipe diameter
- ☐ D Increasing pump speed
- ☐ E Operating the heating system at lower flow temperatures

4. According to the article, what often causes a disproportionate share of total distribution heat losses?

- ☐ A Copper pipe rather than steel pipe
- ☐ B Exposed valves, flanges and insulation discontinuities
- ☐ C Plastic pipework
- ☐ D Straight insulated pipe runs
- ☐ E Vertical risers

5. What is the principal message of the article regarding pipe insulation design?

- ☐ A Compliance with BS 5422 alone guarantees optimum performance
- ☐ B Designers should always specify the maximum practical insulation thickness
- ☐ C Heat losses from pipework are insignificant in modern buildings
- ☐ D Pipe insulation is primarily intended to prevent freezing
- ☐ E Pipe insulation should be considered as part of overall operational building performance rather than simply a compliance requirement

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References:

¹BSI. BS 5422:2023. *Method for specifying thermal insulating materials for pipes, tanks, vessels, ductwork and equipment operating within the temperature range -40°C to +700°C*. London: BSI; 2023.

²Greater London Authority. *London Heat Network Manual II*. 2nd ed. London: Greater London Authority; 2021.

³Department for Energy Security and Net Zero. *Heat Network Technical Assurance Scheme (HNTAS)*. London: Department for Energy Security and Net Zero; 2026.

⁴BSRIA. *Soft Landings Framework 2023*. BG 54/2023. Bracknell: BSRIA; 2023.

⁵HM Government. *Approved Document O*:

Overheating. The Building Regulations 2010. London: HMSO; 2021.

⁶CIBSE. *TM59: Design methodology for the assessment of overheating risk in homes*. London: CIBSE; 2017.

Passivent's new iC9000 control system

Passivent's new control system iC9000 aims to offer the same benefits as the existing iC8000 controller in terms of energy and operational efficiency, multi-zone control and occupant comfort. The added features and benefits, however, will make it a more sustainable solution.

The iC9000 includes the new Rotary sensor, which combines the room sensor and room override into one unit. Its rotating dial, menu options and push-to-select functions, via a full LCD display with configurable readouts, are designed to make the user experience more intuitive. It also features a colour-coded halo LED ring, with green, yellow and red signalling changing CO₂ levels in the building.

The system monitors air quality in real time. This, says Passivent, reduces the burden on building services by using CO₂ and temperature-based demand control to regulate airflow within the required zones.

iC9000 includes options for remote monitoring and data logging, with less field wiring required compared with the iC8000 system. It is designed to provide a reduction in the overall cable and labour costs for a project.

● Visit www.passivent.com



Vent-Axia sponsors white paper highlighting overheating challenge

Solutions for mitigating overheating in residential and commercial buildings, published by Architects' Datafile and sponsored by Vent-Axia, highlights how architects are responding to the need to mitigate overheating in new-build properties, amid tightening regulations and rising temperatures. The report includes the increasing role of ventilation in overall mitigation strategies.

As homes become more thermally efficient to reduce carbon emissions and help meet the UK's net zero 2050 target, the risk of overheating is rising.

● Visit bit.ly/4z37zdT



Ideal Commercial Heating's CPD aims to support decarbonisation of commercial buildings

Ideal Commercial Heating has launched a new CIBSE-approved CPD to help specifiers and building services engineers navigate the design of heating systems.

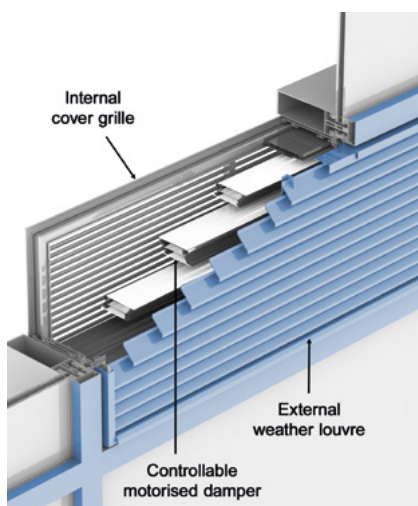
'Low carbon hybrid heating system considerations' aims to provide a real-world overview of how hybrid and bivalent systems can support the decarbonisation of commercial buildings. Ideal Commercial Heating says the CPD examines the key drivers behind the transition to low carbon heating, including net zero targets and legislation.

It focuses on the practical considerations that influence system selection, including: system temperatures; heating circuit compatibility; electrical capacity; available plant space; and the challenges of integrating new technologies into existing infrastructure.

A key objective is highlighting the role of hybrid systems in enabling phased decarbonisation. Rather than requiring full system replacement, Ideal Commercial Heating says hybrid approaches allow engineers to introduce low carbon technologies with the aim of managing capital expenditure, minimising disruption and future-proofing buildings for further upgrades.

The CPD's goal is to provide a decision-making framework to support specification.

● Visit: idealcommercialboilers.com/cpd-courses



CIBSE AM10 updates bring clarity, says Passivent

Passivent has welcomed the latest changes published by CIBSE in AM10 – *Natural ventilation in non-domestic buildings* and the clarity this has brought to the industry.

Edward Richmond, head of sales at Passivent, said: 'Our goal is to support specifiers and building services consultants to create the most appropriate natural ventilation strategy for their project, and we've found that early collaboration with manufacturers, like ourselves, and the use of design tools such as IES can make all the difference.' Richmond said AM10 is the go-to guide for natural ventilation design. 'We welcome these recent revisions, which bring the guidance in line with modern building challenges,' he said.

Passivent's full range of roof ventilation terminals – Airscoop, Airstract, Airstract iAT and Hybrid Plus Airstract – are available for thermal modelling via the IES Virtual Environment (VE) platform. Their aim is to enable specifiers to simulate the performance of natural ventilation products within VE models.

● Visit www.passivent.com

Q&A

Young graduates entering the building services industry benefit from networking and mentorship to gain confidence and develop leadership skills. **Enda Seyama-Heneghan** explains how the Young Engineers Network offers all this and more

As the need for sustainable building solutions shapes our industry, sharing knowledge and experience is vital. Chapters of CIBSE's Young Engineers Network (YEN) in New South Wales, Victoria, South Australia, Queensland and New Zealand play a key role in this. YEN's Australia and New Zealand (ANZ) region chair, Enda Seyama-Heneghan, explains how she is bringing them together

Q How did you become involved in YEN?

A A colleague on the New South Wales YEN committee invited me to a CIBSE event, which happened to be on a sustainability topic relevant to my work at the time. That introduced me to CIBSE as somewhere to learn about current industry topics and hear directly from experienced professionals. Soon afterwards, I was invited to join the YEN committee. It offered a natural way to build my network, connect with other early-career professionals and learn about the wider industry.

Q What are the benefits of joining YEN?

A It's a great way to grow your network beyond your own organisation and discipline. By connecting with people at a similar career stage, you can better appreciate the small but important part we all contribute to large projects. Beyond this, you gain access to events and the opportunity to help organise them, which builds confidence and develops leadership skills.

Q How did you arrive at your current role?

A I joined Arup Sydney in 2020, with a mechanical engineering degree, but have since specialised in sustainable design of buildings and precincts, and am now senior sustainability consultant and a Green Star Accredited Professional.



Enda Seyama-Heneghan

Q Which project have you been most proud of – and what did you learn from it?

A The Bondi Pavilion restoration at Bondi Beach, one of the first I worked on as an Arup intern and the first I saw to completion. Coordinating the sustainability strategy for this heritage building called for careful, tailored solutions. We achieved a five-star Green Star rating, with about 80% of the original structure retained and a 100% electric building, powered largely by rooftop solar. I learned how good sustainability outcomes rely on coordination and collaboration, and about working within real constraints.

Q Where has your regional YEN had its biggest impact in the past year?

A University outreach across our YEN cities. We have attended more careers fairs and campus events, and

held university lectures to introduce students to CIBSE and building services. We believe getting students involved in CIBSE early is valuable, as it gives them access to industry events and mentors, helps them build professional networks before they graduate and offers a clearer view of career pathways.

Q What are the current YEN priorities for your region?

A The YEN ANZ region spans five chapters across New South Wales, Victoria, South Australia, Queensland and New Zealand, and our main priority is connecting these more closely, to share knowledge and learn from each other's strengths. We're also growing our university partnerships to support students beginning their careers.

Q What are your personal objectives as chair and what are you looking forward to?

A To foster connected and engaged YEN communities that create opportunities for early-career engineers to be part of wider industry conversations and feel empowered to make positive changes to our industry. I'm particularly looking forward to the ANZ Young Engineer Awards in Sydney this October. It's a great chance to celebrate our young engineers and the people who support them.

Q What would you say to someone thinking of building services engineering as a career?

A Building services is far broader than many people realise, with room to specialise in areas such as sustainability, and scope to keep learning throughout your career. My main advice would be to get involved early by going to events, joining a community such as YEN and talking to people across different disciplines. You'll quickly see in just how many directions the industry can take you. ●

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DECARBONISING LONDON | 25TH NOV - 10AM

London's buildings offer huge potential for reducing carbon, whether it's the ageing existing stock or new developments - but do those with the power to decarbonise have the imagination or the courage to do it? Or are they hamstrung by bureaucracy? Our panellists consider how to encourage building owners and designers to decarbonise the capital.

FUTURE BUILDINGS STANDARDS - THE PROSPECTS FOR COMMERCIAL BUILDINGS | 25TH NOV - 4PM

The recently release of the Future Homes and Buildings Standards ushered in a world of increased solar PV, use of heat pumps and increased air tightness for homes. But what are the prospects for non-domestic buildings? Our panellists will highlight the new considerations and changes in methodology for specifiers and designers.

THE BATTLE AGAINST OVERHEATING: WHY COOLING HAS A NEW URGENCY | 26TH NOV - 3PM

The recently release of the Future Homes and Buildings Standards ushered in a world of increased solar PV, use of heat pumps and increased air tightness for homes. But what are the prospects for non-domestic buildings? Our panellists will highlight the new considerations and changes in methodology for specifiers and designers.



ELEMENTALLONDON PARTNERS WITH UKGBC

The UKGBC, one of the country's most influential sustainability organisations, is partnering with elementalLONDON to provide sessions looking in depth at the challenges and opportunities for buildings and the related energy landscape. UKGBC will be curating two panels in the Sustainability Arena on Thursday 26th November - focusing on buildings at 10am and on energy at 11am. They will also host a more informal networking session in the elementalLONDON Networking Hub at 2pm on 26th November.

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The result is a velocity pressure which ultimately provides a total air volume measurement. Both static and impact pressure have an independent pressure averaging tank which provides a smooth pressure signal of the whole measured area.

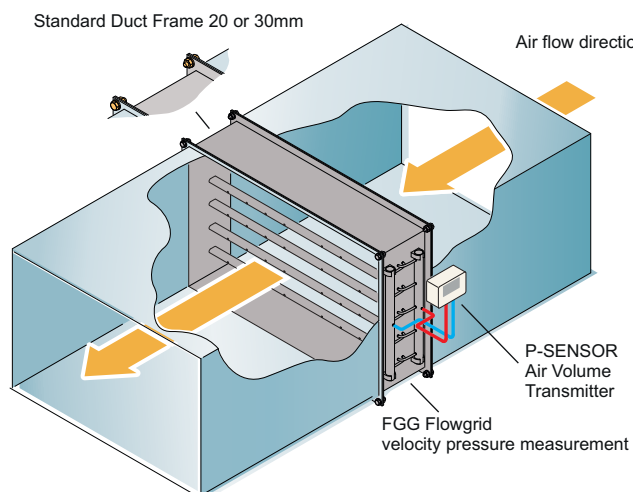
Another great advantage of the FGG Flowgrid is, that it can measure bi-directional as it is manufactured equally on both sides. This means, the air flow is measured in one direction and should there be a reverse flow, this can be detected and measured when using the CMR P-SENSOR.

The Flowgrids are manufactured in standard height increments of 100mm going up to a maximum height of 1200mm. Custom sizes can be made 3000 x 3000mm

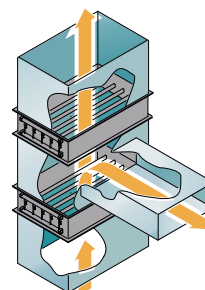
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Hospital Isolation Rooms - Operating Theatres - Data Centres

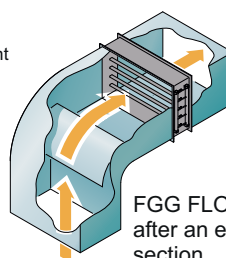
FGG FLOWGRID and P-SENSOR providing accurate average air volume measurement in ducts.



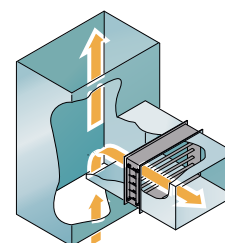
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