cibse Journal

March 2026
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The magazine of the Chartered Institution of Building Services Engineers

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Still learning

The sheer breadth of building services is on full display in this month's *Journal*, with the gleaming hi-tech Henderson tower in Hong Kong contrasting with the urgent reality of preventing mould in social housing and the need to optimise large heat pumps in historic buildings.

Designed by Zaha Hadid Architects, The Henderson is situated in one of the most prestigious locations in Hong Kong, and has become a showcase for smart technology and low carbon building services design (page 24).

Innovations include the world's first AI-powered elevator control system and a 'patented solar responsive ventilator' to maintain comfortable temperatures for occupants. There is also sophisticated hybrid ventilation that uses a digital twin to interpret weather and BMS data to determine when it is appropriate to ventilate. The building has won numerous awards, including the Society of Façade Engineers' Project of the Year 2025 for its Banquet Hall.

In this month's issue on the Hong Kong region, we feature interviews with three of CIBSE's 30 under 30 winners, who describe the challenges of designing in Hong Kong's humid, high-density environment. The 'verticality' of the city means they have to innovate beyond standard practice, in a way that integrates seamlessly with the surrounding built environment in terms of energy systems and transport.

The problem of mould in UK homes is a sorry indictment of the country's construction industry and its culture of non-compliance and poor workmanship. Many homes have been spoiled by insulation installed under government energy efficiency schemes; a lack of consideration around ventilation has resulted in moisture being trapped in homes made airtight by the insulation (page 33).

We're not the only nation that has made a mess of fabric improvement. The same issues of mould occurred in Sweden after its insulation boom in the 1970s and '80s. As a result, the country introduced obligatory mould control in 1991, requiring that ventilation systems be routinely checked by certified inspectors.

Investigations of large heat pump installations are rare, so we were excited to read four new case studies by Max Fordham for Historic England. While the technology is sound, says the report, there are many variables to consider in optimising the performance and providing comfort for occupants (page 36).

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Jason Tramontano
Why the new heat network technical standards risk delaying developments

Andy Pearson
This month's CPD is on operation and applications of condensing and desiccant dehumidification systems

John Wong
The YEN Hong Kong chair discusses the networking opportunities stemming from the organisation

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Social housing retrofit targets at risk, say MPs

Committee calls for more clarity over funding available for retrofits

Progress on retrofitting social homes must accelerate if the sector is to hit new Minimum Energy Efficiency Standards (MEES) by 2030, MPs have warned.

In a new report, published on 9 February, the Commons Housing, Communities and Local Government Committee says it is 'not acceptable' that around 430,000 socially rented homes in England still fail the Decent Homes Standard, which was introduced by a Labour government more than 25 years ago.

Progress on retrofitting social homes 'needs to accelerate', the report states, if the sector is to upgrade the remaining homes to the required MEES by the target date of 2030. However, the government has not yet provided sufficient clarity to the sector on the funding available for retrofits over the course of the parliament, it adds.

The committee backs the government's phased implementation of Awaab's Law to improve safety in social housing. Named after two-year-old Awaab Ishak, who died of a severe respiratory condition resulting from prolonged exposure to mould in his family's Rochdale flat, the new law means social landlords must focus on tackling the most dangerous hazards first.

The committee says a phased rollout of the law may mitigate the risk of some landlords diverting resources from the services for more vulnerable tenants in order to comply with the regulations.

However, it adds that the government must urgently set and publish the timeline for extending Awaab's Law to all remaining hazards, to give tenants and social landlords clarity on when they can expect the new regulations to apply.

The report also recommends that the government establish a new, modern Decent Homes Programme.

New BSRIA guide reinforces 'no insulation without ventilation'

The principle of 'no insulation without ventilation' underpins a new guide to eliminating damp and mould in social housing.

BG 90/2026 Dealing with mould in social housing has been launched by the Building Services Research and Intelligence Association (BSRIA) to help landlords and construction professionals navigate requirements introduced by Awaab's Law. It highlights the need to balance energy efficiency improvements with effective moisture management.

BG 90/2026 has cutting-edge approaches – such as tracking humidity using sensors and stock-level risk assessment using housing data – to support a shift from reactive maintenance to proactive, data-driven management.

Tom Garrigan, executive director of BSRIA, said: 'Continuous, demand-controlled ventilation systems are essential for reliable moisture control, especially as homes become more airtight through retrofit measures.'

See social housing feature on page 32.

Social homes must meet EPC Band C by 2030

All social rented properties must meet Energy Performance Certificate (EPC) Band C by April 2030, under the government's new Minimum Energy Efficiency Standards (MEES). However social landlords will be able to secure a time-limited exemption from the new standard if they have to spend more than £10,000 on a property in order to comply. The exemption would allow providers to delay meeting the MEES for a further 10 years from 2030.

● The government is to keep its existing measure of fuel poverty. In its new strategy for England, published on 21 January, the Department for Energy Security and Net Zero says the Low Income Low Energy Efficiency measure will be retained. This says households are fuel poor if they live in a property with an energy efficiency rating of Band D or less and have disposable income below the poverty line.

Data centres and air con threaten renewable gains

Extra renewable generation is being used to power AI

The rapid expansion of renewable power is being swallowed up by rising demand from data centres and air conditioning, rather than displacing fossil fuels, according to new research by the University of Sussex.

Data centres and growing use of air conditioning are among a range of factors threatening to undermine the climate gains from renewables, according to the paper, which was published in the academic journal *Nature Reviews Clean Technology*.

Researchers from Sussex and Vienna's Central European University found that record growth in solar power in the first three quarters of 2025 outpaced global growth in electricity demand for the first time.

Increases in electricity use could consume most new renewable supply unless measures are taken to limit demand, they say.

'Renewables are scaling at record speed, but demand growth from data centres, cooling and transport is running just as fast,' said Professor Felix Creutzig, Bennett Institute chair at the University of Sussex.

Publication of the research comes as Toby Perkins MP, chair of the House of Commons Environmental Audit Committee, expressed concern about the omission of data centres' emissions from recently published proposals by the Climate Change Committee for a Seventh Carbon Budget.

Seven patients' deaths investigated

Prosecutors are investigating the deaths of seven patients at Queen Elizabeth University Hospital (QEUH), Glasgow, that have been linked to contamination of the water supply and ventilation system.

The Crown Office and Procurator Fiscal Service has said it is investigating the deaths of three other patients – Molly Cuddihy, Andrew Slorance and Anthony Dynes – for potential links.

NHS Greater Glasgow and Clyde (NHSGGC) is under investigation over alleged health and safety offences and corporate homicide in relation to the deaths of four patients, Gail Armstrong, Milly Main and two other children.

Last month, NHSGGC admitted issues with QEUH's water system probably led to fatal infections of child cancer patients.

NG Bailey to phase in new apprenticeships

NG Bailey is creating more than 70 jobs through its apprenticeship programme. Launched to coincide with National Apprenticeship Week (9–15 February), the positions will be released in phases over the coming weeks through a dedicated section of the firm's website. Among the roles available are project engineer, electrician, industrial heating and plumbing, quantity surveyor, high-voltage maintenance fitter, environmental adviser, estimator and network cable installer.

More support needed on embodied carbon

The UK construction industry knows how to cut embodied carbon, but progress has stalled because of policy gaps, inconsistent standards and economic misalignment, says a new cross-industry report.

The *Embodied Carbon Summit Evidence Report* summarises findings from the Embodied Carbon Summit, held last year.

Participants warned that voluntary action will not deliver change and called for government signals, including consistency in carbon methodologies, investment in data infrastructure and a phased approach to regulation.

No single heating solution for churches

A new study by Historic England says no single heating technology can be recommended for each type of historic building.

The research examined heating upgrades carried out in six churches within the Diocese of Gloucester. Two churches were upgraded with air source heat pumps, two with biomass and two with electric heating. The system for each church was influenced by several factors, including: site, location, size and form; how it is used and operated; and the condition of the existing system and utility infrastructure.

The study concluded that no one technology can be recommended for all historic buildings or even each building type.

Grid investment a catalyst for growth, says report

Investing to meet net zero target will bring four-fold return

The additional investment required in the Grid to meet the UK's 2050 net zero target would deliver a 4:1 return, according to a new report from Arup.

Modelling carried out by the consultancy compares the economic impact of the different levels of investment required to hit the 2050 target or continue with a more business-as-usual approach.

The second scenario, which Arup describes as 'underpowered', requires £194m of investment by 2040.

Achieving the higher-ambition 'supercharged' scenario will require an additional £34bn of investment in the Grid, but would enable the connection of more renewable generation and ensure it could meet the demand from electric vehicles and heat pumps.

Overcoming these constraints would add an extra £194bn to the gross value of the economy over the period to 2040, which represents a 4:1 return on investment, Arup calculates.

Its macroeconomic study, *Gridunlocked – unlocking the benefits of investing in the electricity Grid*, conducted with Cambridge Econometrics, says investing in line with the 'supercharged' scenario would ensure the UK's electricity network keeps pace with rising demand and shield businesses and consumers from global gas price volatility.

The study expects there will be an extra £20bn in gross value added for the construction sector, driven by Grid upgrades, new connections and enabling infrastructure.

Apprenticeships decline threatens transition, says ECA

Electrical apprenticeships are down 5.5%, according to new analysis by the Electrical Contractors' Association.

Despite surging demand for such skills, the ECA's 2026 Electrical Skills Index, published on 9 February, reveals that the drop in apprenticeship starts is bucking an overall rise in those beginning training in other areas.

It also shows that interest in electrical careers is continuing to grow, with more than 26,000 learners enrolling on government-funded, classroom-based electrical courses in 2024/25 – up 'significantly' from previous years. However, this is not converting into qualified electricians, with fewer than one in five people on those courses progressing into an electrical apprenticeship or skilled employment within 12 months.

The regions most affected by electrical skills shortages are Greater London, the North West and the West Midlands. The East Midlands, South West, South East and Greater London had an average 8% fall in electrical apprenticeship starts last year, compared with 2022/23. This is despite an average 16% increase in government-funded course enrolments in these regions over the same period.

Luke Cook, ECA skills deputy chair, said: 'The electrical skills gap is a growing threat to the delivery of electrification. Demand for electricians is surging, but the number of people entering the industry through apprenticeships is going backwards.'

Houses of Parliament repair could cost £40bn

Keeping MPs on site will increase costs by at least £24.4bn

Refurbishing the Palace of Westminster could cost nearly £40bn if MPs stay on site during the works, the committee overseeing the project has estimated.

In an update report, submitted to parliament last month, the Restoration and Renewal Client Board outlined the costs and timelines of the two main options for refurbishing both Houses.

Refurbishing after fully decanting MPs and peers from the Palace for up to 24 years from 2032 could cost £15.6bn, according to the report.

The other option is an enhanced maintenance and improvement plan, under which the House of Lords would move into the Queen Elizabeth II (QEII) Conference Centre for up to 13 years. MPs would then use the Lords chamber while work takes place on the House of Commons for up to two years. The board estimates this option would take up to 61 years to deliver and pose a higher fire risk than a full decant.

A decision on which option to pursue should be taken by mid-2030, the report states. It recommends an initial package of 'phase one works' of up to £3bn over seven years. This would include preparation of temporary accommodation by refurbishing the former Department of Health headquarters at Richmond House and the QEII Conference Centre.

Other phase one elements could include enabling works, such as decanting heritage items and installing temporary services and utilities.

Construction downturn eases

The latest S&P Global/CIPS UK Construction Purchasing Managers' Index shows that the downturn in construction output eased considerably at the start of 2026.

It indicates a reading of 46.4 in January, which is below the 50 benchmark that indicates no change in the market, and marks the 13th month in a row of contraction.

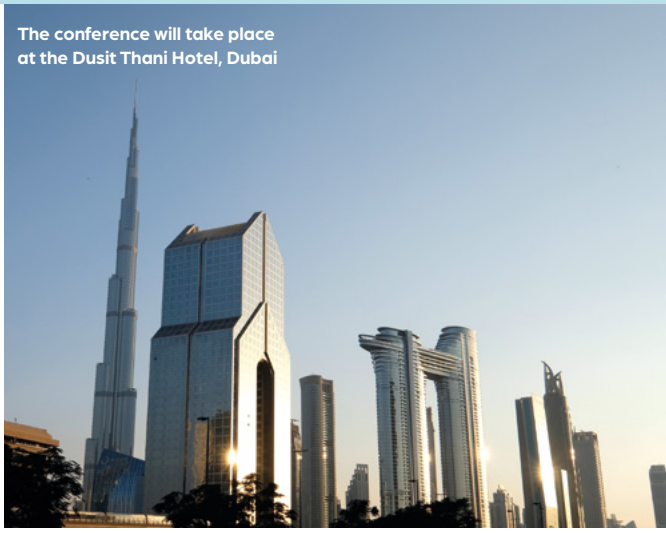
However, the reading was a big improvement from December's five-and-a-half-year low of 40.1 and is the highest since June 2025.

Business activity expectations for the year ahead continued to rebound from the 35-month low seen last November, with around 38% of the survey panel predicting a rise in output volumes during the next 12 months.

cibse News

MENA region launches new retrofit conference

Dubai's Dusit Thani Hotel will host net zero event on 6 May


The conference will take place at the Dusit Thani Hotel, Dubai

A new conference focusing on retrofit, with the theme *Transforming existing buildings for a net zero MENA*, has been launched by CIBSE MENA.

Taking place on 6 May, at Dusit Thani Hotel Dubai, the conference will introduce the importance of retrofit in the MENA region and highlight the role of engineering leadership in addressing carbon, cost and performance challenges. It will provide the industry outlook and the private sector's role in advancing retrofit transformation.

Sessions will examine the macro drivers behind regional retrofit – energy pricing, governmental policy direction, climate risk and national net zero strategies.

There will also be discussions on climate drivers, and the necessity for envelope improvements, airtightness and operational carbon-reduction strategies.

A panel session will explore energy audits, electrification, heat pumps and demand-reduction strategies, with real-world applicability for the MENA region.

HVAC and plant retrofit will be the subject of another session, looking at chilled water system upgrades, refrigerant transitions and plantroom retrofit challenges that highlight practical MEP considerations.

Other sessions will cover: certification frameworks; regional projects; public sector infrastructure retrofit projects; embodied carbon assessments, such as TM65; and commissioning and recommissioning for retrofits, highlighting performance verification, Guide M alignment and mission-critical facility considerations.

A full programme and speakers will be available soon. For more information and to book, visit: **bit.ly/4amwcGT**

Training

For full details and booking:
www.cibse.org/training


Casablanca, Morocco

International building services projects
30 April, 26 October

The course aims to equip building services engineers to succeed in the international construction market through the use of project execution plans. With case studies from two fictional countries, it presents a realistic learning environment to address specific international construction challenges. The course includes compliance with global standards, with attendees learning to harmonise international standards, such as ISO and ASTM, with local regulations. It also covers cultural and environmental contexts, innovation through technology, project management and professional pathways, encouraging engineers to align international opportunities with their career ambitions, leveraging new skills for professional advancement.
www.cibse.org/training

Understanding the law for engineers
11 March
7 July

Low carbon consultant building design
16–17 March
9–10 June

Implementing BS 8519:2020 for life-safety, fire-fighting and critical applications
18 March

Advanced simulation modelling for Design for Performance
19–20 March

Introduction to the principal designer and principal contractor roles
23 March
22 May

Overview of IET wiring regulations
23 March
23 June

Power system harmonics
26 March

Principles of hydraulics and control of modern heat networks
30 March

Design of ductwork systems
31 March

Leadership identity and self-awareness
7 April

BS9251 Automatic water suppression systems overview
14 April

Fire safety management
15 April

Fire safety construction
16 April

Mastering the application of heat pumps
21 April

Electrical services explained
20–22 April

Earthing and bonding systems
23 April

Design of heating and chilled water pipe systems
28 April

International building services projects
30 April

Introduction to heat networks
7 May

Standby diesel generator
8 May

Building services explained
11–13 May

Commissioning Code M: commissioning management
18 May

Coaching and mentoring skills for apprenticeship supervisors
14 May

Mechanical services overview
21 May

The importance of energy-efficient buildings
26 May

High voltage (11kV) distribution and protection
2 June

Mechanical services explained
3–5 June

Low and zero carbon energy technologies
11 June

Energy strategy reports
17 June

Building Safety Working Group leads CIBSE response to regulatory reform

Group will discuss plans for single construction regulator

The first meeting of the refreshed CIBSE Building Safety Working Group took place last month, bringing together cross-disciplinary expertise from across building services and building safety engineering.

The group will play a central role in advising CIBSE on regulatory reform, consultation responses, and the development of training, guidance and professional competence.

Chaired by former CIBSE President George Adams, the meeting welcomed Graham Watts, chief executive of the Construction Industry Council, as a guest speaker. He discussed the government's prospectus on the proposed single construction regulator (SCR), highlighting its significance for the construction and built environment sectors. The prospectus marks a major moment for the industry, with implications for the whole of the UK.

Watts outlined some of the key decisions the Ministry of Housing, Communities and Local Government will need to take in the coming months, including whether the new regulator will operate as a single entity or as a 'system', providing coordinated oversight across buildings, construction products and professions.

The Building Safety Working Group will support CIBSE's response to the SCR consultation. It will help shape engagement with government and regulators, and advise on how CIBSE can continue to lead on competence, professionalism and best practice across building safety and the wider built environment.

To contribute to CIBSE's response – by 6 March – and for further information on the SCR consultation, visit: **bit.ly/CJSCRProp**

In March

Carbon reduction at The National Archives

18 March

A Facilities Management Group event will feature a panel involved in the carbon-reduction programme at The National Archives. They will explain how they have achieved reductions so far and how they will meet the ambitious targets for reduction of carbon emissions, energy, water and waste that are part of government carbon-reduction initiatives. The event will be followed with refreshments courtesy of Equans.
www.cibse.org/events

CIBSE Technical Symposium: Fit for 2050

26-27 March, Loughborough

The 2026 Symposium will bring together industry experts, thought leaders, policy-makers and academia to explore the future of building services design, with a focus on wellbeing, inclusivity and sustainable performance. Home to one of the UK's largest integrated schools for the built environment, Loughborough University brings together expertise in architecture, building, and civil engineering to address global challenges.
www.cibse.org/symposium

SoPHE Technical Conference: Engineering beyond compliance

26 March, London

Sessions include: Circular economy, water circularity and public health – applying circular economy principles while protecting hygiene, safety and performance; Public health engineering and water safety planning – how formal water safety planning embeds hygiene, safety and risk control into building design; Engineering under examination – challenging long-held assumptions; Mind the gap – exploring gaps between design, installation, commissioning and operation.
bit.ly/SoPHEconference

New categories announced for façade awards

Small-scale projects, digital technology and the use of specific materials will be recognised at the Society of Façade Engineering Façade Design and Engineering Awards 2026.

The new Little Gems category will celebrate small-scale projects that have made a significant contribution to the façade industry, while another new award will recognise the growing importance of digital technology in the sector.

Dedicated categories will also reward best use of masonry, glass and timber, and the Project of the Year awards include new categories: refurbishment heritage, residential, commercial, institutions and infrastructure, as well as arenas and stadiums.

Individuals will be recognised within the Dissertation of the Year, Young Façade Engineer and Lifetime Achievement awards.

Entries open on 2 March and close on 15 April.

● **More at** bit.ly/SJSFEAw26

Fluid Dynamics achieves Embodied Carbon Verification

Fluid Dynamics has achieved Embodied Carbon Verification (ECV) through CIBSE Certification, demonstrating its commitment to transparency and robust embodied carbon reporting.

The verification confirms that its MEP products' data has been independently assessed in line with CIBSE TM65 methodology.

Fluid Dynamics now joins a growing number of manufacturers whose embodied carbon data has been independently verified through CIBSE Certification and whose MEP products are now listed on the ECV register.

This expanding ECV register helps consultants quickly identify products backed by trusted, CIBSE TM65-verified data.

● **Email** cclecv@cibse.org

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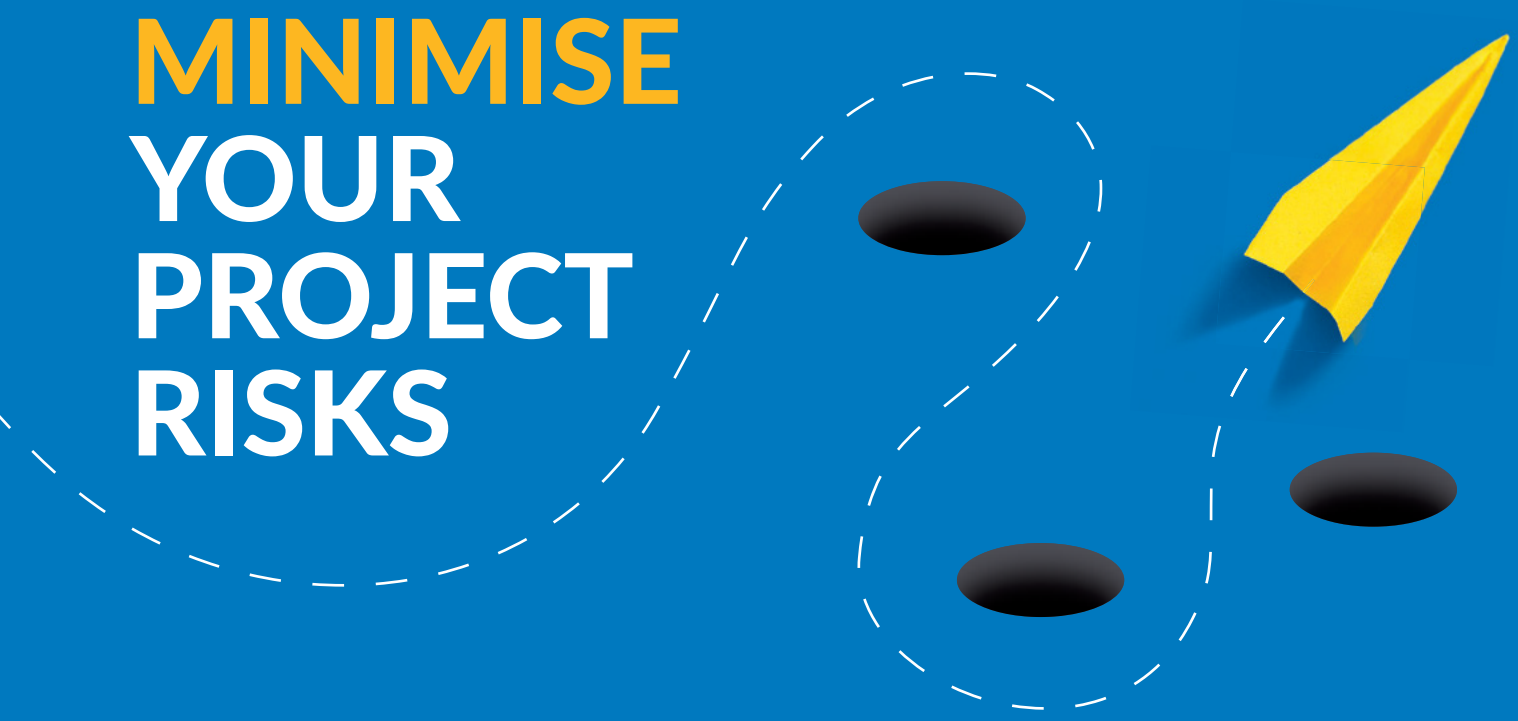

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Balancing the scales

More action is required to close the persistent gender pay gap in the building services industry, says WiBSE

International Women's Day 2026 calls for 'Rights. Justice. Action. For ALL women and girls'. For the UK building services sector, this theme resonates strongly with our own WiBSE focus for the year, 'Balancing the scales'. Nowhere is the imbalance between progress and parity more evident than in the gender pay gap.

To understand where the industry stands, we have reviewed published gender pay gap data from UK building services consultancies listed in the top 20 of *Building*'s Top 150 Consultants 2025 (ones that are large enough to be mandated to report under UK regulations). By examining the average mean and median gender pay gaps between 2020 and 2024, a picture emerges of steady, but incomplete, progress.

The data shows that, over this period, the mean gender pay gap has reduced by 2.91 percentage points, while the median gap has reduced by 1.43 percentage points. This trend matters. It reflects sustained efforts across the sector: improved recruitment practices, greater awareness of flexible working, leadership accountability, and targeted initiatives to attract and retain women. It is evidence of action.

Context is critical, however. Despite these improvements, the average gender pay gap within large building services firms remains 6.35% higher than that of the overall UK workforce. Progress, yes – but justice remains elusive. In 2024, our industry was still dealing with a gender pay gap of around 20%. For salaries less than £53,000, this is equivalent to more than you pay in income tax!

This gap is shaped by structural imbalance. Women remain underrepresented in senior technical and leadership roles, while being overrepresented in lower-paid grades and support functions. This is the scale that still tips away from fairness, and it directly affects women's lifetime earnings, pensions and economic security.

Balancing the scales requires more than incremental change; it requires intentional action: accelerating progression into senior roles; redefining what leadership looks like in a technical profession; designing career paths that do not penalise caring responsibilities; and ensuring transparency in progression and reward.

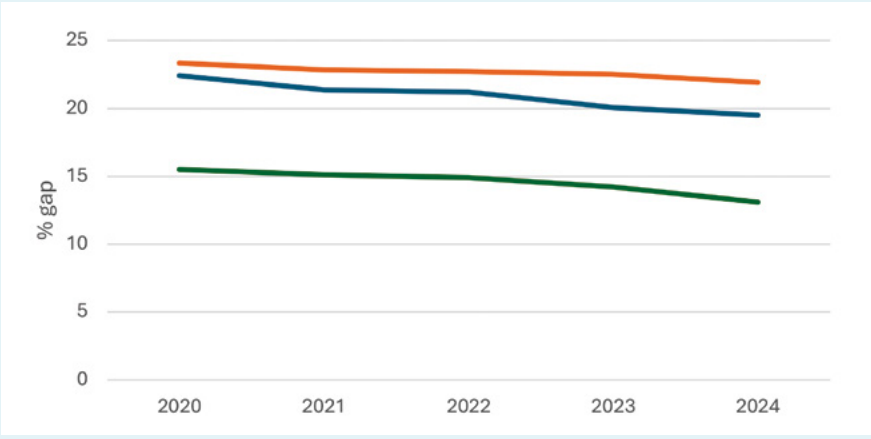
It also requires collective responsibility from employers, professional institutions and the individuals who shape organisational cultures. Most companies only report their gender pay gap when required to by law, but we should be pushing smaller companies to publish their data, too.

On this International Women's Day (8 March), the building services sector can point to evidence of progress, but also to the work still ahead.

If rights are the foundation and justice the goal, then closing the gender pay gap is one of the clearest measures of whether our actions are truly balancing the scales.

If you're not sure where to start, begin with small steps – listen to the women you work with, advocate for them, attend events where experiences are shared, and get involved with WiBSE and other groups' activities.

What have you seen in your workplaces that is helping to balance the scales? Contact WiBSE on LinkedIn and share your thoughts! **bit.ly/CJWibse**



Gender pay gap data from building services consultants in top 20 of *Building*'s Top 150 Consultants

Viva Las Vegas

CIBSE's Graduate of the Year, **Hannah Gray**, describes an inspiring trip to the ASHRAE Winter Conference

As the CIBSE ASHRAE Graduate of the Year, I had the privilege of attending the 2026 ASHRAE Winter Conference . Hosted this year in Las Vegas, I travelled to Nevada at the end of January and enjoyed a welcome contrast to the cold winter conditions back in the UK. The conference proved to be an excellent opportunity for technical exposure and for connecting with engineers from across the world.

The technical programme was extensive, with seminars, workshops and paper sessions running throughout the week. I focused my schedule on mechanical services and decarbonisation topics. Hearing from leading researchers and specialists offered valuable insight into emerging technologies and innovative design .

Highlights included sessions on heat exchanger optimisation and new humidification technologies, and a thought-provoking discussion on the social science behind low carbon technology adoption. This research challenged me to understand barriers engineers may not always recognise when driving technological change at scale.

At the conference, I presented during a seminar session, delivering an extended version of my Young Engineers Awards presentation. I shared my work on carbon reduction in MEP services, as well as my wider perspective on the topic. To have this opportunity at this stage of my career was undoubtedly exciting, and the professional development gained through this experience was invaluable.

Networking with engineers from across consultancy, academia, manufacturing and research was another highlight. It gave me insight into how similar engineering challenges are approached in different regions.

These conversations reinforced the global nature of our profession and the importance of collaboration in achieving shared goals.

I met young engineers within ASHRAE and spoke with students attending the conference, which left me feeling inspired by the enthusiasm and talent that is entering the industry.

Overall, the ASHRAE Conference was an extremely positive experience, combining strong technical exposure with valuable professional and personal development. Representing CIBSE as Graduate of the Year was a privilege, and I would strongly recommend any passionate young engineer, or mentor of one, to look into the award for 2026.

Policies must tackle non-domestic heat

While the Warm Homes Plan is positive, government must waste no time in addressing the decarbonisation of heat in commercial properties, says Mitsubishi Electric's **Graham Temple**

We recently passed a key milestone in the UK's net zero path, when the government published its Warm Homes Plan. This prioritises the decarbonisation of domestic heating through more efficient homes, while supporting clean heat manufacturing and its supply chain.

The plan is a clear commitment to building market demand and the domestic capability needed to meet it. It sends a message for which the industry has been waiting – the government backs the sector to lead the UK's energy transition and will support it do so.

While it is right that the Warm Homes Plan addresses domestic properties, the opportunity to extend similar support to commercial buildings remains unfulfilled. With around two million non-domestic buildings, this sector holds significant potential for emissions reduction and energy efficiency.

Extending retrofit incentives and clear policy frameworks to the commercial sector would create a pipeline of demand benefits for UK manufacturers, installers and service providers. However, a strong and resilient industry also depends on a stable and affordable energy system.

Electricity prices remain linked to the cost of gas, despite a growing share of generation coming from renewables. This artificially inflates electricity costs and undermines the competitiveness of clean electric technologies, including heat pumps.

The government's continued commitment to consult on energy pricing is welcome, because we need swift progression towards implementation of a more balanced approach. This will not only provide cheaper electricity for heat pumps, but also bring cheaper electricity for manufacturing.

We already have proven, sustainable heat pumps available for commercial and residential situations, and we need policies and incentives that are aligned with the net zero buildings of tomorrow.

The pending Future Homes and Buildings Standards will be essential to maintain market confidence and provide the certainty needed to plan, invest and scale. With consultation responses due imminently, and regulations expected early this year, momentum must now be sustained.

Graham Temple is marketing manager at Mitsubishi Electric

Flexible and rapid deployment of modular liquid and airside cooling

Data centre developers are facing a seemingly impossible predicament: demand is outweighing supply.

Typically, the technical assumptions underpinning a data centre hall are locked in years before the first rack even arrives. Despite this, demand pressure is pushing developers towards phased expansion and early commitments, while the tenant mix is still fluid.

The differences between a conventional air-cooled deployment and a liquid-cooled AI build changes everything. For developers, the challenge arises from ensuring a site can absorb changing demand without forcing expensive redesigns as the market evolves.

However, there is a solution: packaged, perimeter-deployed systems. They deliver speed, able to be installed quickly while being highly adaptable, with adjustable configurations as demand becomes clearer.

This is the approach behind the Excool Switch, a packaged hybrid cooling unit to support airside and liquid cooling within a single unit.

The Switch is designed to serve a data hall's need for conventional air-cooled deployments, liquid-cooled AI loads (including those with a supply temperature of 45°C and above), or a blend of both, with the presumption that the balance may change over time.

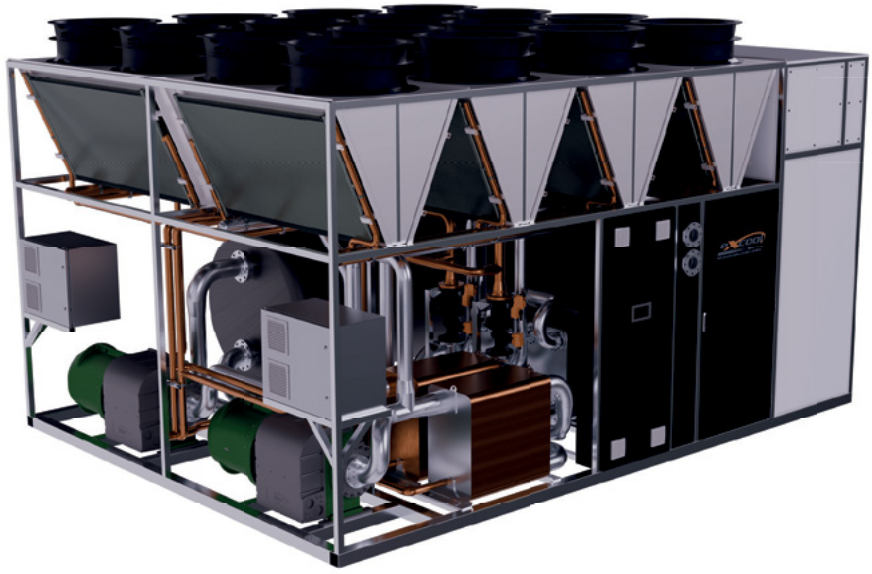
It combines liquid and airside cooling within a packaged module of up to 1.2MW, making 2.4MW achievable in as little as 10m of external wall space, with variable load allocation between the two. The unit also integrates indirect glycol-free cooling, supporting high-efficiency operation when ambient conditions allow.

Engineered to facilitate rapid deployment, the Switch units are heat-load tested before delivery to reduce onsite commissioning time, and are specifically designed to streamline the installation process. This is supported by Excool's market-leading delivery times of just 16-18 weeks. This enables late-stage deployment within the build programme, as developers can defer a significant portion of cooling capex until tenant requirements are confirmed and fit-out is imminent, improving cash flow on phased builds while still being ready, regardless of whether the tenant requires liquid or air-cooled facilities.

The Switch removes the need for primary chilled-water pipework while minimising supporting equipment requirements, giving it the lowest connected load of any comparable system. It also avoids the need to allocate internal data hall space for air cooling units or CDUs, supported by an in-built buffer tank for additional redundancy in instances of a power failure or large transient load steps.

In an operating data centre, the service running on a server is often less important to facilities teams than the behaviour it creates in power and heat. A new hall is a blank canvas for a reason: it has infinite potential to accommodate anything, but cooling choices are difficult to reverse once concrete and pipework are in place.

Like the Switch, adaptable cooling empowers developers and operators to reduce commitment risk while staying responsive to market demand. In a sector where the next tenant requirement may directly oppose the last, the ability to switch from liquid to airside cooling without rebuilding is integral to what makes a data centre commercially resilient.



● For more information on the Switch unit, get in touch at info@excool.com or www.excool.com/solution/switch or www.linkedin.com/company/excool-ltd

Spring statements

Now is the time to respond to four key consultations that will determine heat and energy efficiency rules for years to come. **Julie Godefroy** summarises CIBSE's input

A number of important consultations have been published recently, to which CIBSE will respond.

The proposed revised National Planning Policy Framework aims to speed up housing and infrastructure delivery, with a stronger presumption in favour of development and more consistency across local authorities – including a proposal to limit their ability to set energy efficiency requirements above Building Regulations. This could also limit local authorities' ability in other areas, such as embodied carbon.

CIBSE strongly disagrees with the proposal. Local authorities have been setting ambitious standards without impeding development, as evidenced in the LETI response[1], to which CIBSE has contributed. Local authorities should retain the ability to set ambitious standards to support energy efficiency and carbon reductions. This can be subject to viability tests on local plans and individual applications (as currently). The government could set a framework for higher standards, as it has for water efficiency through Part G.

The consultation also seeks to respond to the huge expected growth in data centres[2], with proposals on energy-intensive development and co-located renewable energy projects.

The consultation on the Home Energy Model (HEM) and associated Energy Performance Certificate (EPC) reforms focuses on existing dwellings. HEM will replace SAP as a more sophisticated modelling methodology and the consultation proposes a modular approach to HEM inputs, depending on available data.

"Local authorities should retain the ability to set ambitious standards"

The consultation focuses on replacing the current main EPC 'energy efficiency' rating and secondary carbon-based rating with four new metrics: fabric performance, heating system, smart readiness and energy costs. This could have a significant impact on stock assessments and retrofit investment priorities.

As expressed over the years[3], CIBSE supports the introduction of separate metrics, rather than seeking a single metric covering multiple issues. It also supports having a dedicated metric on fabric performance, but recommends one that can be compared with actual measured performance.

A smart-readiness metric is the most innovative proposal. There is no well-established approach to assessing and rating 'smart readiness', which can encompass a number of technologies and outcomes. Options were explored in initiatives such as the UK Net Zero Carbon Buildings Standard, but with insufficient consensus and supporting data, the approach has been to start data collection on several parameters to inform future metrics and objectives.

The proposed Heat Network Technical Assurance Scheme (HNTAS) will support statutory regulation of heat networks by setting technical specifications covering system design, construction, commissioning and operation, alongside governance arrangements for compliance monitoring and certification. It defines requirements for energy centres, hydraulic design, metering, controls and customer-interface systems.

While the proposed standard sets performance requirements in some areas, it does not set overall energy efficiency or carbon performance requirements. Instead, it focuses on the engineering parameters supporting performance and allowing its verification. Requirements for overall performance outcomes are expected to be delivered through other means.

CIBSE has expressed concerns about how heat zoning would deliver low carbon heat networks[4] and welcomes views on the HNTAS proposals. ●

● **Dr Julie Godefroy is CIBSE's head of net zero**

How to contribute

All consultations to which we plan to respond are listed on our website. Please send your contributions to **technical@cibse.org**

Consultation	Deadline for contributions to CIBSE	Deadline for response
The Single Construction Regulator Prospectus	6 March	20 March
National Planning Policy Framework	Passed	10 March
Home Energy Model: Energy Performance Certificates	Passed	18 March
Heat Network Technical Assurance Scheme	25 March	15 April

References:

[1] LETI Consultations **bit.ly/CJLETICo**

[2] Future energy scenarios: Pathways to net zero, Neso, November 2025 **bit.ly/CJFES25**

[3] Reforms to the energy performance of buildings regime, CIBSE Response, 2025 **bit.ly/CJEBPCo25**

[4] Heat network zoning consultation, CIBSE response 2024 **bit.ly/CJHNZCons**

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The FGG Flowgrid has been designed to measure air volume in ventilation ducts. The Flowgrid consists of a standard duct section with a length of 200 and 300 mm and is available with a 20-30 or 40mm duct connection flange to suit standard duct work

The CMR sensing probes are fitted across the internal duct frame area in predefined spacing. Each probe has a number of pressure inlet points to measure the impact and static pressure at the same time and provide an average velocity measurement.

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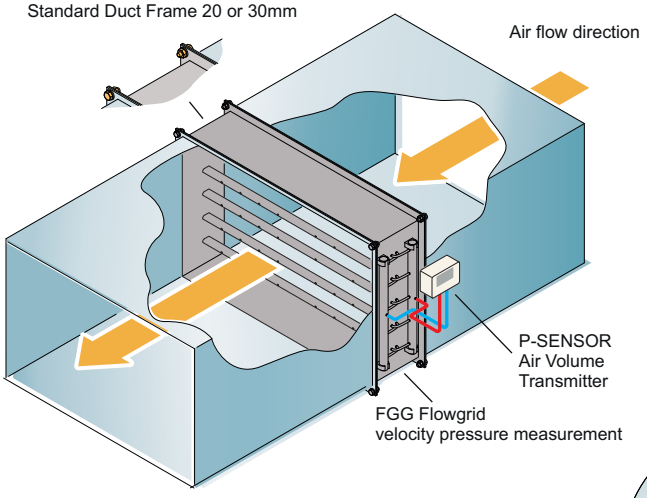
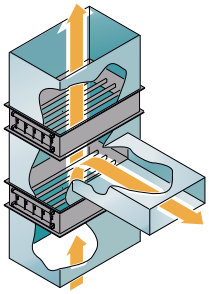
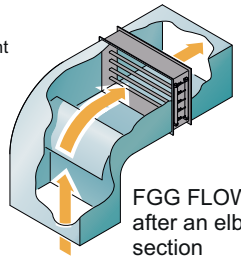
FGG FLOWGRID and P-SENSOR providing accurate average air volume measurement in ducts.



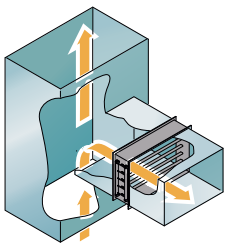
P-SENSOR
With LCD display
and keyboard



FGG FLOWGRID
before and after a
T- duct section



FGG FLOWGRID
after an elbow duct
section



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Is HNTAS the new BSR?

The Heat Network Technical Assurance Scheme aims to improve heat network performance, but Whitecode Consulting's **Jason Tramontano** argues that it could lead to Gateway 2-style bottlenecks and project delays

Serving as the principal reference point for the Heat Network Technical Assurance Scheme (HNTAS), the heat network technical standard (TS1) will mandate technical requirements for existing and new heat networks.

While it will be hugely positive for the industry, there are concerns the approval process could create large project delays – similar to those seen with the Building Safety Regulator's (BSR's) gateway process.

HNTAS was introduced to establish consistent, mandatory technical standards for the UK's heat networks, with the aim of improving energy performance and enhancing consumer protection. By ensuring consistent heat quality and performance, the standards will address issues with underperforming or unreliable networks, while improving system efficiency.

The HNTAS aligns with the CIBSE Code of Practice (CP1), which provides integrated checklists that ensure a more stringent and structured compliance toolkit. While CP1 requirements were sometimes open to interpretation, HNTAS auditing ensures all requirements are assessable, with operators providing proof – such as design data, commissioning records and performance logs – to check against TS1's measurable criteria.

Key performance indicators and monitoring requirements will be upfront, enabling integration of performance validation early in design. Clearly defined 'key failures' will help set pass or fail thresholds, simplifying compliance management. The mandating of regular reporting will promote transparency, helping compliance and refining burdens to avoid excessive implementation costs. Having Ofgem as the statutory regulator for heat networks will also prevent consumers from paying over the odds for their heating.

The HNTAS will have a positive impact on design, but the multiple

"Projects may not be able to proceed until all... non-conformities are resolved"

phases, extensive monitoring and additional certification steps may extend project timelines and inflate early-stage costs.

Technical specifications and assessment procedures also remain in draft and may be revised before finalisation. Similarly, a reliance on pilot programmes means some practical adjustments are pending.

Designers must navigate operator coordination, audits, ongoing compliance, data-collection processes and certification procedures, and there must be careful consideration of the resourcing and infrastructure needed to manage these requirements without incurring additional expense.

HNTAS Stage 1 concept design aligns with RIBA Stage 2 – but while RIBA Stage 2 is iterative and creative, HNTAS restricts design freedom through early performance obligations.

HNTAS describes Stage 1 as concept design, but it could be argued that the information required is more commonly provided during developed design stage. With this Stage 1 being seen as an HNTAS assessment point, projects may not be able to proceed until all information is issued, feedback received and non-conformities resolved.

If designers rely on old CP1-compliant but non-regulatory approaches, they may unintentionally produce a concept design that cannot gain HNTAS approval.

While these stringent standards will encourage consultancies to design heat networks to the same standards, this regulatory assessment could push all Stage Two applications back.

Developers must also be aware that most design work takes place early and nothing can change once design is approved. Consequently, they may consider alternatives, such as exhaust air heat pumps in individual units.

For new-build networks, eight phases of assessment will take place at four key stages of development – feasibility, design, construction and operation. While Ofgem will be the official regulator, a code manager will register independent professionals to carry out the assessments. This could be lengthy, however. Three validators could be checking one heat network, with the third signing off the two validation reports from the previous assessors.

Are there enough assessors ready to start work on the number of heat networks that need to be assessed? As highlighted with the BSR, a lack of knowledge or shortage of people can cause significant backlogs.

Sharpening the focus on heat network quality standards is crucial, but the built environment must work together to ensure the HNTAS approval process remains streamlined. This is where advice and guidance from heat network consultants will be critical. ●

● **Jason Tramontano is technical director at Whitecode Consulting**

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Designing with light

A new guide sets out to help practitioners navigate the evolving demands of architectural lighting design. **Jeff Shaw** FSLL, author of the guide, outlines its key aspects, which balance creativity, compliance and responsibility

The Society of Light and Lighting (SLL) launched its latest lighting guide in February – *LG23: Design, creativity and compliance*.

Lighting is both an art and a science, practised across many disciplines, from contractors and manufacturers to engineers, interior designers and specialist lighting designers. While there is extensive guidance on specific lighting applications, the industry lacked a guide that could support practitioners to make clearer, more confident lighting design decisions. This guide aims to fill that gap.

It arrives at a pivotal moment. The lighting industry has undergone significant change in recent years, and there has been growing recognition of lighting design as a profession and as a critical component of the built environment. Over the past two decades, the rise of LED has transformed what is possible, opening a far broader range of design opportunities than ever before.

The drive for sustainability has also intensified. Designers are expected to minimise energy use and embodied carbon, reduce waste, and promote reuse and recycling, all while considering whole life carbon impacts.

'Design' can mean different things at different times and in different contexts. In the case of lighting, it could be about improving the quality of a space, changing its use, or using light to make a new space comfortable, inviting and sustainable, while still supporting its function.

LG23 does not focus on a single application, but addresses the architectural lighting design process as a whole, offering guidance on creative approaches and delivery methods.

Good lighting design draws on a broad mix of skills, experience and judgement, and there is rarely a single solution to a design problem. The designer's role is to work with the project team to develop a response that meets functional requirements while aligning with stakeholder aspirations.

Good lighting design goes beyond minimising the carbon footprint. An extremely low-energy scheme that is technically compliant may, if not considered holistically, be deemed inadequate or uncomfortable by users. A truly sustainable lighting scheme is 'energy effective' – delivering a useful, comfortable space that people will use. This may require a little more energy use, but gives a scheme longevity.

LG23 supports practitioners to balance these sometimes competing demands: meeting functional and energy targets while considering comfort, safety, health, wellbeing, sense of place and orientation. It also addresses wider social impacts, local ecology and dark skies.

The guide promotes a responsible approach that seeks to maximise overall effectiveness. It outlines models for the design process and is structured around these, covering the principles of lighting design, including:

- The human relationship with light, and the intrinsic relationship between light and architecture
- The fundamentals of lighting design, such as visual perception, lighting the task, emphasis, mood, atmosphere, style, suitability, spatial expression and decoration
- The importance of considering all the requirements of the people using the space being designed
- Consideration of the place – a project's context, materiality and architecture
- Lighting regulations, standards and guidance, how to interpret them, and when it may be right to challenge standards and guidance
- Key lighting design considerations, including: daylight, sustainability, circular economy, safety and security, wellbeing, dark skies, ecology, CDM, maintenance, and lighting control
- Key objectives a lighting designer has and the choices they must make in their approach to a scheme
- The lighting design process, from gathering information through to developing the detailed design
- Fundamentals of project delivery, such as outlining the various roles in the project design team, project design stages (RIBA Plan of Work), BIM, lighting-analysis software and communication of the design.

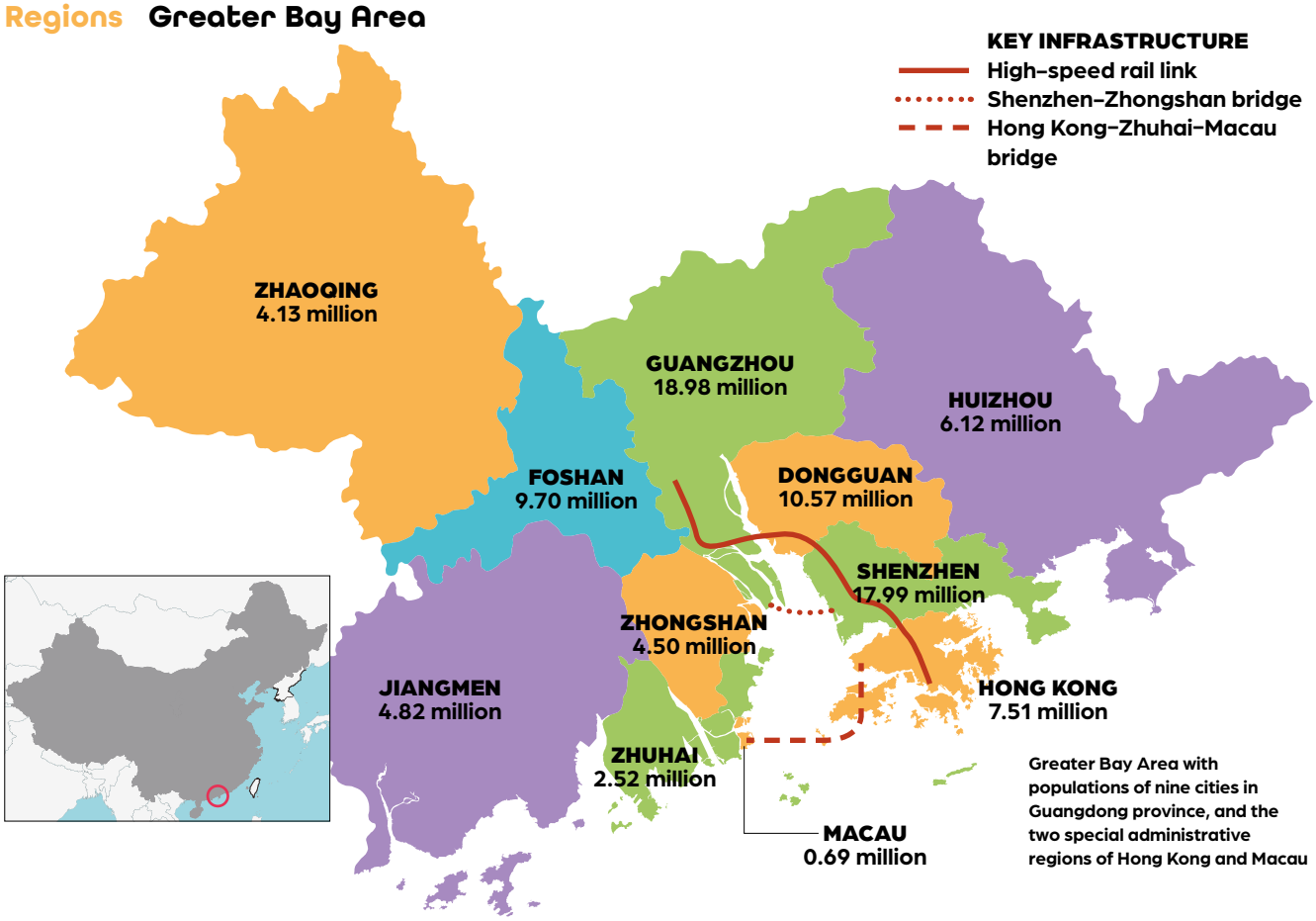
Lighting by Hoare Lea at the Beecroft building, University of Oxford

The guide reflects an industry in transition: LED technology has reshaped the palette available to designers; sustainability expectations are higher than ever; there is greater awareness of inclusion and wellbeing; and legislation and digital tools continue to evolve.

LG23 acknowledges this and offers a framework for navigating it. By bringing together creativity, compliance and responsibility, it positions lighting design as a considered, collaborative discipline central to the quality of the built environment. ●

LG23 is available at: bit.ly/CIBSEknowledge

Jeff Shaw FSLL is a lighting designer at Arup, and chair and author of LG23



Greater Bay Area with populations of nine cities in Guangdong province, and the two special administrative regions of Hong Kong and Macau

Gateway to growth

As China's Greater Bay Area evolves into an integrated metropolis of 87 million people, CIBSE is strengthening its regional Hong Kong ties to ensure chartered engineers are at the forefront of this economic expansion

With 3,466 members, the CIBSE Hong Kong Region is the Institution's largest region, making up 15% of the global membership – and it's set to get larger.

That's because it sits within the rapidly growing Greater Bay Area (GBA), a metropolis of 87 million people around the Pearl River Delta that covers the special administrative regions of Hong Kong, Macau and nine cities in mainland China's Guangdong province, including Guangzhou and Shenzhen, which have populations of around 19 and 18 million, respectively. The region's economy is similar in size to Germany's, but with a growth rate of 5% – and an expected population of 100 million by 2030 – it is predicted to outstrip it soon.

While CIBSE's Hong Kong Region traditionally centres on Hong Kong, increasing connectivity with the GBA means there are now many opportunities across the 'border'. High-speed rail links from Guangzhou to Hong Kong and the recent completion of the Shenzhong Link (connecting Shenzhen and Zhongshan) have reduced travel times between major cities to less than one hour (see map).

For CIBSE members and other professionals, the improved connectivity turns the GBA into a single 'local' market effectively, allowing an engineer to potentially live in Hong Kong or Macau while managing projects in Shenzhen or Zhongshan.

Last November, CIBSE President Elect Dave Cooper and CEO Ruth Carter embarked on a tour of Hong Kong and mainland China to build relationships with institutions and government in the GBA. The Institution is keen for the chartered status of CIBSE engineers in Hong Kong to be recognised across the GBA.

During their visit, Cooper and Carter met senior representatives from the Guangdong Provincial Association for Science and Technology, which represents engineers across the province's 70 million residents. The discussions focused on mutual recognition of members and reciprocal agreements to share best practice. CIBSE's representatives also signed a memorandum of understanding with the Macau Institution of Engineers.

CIBSE currently provides the 'chartered' foundation that mainland authorities increasingly recognise through an agreement with the Hong Kong Institution of Engineers (HKIE), which it renewed in November 2024.

Under the agreement, CIBSE chartered engineers can apply for corporate membership in the HKIE Building Services Discipline without a full reassessment. Once an engineer holds MHKIE status via the CIBSE route, they become eligible for GBA pilot programmes. This has allowed more than 200 engineers to obtain mainland

titles, such as senior engineer, from 2024 to 2025.

China's 15th Five-Year Plan (2026–30) emphasises regional coordination as vital for achieving high-quality development and modernisation of the GBA by 2035. The area is a powerhouse for IT, manufacturing and healthcare, and Shenzhen, located just across the border from Hong Kong, is known as China's Silicon Valley. It hosts some of the world's most prominent technology companies, including car maker BYD, telecommunications giant Huawei and drone manufacturer DJI. The world's largest air conditioning company, Gree, is in Guangdong province and the CIBSE delegation visited its factory in Zhuhai.

The 15th Five-Year Plan represents a key stage in China's journey towards its goal of carbon neutrality by 2060. The GBA is seen as a pioneer of low carbon technologies and will need CIBSE engineering expertise to transition from fossil fuels to clean energy in buildings and infrastructure. The plan sets a binding target to reduce the amount of CO_2 emitted per unit of gross domestic product significantly. Absolute limits on total carbon emissions are also being introduced at regional and industrial levels to ensure the national carbon peak is reached before 2030. In addition, the plan mandates a reduction in coal from 2025–30 and is targeting 25% of primary energy to come from non-fossil fuel sources by 2030.

The creation of 100 national-level zero carbon industrial parks by 2030 also features in the plan. In January, the first batch of pilots was announced, with a heavy concentration in Guangdong's high-tech hubs (Shenzhen, Guangzhou and Foshan).

The GBA is piloting environmental regulations and low carbon finance mechanisms as part of the State Council's Beautiful China initiative, which aims to integrate environmental protection with economic development.

There is further evidence in Hong Kong of the inexorable drive for decarbonisation in the GBA. The Buildings Energy Efficiency (Amendment) Ordinance 2025 is designed to strengthen energy performance in the built environment by shortening energy audit cycles and broadening the regulatory scope to bring in more sectors, such as data centres, healthcare facilities and public buildings. There is also a requirement to submit energy data through standardised disclosure forms. Some of this information will be made publicly available to increase transparency and performance benchmarking.

As the GBA continues to develop into a single, high-tech metropolis, the demand for CIBSE's rigorous standards in low carbon design and energy auditing will only intensify. The decarbonisation drive represents a generational opportunity for the building services sector to lead from the front. ●

Shaping the future

Inspired by nature and driven by sustainability, The Henderson has set a new global benchmark for smart office buildings. **Andy Pearson** looks at the pioneering MEP engineering and technology behind a distinctive new Hong Kong landmark

'No-one tells you how to lead the market. You have to somehow understand what people are thinking and design something that will exceed their expectations – that is what drives us to think differently,' says Kevin Ng, project-in-charge and senior deputy general manager at Henderson Land Development.

Ng was talking about The Henderson, the developer's latest office tower, which has recently opened in one of the most prestigious locations in Hong Kong. Designed by Zaha Hadid Architects, the tower takes inspiration from the Bauhinia flower, Hong Kong's official symbol. The 36-storey building stands out with its distinctive silvered, curved, glass façade, which gives it a sleek, futuristic look, almost like three clusters of silver petals stacked on top of each other.

Each cluster creates a visual pinch point in the structure: at the base, where it hovers above the city's walkways; midway up, around the hidden plantroom floors; and just above the sky garden and refuge area. The top of the tower features a glass-roofed banqueting and event space, which won Project of the Year – Innovation at the 2025 SFE Façade Awards.

To ensure The Henderson exceeded market expectations, Henderson Land Development worked with MEP engineers WSP and sustainability and IT consultants Arup. The result? A building packed with innovations, including the world's first AI-powered elevator control system (see panel, 'How AI optimises lift operation') and patented solar-responsive ventilators (SRVs). It also launched a new environmental, social and governance partnership model with tenants, to boost the building's sustainability impact (see panel, 'Empowering occupants').

The tower's tight footprint, bold curves and glass façade made the engineering particularly complex (see panel, 'Typhoon-proof façades'). With the core placed on the eastern side to open up panoramic views, WSP had to carefully plan where plantrooms would go and how services would be routed, while keeping ceiling heights generous. OpenBIM and construction

Project team

Developer: Henderson Land Development Co
Design architect: Zaha Hadid Architects
Lead architect: Ronald Lu & Partners
MEP & BIM consultant: WSP
Sustainability and IT consultant: Arup
Glass façade consultant: Eckersley O'Callaghan
Façade lighting consultant Speirs Major
Main contractor: Hip Hing Construction

digitalisation played a big role in making it all fit. On office floors, for example, WSP managed to maintain a spacious 3.5m-clear headroom, even though the total slab-to-slab height is just 5m.

Office floors are ventilated using what Thomas Chan, WSP executive director, building services, property & buildings, calls 'a hybrid ventilation system' that 'seamlessly integrates cooling with natural ventilation, enhancing both energy efficiency and occupant comfort'.

In downtown Hong Kong, external temperatures range from 7°C to 35°C, with humidity hovering at more than 66% during the summer. The HVAC system is designed to enhance climate resilience, with the chiller plant capable of meeting 100% cooling demand even when outdoor temperatures reach 37°C.

Automatic operable windows on office floors enable natural ventilation during periods of favourable weather. Helping manage this system is an onsite weather totem accommodating weather stations that track local weather and air quality, including PM10, PM2.5, ozone, wind speed, temperature, humidity, rainfall and noise.

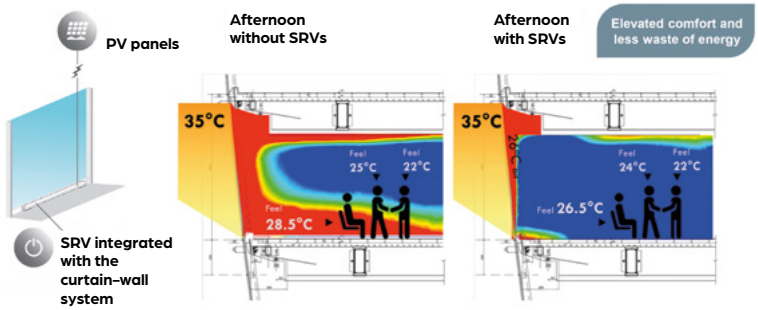
Weather and BMS data are fed into the digital twin, and an algorithm developed by the project team informs the occupants of the favourable period for hybrid ventilation. An app allows individuals to control the variable air volume (VAV) operation, motorised solar blinds and window actuators. For the rest of the year, mechanical ventilation delivers fresh air at 12 $L{\cdot}s^{-1}$ per person to office floors, based on an occupancy density of one person per $9m^2$ of floor area, outperforming the excellent class of the local IAQ standard.

Air conditioning is demand controlled via VAV boxes, to minimise unnecessary cooling and fan power during partial-load conditions. Conditioned air is supplied through ceiling diffusers and drawn back via a dedicated ducted return system, ensuring optimal air quality.

To tackle the possible discomfort for those sitting behind the west-facing façade, Arup and the developer came up with a project-specific patented ventilation solution, the 'solar-responsive ventilator'. The device boosts office ventilation and creates dedicated air circulation in the form of an air cushion, to reshape airflow within the office perimeter zone.

The units' low-speed DC fans are powered from a $230m^2$ walkable photovoltaic (PV) array on top of the building and are controlled via a

The curved, insulated glass of the façade has solar and low-E coatings on the outside, and anti-reflective coatings on the inside



The SRVs create an air cushion between the façade and office space

How PV-powered solar-responsive ventilators (SRVs) protect occupants against excessive solar-radiative heat from glazing

Typhoon-proof façades

The design team implemented elevated performance criteria for wind and water resistance to ensure long-term durability and occupant safety in the face of future extreme weather events.

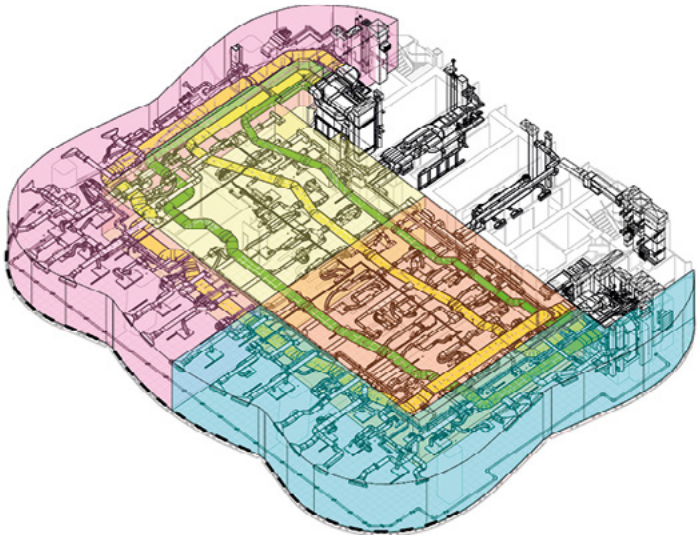
Localised design wind loadings were derived from wind-tunnel testing, tailored to the building's unique geometry and urban context.

For wind-pressure testing, the design applied an amplification factor of 1.75, exceeding the typical industry standard of 1.4, to ensure robustness under extreme wind conditions. A missile-impact test was also conducted, simulating debris strikes during typhoons.

The results confirmed that the glass remained intact within the frame, demonstrating the façade's ability to withstand impacts even under Typhoon Signal No 10 conditions (winds of more than 118kmh and gusts of more than 220kmh).

The fully-glazed façade is formed using double-laminated, curved, insulated glass units. These four-ply units have a double-laminated outboard glazed pane incorporating solar and low-E coatings, and another double-laminated inner pane with anti-reflective coatings.

The thermal performance of the façade outperforms the overall thermal transfer value of the building envelope, as required by the Hong Kong Buildings Department.



Multizone AHU system on one floor

combination of solar sensors and real-time data from the building's local weather station.

The power supply system is designed with two independent substations and dual busducts, ensuring uninterrupted electricity supply. Emergency and mobile generators are provided as backup sources. This configuration achieves an exceptionally high level of reliability — more than 99.9999% — which supports the resilience requirements of a super-Grade A office.

The circadian lighting control system is engineered to promote occupant wellbeing and enhance workplace performance. Using timer-based controls, the system adjusts colour temperature and light intensity to simulate natural daylight patterns. This helps regulate the human circadian rhythm, thereby improving motivation, creativity and productivity.

Each office floor is split into four zones, each served by its own air handling unit (AHU) to allow precise comfort control (perimeter north, perimeter south, inner north and inner south). This multi-AHU configuration also ensures that, in the event of an AHU failure, the remaining units can deliver up to 90% of the total cooling load to maintain occupant comfort, provide system resilience and allow for future adaptability.

The Henderson has a distinctly futuristic look, inside and out

The air in The Henderson is treated to a very high standard. Each AHU incorporates a MERV 13 pre-filter, a carbon filter, photocatalytic oxidation and a UV lamp. In addition to the central air purification in the AHUs, purification units incorporating UV disinfection are integrated into ceilings to neutralise airborne pathogens.

To minimise the energy needed for cooling humid outside air for the banqueting hall, the building incorporates a liquid-desiccant system. This circulates a desiccant solution to remove moisture from the air to reduce latent heat loads before the air is mechanically cooled. This eliminates the need to overcool the air to dehumidify it, reducing energy use significantly.

Unlike other Grade A offices, The Henderson has return air ducts, rather than using false ceiling voids as the air return plenum. This improves room-to-room acoustics and air quality.

How AI optimises lift operation

WSP has designed an AI-based system to optimise The Henderson's sophisticated arrangement of lifts. It works in addition to the standard destination control system, and aims to assign vacant lift cars and prevent unnecessary stops by overcrowded lifts.

The building has 12 passenger lifts to serve the office floors: six serve the low zone (ground floor to level 25) and six the high zone (levels 26 to 38). There are two dedicated lifts for the banqueting floor (level 39), which is also served by four high-zone lifts that enable large numbers of guests to exit the building speedily.

The system caters for passengers who follow others into a lift car without first making a hall call, which can lead to inefficient stops and delays. The system uses video analytics and AI technology to count the number of passengers inside the car and the lift lobbies. When this exceeds a predefined headcount threshold, the system sends a signal to the lift controller to bypass hall calls for the overcrowded lift. It then reassigns these calls to less crowded lifts.

The system also uses AI-powered tracking to monitor people movement within the lift lobby on typical floors. When a passenger is detected, but no hall call registration is made within a predetermined time interval, the system signals to the elevator controller to initiate an automatic hall call registration on behalf of the passenger and ensure efficient lift car dispatching.

'This intelligent automation enhances lift responsiveness, particularly during high-traffic periods, and ensures that all passengers are accounted for – even when they don't actively interact with the call buttons,' says Andy Chan, head of E&M division at Henderson Land Development.

The lift cars also incorporate air sterilisation. The patented system developed for the project uses UV-C disinfection, air filters and IAQ sensors to sanitise the cabin.

A central chiller plant provides cooling to the AHUs, primary air units and fan coil units. This is located in the double-height mechanical plantroom on levels 10 and 11, freeing up roofspace for a garden overlooking Hong Kong's Central Business District. To address global warming risks and maintenance concerns, the central chiller plant comprises eight variable-speed drive, high efficiency air-cooled screw chillers with a cooling capacity of 967kW. By combining chiller plant optimisation with machine learning, operation patterns can be uncovered and optimised, leading to energy savings. The use of air-cooled chillers also eliminates the risk of legionella associated with water-cooled systems.

The chilled-water system is resilient and can maintain 100% cooling capacity, even with two chillers offline or when outdoor temperatures rise to 37°C. To ensure cooling is available during power cuts, one chiller is designated as 'essential' and is backed up by an emergency generator. When power is restored, the system is designed to support a rapid restart within a minute.

To capture rainfall and reduce water consumption, The Henderson incorporates 35m^3 of rainwater-harvesting tanks for irrigation. Condensate drain water collected from the air conditioning is used for the water-mist system, which can cool down the air-cooled chillers.

Since opening in 2024, The Henderson has earned an impressive array of certifications including: Well and Leed Platinum Pre-certifications; and China Smart Building Label and China Healthy Building Design Label. It has Platinum status for digital infrastructure (WiredScore) and intelligence (SmartScore), and with dual Platinum ratings in active travel (ActiveScore) and transport (ModeScore), The Henderson is setting a new benchmark for world-class connectivity and green travel.

The Henderson's occupants can use an app for contactless movement from the street to their workspace

Empowering occupants

The impact of user behaviour on operational carbon emissions can be significant. At the design stage of this scheme, the project team set out to harness data-driven digital technologies to make workplaces more sustainable.

An app enables employees and tenants to control workplace systems such as window opening, window blinds and room temperature. The expectation is that giving tenants control will lead to a reduction in carbon emissions in response to the outdoor climatic condition.

Occupants have reacted positively to enhanced user controllability features. 'This demonstrates that empowering users with direct control over their office environment encourages more sustainability-conscious engagement with the building's tenant-orientated digital ecosystem,' says Edward Chan, head of the green building sub-committee at Henderson Land Development.

The smart app gives users a contactless journey from street to floor. Multiple access methods allow users to pass through turnstiles and security checkpoints without having to touch surfaces. This includes novel multipoint contactless technology developed for The Henderson. The app enables automatic lift calling, floor selection and designated floor assignment.

It is amalgamated with the digital twin and the integrated tenant experience analytic platform, which tracks and analyses tenant journeys throughout the building, and facilitates analysis of ESG-related data to share with tenants.

The Henderson launched the industry-first partnership programme in Hong Kong, a three-way collaboration that engages corporate tenants and individual users in pursuing ambitious and data-driven sustainability goals.

Participants earn sustainability credits by engaging across four key pillars: carbon neutrality; health and wellbeing; partnership for good; and integrated culture. These credits are redeemable for a range of benefits.

To support tenants on their carbon-neutrality journey, analysis from The Henderson's digital twin provides energy, water and waste performance data for ESG reporting and global sustainability benchmarking.

30 under 30

The next generation of talent driving the future of building services engineering

Engineering Hong Kong's vertical cities

In Hong Kong's humid, high-density environment, a new generation of engineers is pioneering integrated solutions for the region's vertical cities. Three of CIBSE's current 30 under 30 engineers answer questions on decarbonising the thriving metropolis

Hong Kong and Mainland China have some of the highest urban densities in the world. How does this 'vertical' context influence innovation?

Zhengguang Liu In ultra-dense, vertical cities – such as Hong Kong and many Mainland China megacities – conventional sustainability approaches based on incremental efficiency gains reach their limits quickly.

Spatial constraints, limited roof area and tightly coupled infrastructure mean that optimising individual components is no longer sufficient. This context forces a shift in thinking: buildings must be treated as active nodes within a wider urban energy system rather than isolated energy consumers.

Much of my work focuses on how building-integrated photovoltaics and demand-side flexibility can unlock system-level decarbonisation in environments where space, capacity and redundancy are constrained.

Jill Leung In Hong Kong and Mainland China, density and verticality push us to innovate beyond standard practice. Extremely high occupant and equipment densities require advanced load prediction, dynamic zoning and AI-assisted chiller and air-side optimisation to maintain comfort while cutting energy use.

Space constraints drive modular, prefabricated, multi-trade integrated mechanical, electrical and plumbing (MiMEP) systems that fit tight plantrooms and enable staged retrofits. Onsite renewables move beyond roofs to building-integrated photovoltaics (PVs) on façades, and hybrid PV and solar thermal (PVT) systems that provide electricity and useful heat. Micro wind turbines are also being explored.

↖ Jill Leung
Arup

Tsz Kai Charles Lam Vertical city conditions have pushed us to design sustainability as a three-dimensional, operational discipline – where plant, air paths, controls, logistics and user behaviour must work together at height, speed and scale.

In that context, innovation is less about inventing new standards and more about re-engineering how international best practice is applied to dense, mixed-use towers and campuses with long operating hours and complex stakeholder interfaces.

In ultra-dense districts, we cannot treat buildings as isolated assets; we have to optimise clusters such as shared central plants and district energy interfaces, and we need resilient maintenance strategies that work in constrained plantrooms and vertically distributed risers.

That 'stacked' complexity forces


↗ Tsz Kai Charles Lam
Swire Properties

earlier, more integrated decisions: separating sensible vs latent cooling demands, and designing for 24/7 tenancy diversity (for example, retail, offices and serviced apartments in one tower). Retrofit phasing has to be planned carefully so that decarbonisation happens without disrupting business continuity.

Building services in the region are dominated by cooling and humidity challenges. What is the biggest hurdle to achieving true net zero in a subtropical climate?

Zhengguang Liu The biggest hurdle is not cooling demand itself, but the rigid coupling between thermal comfort, humidity control and conservative operational strategies. In humid subtropical climates, maintaining wellness often locks systems into inflexible modes of operation, leaving little room for optimisation. My research explores how thermal storage, system inertia and predictive control can decouple when cooling is generated from when it is used. This allows energy use, carbon emissions and comfort to be optimised simultaneously, rather than forcing trade-offs that undermine performance or wellbeing.

Jill Leung The biggest hurdle is managing rapidly rising cooling and dehumidification loads without over-reliance on energy-intensive systems. Climate change is increasing temperature and humidity, which drives up latent and sensible loads, and lowers equipment efficiency. To approach true net zero, we must dissect cooling load components rigorously, then reduce demand through façade optimisation, airtightness, moisture control and heat recovery. In parallel, we must promote behaviour change via green tenancy and incentive schemes, and encourage acceptance of higher setpoints. This load reduction underpins efficient, wellness-focused system design.

Tsz Kai Charles Lam The biggest hurdle is latent load. We have to remove moisture safely and efficiently during long operating hours, without overcooling or compromising indoor air quality and comfort. Research focused on Hong Kong shows the latent portion can dominate ventilation cooling load (reported around 80% in one study) and it is highly sensitive to outdoor moisture, making dehumidification energy a core barrier to 'true' net zero in our climate. ●


↘ Zhengguang Liu
University of Manchester

To read an extended version of this feature visit bit.ly/CJHKYENQ

● **Tsz Kai Charles Lam The senior sustainable development officer at Swire Properties is active in CIBSE YEN Hong Kong through mentorship and retrofit workshops. He also serves on Hong Kong's Advisory Committee on Water Supplies, and the Environment and Conservation Fund.**

● **Jill Leung A sustainability engineer at Arup, Leung leads decarbonisation initiatives for new and existing buildings, applying advanced data analytics to assess performance and identify opportunities. Her work includes developing a digital tool for rapid energy analysis.**

● **Zhengguang Liu With more than 60 peer-reviewed papers, 3,000+ citations and more than ¥15 million in competitive funding secured, Zhengguang's work bridges scholarship and deployment. He has co-founded the CleanEnergy Tech Co, holds two patents, and piloted PV-geothermal systems on commercial campuses.**

30 under 30 2026

The 2026 30 under 30 competition is now open for entries, with thanks to headline sponsor, BAXI. For more information and to enter, visit: www.cibse.org/30under30

The categories are:
Emerging leader
Sponsored by Swegon
This recognises future leaders of building services engineering.

Sustainable champion
Sponsored by Ideal Heating – Commercial Products
Recognising those who are driving sustainability within building services.
Digital and automation innovator
Recognising those driving innovation in building services through the use of digital technologies and automation.
Project delivery champion
Sponsored by Georg Fischer
This category recognises the professional excellence of young supplier or contractor-side professionals.
Technical excellence engineer
Sponsored by CIBSE Patrons
This category recognises young professionals who have made outstanding contributions in a specialist building services engineering discipline.

Retrofit reality

The star performer in the NABERS UK ratings scheme is not a gleaming new office scheme, but the 1960s office of consultant engineer Watkins Payne, which has a forensic approach to energy efficiency. **Alex Smith** highlights its methods

In the race to decarbonise the UK's built environment, the industry frequently fixates on the gleaming promise of new 'smart' buildings designed to achieve net zero from the drawing board. Yet the true battleground for operational energy efficiency lies in the country's existing, ageing stock.

In November 2024, building services consultant Watkins Payne proved that exceptional operational performance is not exclusive to new developments. By securing a 5.5-star NABERS UK whole building energy certified performance rating for its Surrey office, the consultancy established a UK first: no other office has achieved a 5.5-star rating under NABERS UK's whole building metrics and it is currently the only one to have achieved any type of certified performance 5.5 rating. Twelve months later, the building maintained its second 5.5-star rating, with an improved decimal tracking indicator score of 5.65 (a metric introduced by NABERS UK to allow occupiers to track granular improvements).

With the consultant now aiming for a 6-star rating, the office project serves as a live case study for NABERS UK, demonstrating the rigour required to maintain and improve operational efficiency in legacy assets.

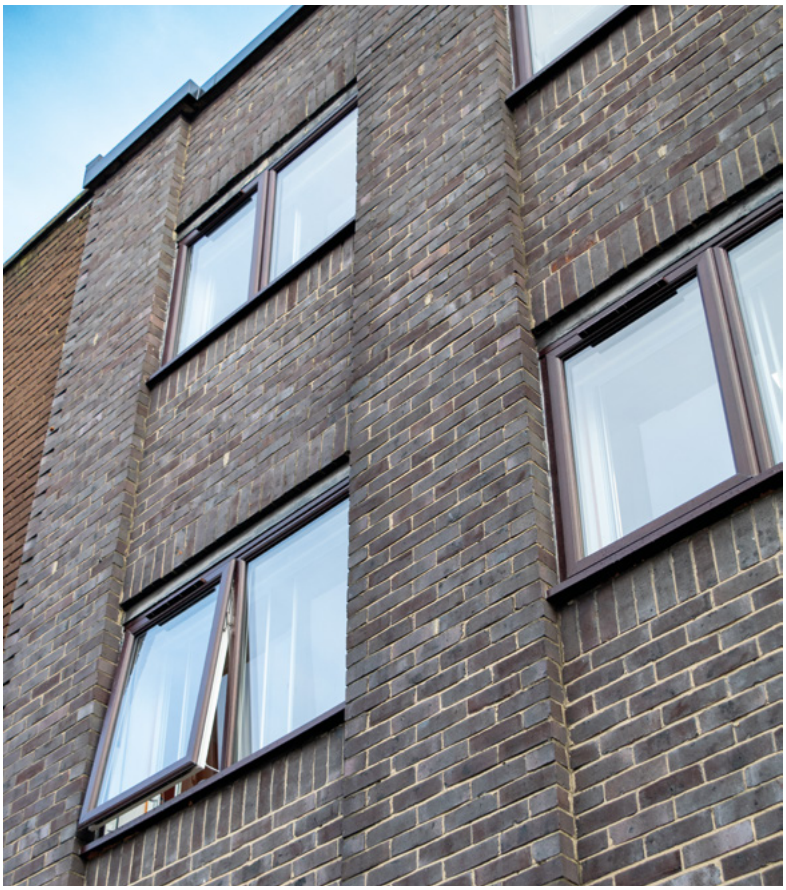
Constructed in the 1960s, the Sunbury-on-Thames office was originally fitted with single-glazed, steel-framed windows. Heating and cooling are provided by a local direct expansion heat pump system.

The consultancy pursued a whole building rating for the office, as it is the only tenant. This is often a more demanding metric than the NABERS UK base building rating sought by developers, as it encompasses the occupier's lighting and small power loads.

The journey to 5 stars

The path to high performance began in 2023 with a strategy focused on 'low-hanging fruit' – measures that required low capital intervention but promised high impact.

Technical upgrades included replacing compact fluorescent lighting with high-efficiency LEDs equipped with daylight dimming and occupancy sensors. Timers were installed on high-energy plant equipment, and staff were shown how to optimise controls for heating, cooling and ventilation by a HVAC energy champion. The changes resulted in the building achieving a 5.0-star rating and, for the period ending October 2023, it recorded energy use intensity of 89.6kWh·m^{-2}.



Watkins Payne's 1960s office block is the first in the UK to be awarded a 5.5-star NABERS UK rating

Crossing the threshold to 5.5 stars

Having secured 5.0 stars, the consultant used an advanced simulation model to identify the specific interventions required to bridge the gap to 5.5 stars. The data suggested that a reduction in energy intensity of approximately 12% from the 2023 baseline was required.

The primary capital intervention during this phase was the replacement of the original single-glazed windows with double-glazed units. This cut heat loss through the façade significantly and improved occupant comfort. Crucially, the new windows were easier to operate, encouraging staff to use natural ventilation.

Simultaneously, the team refined the heating

strategy for toilet facilities to minimise out-of-hours energy consumption. The impact of these measures is evident in the data for the rating period of November 2023 to October 2024, which showed that the project team had met its 5.5-star rating target, with a decimal tracking indicator of 5.51.

Constant vigilance is required for the rating to be maintained. For Watkins Payne, the energy champion is crucial in continuing a culture of energy efficiency.

The company maintained its 5.5 rating last November, with a higher decimal tracking indicator of 5.65 stars. The improvement was driven by an increase in operational hours because the energy intensity has remained almost flat, projected at 75.6kWh·m^{-2}, compared with the previous year's 75.7kWh·m^{-2}. Because the NABERS UK algorithm normalises for hours of use, the building is being rewarded for maintaining its efficiency profile while servicing a longer operational week.

The path to 6 stars

The target has now been set at the pinnacle of the NABERS UK scheme: 6 stars. The gap, however, is substantial.

To achieve its goal, the Sunbury office must reduce its annual energy consumption to approximately 32,249kWh. This represents a further reduction of roughly 31% from its current performance level. With the fabric and primary lighting already upgraded, the 'easy' wins are gone. The strategy must now shift from demand reduction to generation and granular control.

The consultancy has identified four key 'improvements' to bridge this gap:

1. Onsite generation: Since its last certification, 41 solar panels have been installed on the roof, with a total capacity of 21kW peak, delivering an estimated 13,075kWh of annual solar electricity generation (after losses). This is expected to meet around 25% of the building's annual electrical demand. For a whole building rating, renewable energy generated and consumed on site is deducted from the Grid electricity import. This directly lowers the 'electricity equivalent energy' figure used for the rating calculation.

2. Granular metering: To squeeze out the remaining inefficiencies, the firm plans to upgrade metering to provide detailed monitoring of major consumption sources.

3. Smart power control: Small power loads are often the 'silent assassins' of energy ratings. The next steps include the installation of smart sockets to monitor and control small power loads, specifically targeting the elimination of standby loads.

4. Refined heating: Further updates to heating controls are planned, specifically to minimise out-of-hours use in areas such as toilets.

Solar panels are expected to meet around 25% of the building's annual electrical demand

Lessons for industry

The success of the Sunbury office offers a validation of the NABERS Design for Performance (DfP) ethos. DfP is the framework NABERS created to ensure buildings in operation achieve their design target. Watkins Payne has demonstrated that retrofits do not always require a complete strip-out or a new façade. Instead, a combination of targeted fabric upgrades (glazing), systems modernisation (LED lighting and controls) and, crucially, occupant engagement (energy champions) can deliver world-class performance.

As the UK industry faces the challenge of stranded assets and tightening Minimum Energy Efficiency Standard regulations, this journey proves that the path to 5.5 stars is open to buildings of the past, provided they are managed with the precision of the future. ●

For more information about NABERS UK, visit: www.cibsecertification.co.uk/nabers-uk

New double-glazed windows encourage staff to use natural ventilation

Special features

Stopping the rot

Poorly installed insulation without adequate ventilation has caused damage to thousands of homes. **Molly Tooher-Rudd** looks at how the industry is tackling the spread of mould and damp

Heat pumps

Ventilation

Air conditioning

The rise in reports of damp and mould across the UK's housing stock has exposed a systemic weakness in how homes are designed, retrofitted and maintained.

The scale of the issue is vast: in 2023, the BRE found that 65,000 homes in England are affected by category 1 damp and mould hazards.

Mould led to the death of two-year-old Awaab Ishak, who died from a severe respiratory condition caused by prolonged exposure to mould. In response, the government introduced Awaab's Law, which mandates strict timescales for social landlords (and soon private landlords) to investigate and repair damp and mould.

Demonstrating ventilation products at the Zehnder training academy

Insulation failures

Many cases of mould and damp are the result of botched installations financed by government programmes such as the Great British Insulation Scheme and the Energy Company Obligation (ECO). These were targeted at low-income households and aimed to improve the energy efficiency of poorly insulated homes.

However, work carried out under both schemes was found to be not compliant with ventilation standards.

Hywel Davies, independent adviser on building safety and performance, says the situation has been years in the making. 'Twenty-five years ago, there was a focus on energy performance in buildings, and some of us warned that we might not be building stuff that complied with the regulations,' he says.

'Now we're dealing with these external wall insulation problems,

among others. The National Audit Office has looked at 23,000 instances of failure. That's 23,000 instances of non-compliance.'

Regulation versus compliance

There is an argument that ventilation rates in the Building Regulations are inadequate, but Davies is not convinced the issue is down to a lack of regulation. 'It's a lack of compliance. If [housing] stock is built to meet current regulations, it should be adequately ventilated,' he says. 'The people who don't comply need to face the consequences.'

Davies warns of a siloed approach to Building Regulations. While Part L (energy efficiency) drives the push for airtightness, Part F (ventilation) is often treated as a secondary consideration. Each part should be considered together, he adds, as 'they allow ventilation and airtightness to be considered in a systematic way'.

David Bleicher, publications manager at BSRIA, agrees: 'You can't talk about airtightness without talking about ventilation. If you build a building that is completely airtight with no ventilation, you get mould, you get air-quality problems, you get health problems. So you must have adequate ventilation and it must be installed correctly.'

As well as regulations, guidance is needed to teach people how to follow them, adds Bleicher, who is editor of BSRIA's new *BG 90/2026: Mould in social housing*. The guide was published in partnership with the UK Centre for Moisture in Buildings (UKCMB) and follows the 'no insulation without ventilation' principle to help providers move from repair to prevention, offering solutions for those retrofitting and maintaining buildings. It is free to access for social housing providers and full-time students on relevant courses.

While the guide is designed for social housing providers, Bleicher says it is also useful for contractors, manufacturers and engineers, adding that it is important for ensuring issues are dealt with proactively, rather than reactively. 'In the past, we've seen mould problems ignored until they become a serious issue.'

Skills gap

There is, however, a significant skills gap when it comes to the construction, installation, testing and maintenance of ventilation systems, says Bleicher – a statement with which Adam Taylor, CEO at Arm Environments and chair of the BESA Indoor Air Quality group, agrees. 'A lot of the problem stems from a lack of knowledge. There is a lack of awareness of how important it is,' says Taylor, who adds that residents' lifestyles are often wrongly blamed for causing the mould.

'There is the insinuation that if someone has mould in their home it's because they are dirty, but that isn't the case, particularly in social housing. There are lots of other reasons, such as high occupancy, smaller and smaller buildings, airtight fabric and a lack of education about the importance of ventilation.'

'We can't just blame the residents,' echoes Bleicher. 'There are many socioeconomic issues at play, such as overcrowding and fuel poverty, where residents can't afford to heat their homes. It is not people's fault that they're cooking, drying clothes and showering. These are normal activities that everyone does, but in an overcrowded dwelling that isn't effectively insulated, ventilation can't do what it is supposed to be doing. All of these things can conspire together to cause significant mould issues.'

Bleicher says it can't always be the responsibility of tenants to deal with the condition of the property when the ventilation is failing.

Finding solutions

Maintenance is the big elephant in the room, according to Taylor, who says: 'We're putting more sophisticated ventilation systems into buildings, but they are not always getting serviced.'

Bleicher explains the physical reality of neglect. 'Ducts get plugged with dirt or damaged, motors lose speed. All these things mean a system that works on day one isn't working correctly a few years later,' he says.

To solve the maintenance crisis, Taylor references the Nordic model. After its own mould crisis, following the insulation boom of the 1970s and 80s, Sweden introduced Obligatory Ventilation Control in 1991. This stipulates that ventilation systems must be routinely checked and signed off by certified persons. BESA and GCP Europe are currently working on a similar standard for indoor environment quality that they hope will become UK legislation, explains Taylor. 'When I look at Sweden, it's like looking into our future,' he says.

Bleicher says what is required is a solid training framework and recognised qualifications and accreditations. Training and competence are indeed now central to the conversation, and the Zehnder

A ventilation component at Zehnder

Group has invested in a dedicated training centre through its Zehnder Academy. Tony Rendell, head of the group's operations and customer services, says the goal is to create healthy indoor climates with a deeper focus on indoor environmental quality.

'We are investing to reduce the skills gap and improve industry knowledge. This can reduce preventable issues that come from poor installation and maintenance,' he says.

Stuart Smith, commercial director at Zehnder, argues that ventilation is no longer a 'plug and play' product. 'Thirty years ago, ventilation was simple and easy to install, but buildings were leaky. Today it needs specialist knowledge, but it's still treated as an old product,' he says.

Smith questions why ventilation is not more tightly regulated. 'We still see systems today installed by non-specialists. We wouldn't allow an unqualified engineer to install a gas boiler, yet we allow a non-specialist to install ventilation systems that we rely on to breathe. Gas boilers and air conditioning – these are certified and regulated. Ventilation systems are not regulated in the same way. Anyone can install one.'

"If we can just give people better information about the importance of ventilation, that could be such a quick win"

At a European level, Eurovent is working to ensure systems perform as advertised. Its Indoor Air Quality certification programmes verify that systems can maintain CO_2 levels below 900ppm and effectively manage relative humidity, the primary driver of mould. The message is clear: bad ventilation can be worse than none at all.

Ultimately, the industry must shift its perspective to view ventilation not as an 'add on,' but as a critical safety system on a par with gas and electricity.

'If we can just give people better information about the importance of ventilation, that could be such a quick win,' says Taylor, who offers a sobering reminder of why the problem cannot be ignored.

'If you get electrocuted, or your boiler explodes, it's quick, it's dramatic. With air pollution, mould and damp, it happens quietly and people are killed slowly – and it should not be ignored.' ●

A match made in heritage

Large heat pumps can perform well in historical properties, but only if designers understand the context of the setting and its use, says a new report from Historic England. **Alex Smith** highlights lessons learned

A new report commissioned by Historic England has found that air source heat pumps (ASHPs) are a viable and effective solution for decarbonising historic buildings, challenging the common misconception that older structures are unsuitable for modern heating technology.

It features case studies of five ASHPs at four UK sites, ranging from a small café and museum in a historic barn, to a major retrofit of a Grade II-listed university college.

The study, carried out by Max Fordham, found that when performance issues did arise, they were typically rooted in the design of the heating distribution or delivery – such as convectively heating areas open to the outdoors – rather than a failure of the heat pump itself. Notably, the aesthetic and acoustic presence of the units did not cause concern for users, mirroring findings from previous research.

To achieve peak efficiency, carbon dioxide refrigerant systems are highlighted as a major advantage. These allow for the reuse of existing pipework – significantly lowering embodied carbon – and mitigate the environmental impact of potential refrigerant leaks.

The report said the technical success of ASHP installations relies heavily on the 'human factor'; building users must be educated on how to operate the system controls to ensure the heating is effective and sustainable.

One of four sets of ASHP evaporators next to a gas pipe at the university college case study

Site 1: Visitor centre and workshop

Case study one was the installation of two air-to-water ASHPs in a visitor centre and workshops sited in 19th-century, Grade II-listed agricultural buildings. Additional insulation and a new radiator system were also installed in the visitor centre.

The ASHPs are used to heat the building and to provide domestic hot water to sinks in the bathroom and the office next to the plantroom. Other sinks in the building have hot water provided by point-of-use heaters.

The research engineers uncovered numerous issues and gave the installation no stars for technology choice, thermal comfort or system design/installation quality. (Each project was ranked 0 to 2 stars for each of these criteria). They found that the convection-based radiators do not match the use of the building. The doors of the visitor centre and toilet were propped open, causing heated air to leave the building. There was also limited insulation.

The report states that typical heat output for an old building that has had some fabric improvements is around 120W/m^2, but, in this system, the capacity for the building is 54W/m^2. During the visit, one of the ASHPs was out of use, reducing the capacity to 32W/m^2.

A lack of insulation on pipework in the plantroom was increasing thermal losses, while a lack of mechanical protection meant one ASHP had been decommissioned because of damage caused by vermin. The research engineers said the ASHP's secluded position behind a hedge made it more vulnerable to attack.

A 260L hot-water cylinder was also found to be oversized for the four sinks that the ASHPs serviced. The other 10 sinks in the building used direct electric heaters.

In user interviews, occupants said they wore coats and used electric heaters to keep warm. They were unhappy with the installer's aftercare and were having difficulty securing a maintenance contractor trained in ASHPs. This lack of call-out support led to extended periods when the ASHPs were unable to provide space heating.

The report concludes that the ASHP technology was not at fault, but questioned whether such a draughty space should be heated by a heat pump. It suggested using radiant panels near reception staff and in the toilets as a

replacement for the radiators. Facilities manager and site staff also had limited knowledge of how to use the heating controls.

Site 2: Visitor centre and restaurant

There was a much more successful installation of two 11kW air-to-water monobloc ASHPs at Site 2, a modified 15th-century barn that has been converted into a visitor centre, retail space and restaurant. The ASHPs connect to an underfloor heating system and trench and electric heat emitters, and the system has a 200L buffer vessel and an 80L direct electric hot-water cylinder providing hot water.

The research engineers said the system was installed to a high standard, with all external and plantroom pipework insulated. They gave the site 2 stars for technology choice, stating that the heating schedule for the underfloor heating allowed time for the visitor centre and restaurant to warm up before opening. Thermal comfort in the restaurant is low, however, despite the space having additional electric heaters. The report says draughts in the restaurant are the result of the barn's full-height ceiling, lack of modern insulation, gaps in the fabric and high-speed airflows between open doors. It notes that the restaurant has a wooden floor, which is less suited to underfloor heating, producing 70W/m^2 compared with 100W/m^2 for a stone floor, according to the BSRIA underfloor heating guide.

The performance of the ASHPs was found to be compromised by an enclosure comprising stone walls and an acoustic louvre screen that aimed to reduce noise pollution.

Acoustic enclosures can impact ASHP performance if they block or inhibit flow from the ASHP exhaust, says the report, as this flow is likely to be diverted back into the inlet. This reduces the temperature of the intake air and forces the ASHP to use more energy to extract heat from air.

Site 1
Visitor centre and workshop
Split ASHPs
Installed capacity: 16kW and 11kW

Site 2
Visitor centre and restaurant
Monobloc ASHP
Installed capacity: 2 x 11kW units

Site 3
University college: residential/education/hospitality
Split CO_2 and multiple monobloc R-32
Heat pump capacity: 700kW and 75kW

Site 4a
Commercial
Monobloc R410-A, R-32
Heat pump capacity: 28kW (2x 14kW)

Site 4b
Residential
Monobloc R-407
Heat pump capacity: 9kW

The acoustic enclosure that impacted ASHP COP at Site 2

Data from sensors showed that the intake air was 3°C lower than the ambient air temperature, which the researchers attributed to the recirculation of air within the enclosure. As a result, it was calculated that the coefficient of performance (COP) of the ASHP was reduced from 3.98 to 3.66 – an 8% reduction, meaning an 8% increase in running costs and CO_2 emissions.

Site 3: University college

The third case study, at a university college building, featured a large, bespoke air-to-water ASHP using a CO_2 refrigerant, and five R32 ASHPs to ensure domestic hot water is always at the target temperature.

The CO_2 high-temperature heat pump allowed the existing distribution system, including fan coils, radiators and pipework, to be reused. The report awarded 2 stars for technical choice, thermal comfort and system design/installation quality.

The system is designed to work at 70°C flow/30°C return, as the transcritical CO_2 refrigeration cycle means COP is optimised when the return temperature is kept very low (above a certain temperature a CO_2 system can't operate and will switch off). Limiting valves are fitted to radiators to control the return temperature. These are costly, says the report, and must be judged against savings made using a high-temperature system.

As CO_2 ASHPs require a low return temperature to operate efficiently, they are not well suited to providing the slight rise in temperature required to maintain domestic hot water at the target temperature. Instead, a bank of five domestic Samsung R-32 ASHPs is used to raise the hot-water temperature. One of these R-32 units is located in the plantroom, making use of waste heat from the CO_2 ASHP and mitigating plantroom overheating. Three of the units cover the full hot-water demand of the site in the summer.

The large external evaporators of the ASHPs are sited in a car park undercroft. They are custom designed to discharge air horizontally, rather than vertically, which would have limited the airflow rate.

Site 4: Museum, tearoom and shop

The research engineers reported a successful installation of two heat pumps at Site 4, which comprises three main buildings – currently used as a museum, tearoom and staff offices – and a stable yard, which has a small, seasonal cafe, shop and staff accommodation. The heat pumps represent an excellent renewable transition away from oil heating, the report says.

One of the installations was penalised a star

Left: ASHP hidden by the workshop at Site 1

because the hot-water cylinder was oversized significantly. It transpired the engineer had mistakenly believed that hot water was to be provided to two baths exhibited in the museum. The misunderstanding emphasises the importance of clear client briefs, the report adds.

The installers decided to exclude the reception area at Site 4b from the heat pump system (unlike Site 1), as it had automatic opening doors and high footfall, meaning high heat loss. It is inefficient to warm such spaces by heating the air, the report says, and the radiant heating provided by the wood-burning stove was more appropriate.

The report notes, however, that stoves emit high levels of CO_2 and other harmful emissions, so need regular cleaning, and they run at high surface temperatures that require extra safety measures.

These case studies demonstrate that the 'heritage' label is not a barrier to electrification, but rather a call for more rigorous, site-specific engineering. The report says success hinges on a holistic approach that bridges the gap between high-tech plantrooms and the practical realities of historic building fabric. ●

Other Historic England guides to heat pumps and heating decarbonisation
Air source heat pump case studies – large buildings bit.ly/CJHEHPla
Air source heat pumps case studies – small-scale buildings bit.ly/CJHEHPsm
The viability of ground source heat pumps in historic buildings bit.ly/CJGSHPEH
Viability of water source heat pumps in historic buildings bit.ly/CJHEWSHP
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Why proven heat pumps still struggle to scale

The successful adoption of heat pumps is affected by complexity, compatibility and user experience, according to UC Davis research. **Tim Dwyer** looks at how consumer uncertainty threatens the rollout of heat pumps into the mainstream

Air source heat pumps (ASHPs) are no longer an emerging technology. Their thermodynamic performance is well understood, product ranges are mature, and they sit at the centre of UK and international decarbonisation strategies.

Yet adoption remains uneven and outcomes variable, particularly in retrofit. This persistent gap between technical capability and real-world delivery raises an uncomfortable question: if heat pumps work, why do they still struggle to scale smoothly or perform consistently in practice?

Research from the University of California Davis (UC Davis), presented at the ASHRAE Winter Conference in Las Vegas, examines non-cost barriers that shape whether heat pumps are discovered, specified, installed, operated and, ultimately, trusted by occupants.

While the underlying studies are largely US-based, the patterns they identify resonate strongly with issues familiar to UK building services engineers and across global heating markets. As the lead author, Sarah Outcault, explained during her presentation, the work focuses on 'the gap between technical potential and sociotechnical potential' – the space where well-designed systems can still fail to be adopted or trusted in practice.

The research synthesises findings from multiple studies, including reviews of heat pump promotion initiatives, analysis of consumer questions raised in public forums, and market studies examining policy, workforce and delivery conditions. These findings are interpreted using an 'energy technology adoptability' framework, adapted from diffusion of innovation theory, which considers how characteristics such as complexity, compatibility, observability and user experience influence whether a technology is adopted in practice.

For engineers, the value of this work lies in what it reveals about the space between design intent and lived performance. Many of the barriers identified sit within areas influenced by engineering decisions, installation practice, commissioning quality and how systems are explained to users.

Installation complexity

One of the most significant challenges is installation complexity, particularly in retrofit. Heat pumps succeed or fail as part of a wider system that includes emitters, distribution, controls, electrical infrastructure and the building envelope. Compatibility issues – such as undersized electrical panels, poorly sealed envelopes or limited external space – are common. None is insurmountable, but each adds risk, cost and uncertainty. If installers lack experience or confidence, uncertainty can translate into conservative design, inflated pricing or discouragement of heat pump options.

From a UK perspective, this reinforces a familiar message: heat pumps are not boiler swaps. Treating them as such risks underperformance and reputational damage. The research strengthens the case for early system appraisal and integrated approaches that address fabric, distribution and controls, alongside heat generation, rather than expecting the heat pump to compensate for systemic weaknesses.

Closely linked to system complexity is workforce capability. In markets where heat pump deployment is still accelerating, relatively few installers have deep experience of system design, sizing and commissioning. This has several consequences: limited competition, inconsistent advice and a tendency towards 'risk pricing', where uncertainty is reflected in conservative or inflated quotes. Contractors hedge against unfamiliarity by oversizing equipment or defaulting to hybrid solutions, while others dissuade clients based on outdated perceptions of performance.

Beyond technical design, prospective adopters often struggle to identify qualified installers, receive inconsistent or contradictory advice, and find it difficult to compare quotations where system specifications differ. These challenges are compounded by complex and opaque incentive rules, with eligibility criteria and application

processes that are not always clear. Such issues increasingly shape the context in which engineers are asked to advise clients or validate proposals, particularly in retrofit programmes, where trust and confidence are fragile.

In response, some programmes have begun to restructure delivery rather than refine individual steps. 'One-stop shop' or concierge-style models have emerged to guide householders through contractor selection, system choice, incentive applications and financing. These reflect recognition that coherent delivery matters and that fragmented processes can undermine technically sound designs.

Another recurring theme is the challenge of predicting and achieving energy savings. In gas-dominated markets such as the UK, switching to a heat pump does not guarantee lower running costs. Relative fuel prices, system design and operational behaviour all influence whether efficiency gains translate into savings. Poor sizing, inadequate insulation and inappropriate control strategies persist in practice, particularly in cost-constrained retrofits. User operation also plays a role: heat pumps generally perform best with stable setpoints, rather than aggressive setbacks, and systems may operate inefficiently where this is not clearly explained at handover.

Two less familiar, but highly relevant, concepts are observability and trialability. As Outcault noted, 'most residential heat pumps live out of sight, and that low observability means neighbours don't learn from neighbours and old myths persist long after the technology has improved'. This reinforces misconceptions based on legacy technology. While engineers are not responsible for public awareness campaigns, they influence observability through case studies, monitored performance data and transparent reporting of outcomes.

Light under a bushel: The invisibility of heat pumps means they are in danger of being overlooked

The research also highlights the importance of non-energy benefits. Outcault observed that these 'are often the most compelling selling points for customers, yet are not well understood and are under-communicated'.

Specifications and programmes often focus on efficiency and carbon, but occupants tend to value comfort, quiet operation, air quality and perceived safety just as highly. This underlines the importance of treating comfort and usability as legitimate design parameters. Stable temperatures, appropriate emitters, intuitive controls and clear guidance on operation can have a greater impact on user satisfaction than marginal gains in nominal efficiency.

The central message of this research is that heat pumps reward good engineering and expose weak practice. As deployment accelerates, the challenge is to move from demonstrating that heat pumps can work to ensuring that they work reliably, predictably and comfortably at scale.

By paying closer attention to system integration, workforce capability, delivery structures and the lived experience of occupants, building services engineers can help close the gap between technical potential and real-world performance. ●

This article is based on a pre-print paper presented at the 2026 ASHRAE Winter Conference by Sarah Outcault, Eli Alston and Angela Sanguinetti, of UC Davis. The final paper will be appear in *ASHRAE Transactions*, vol 132, part 1 (2026).

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Condensing and desiccant dehumidifiers

This module explores the operating characteristics, applications, energy implications and integration considerations of condensing and desiccant dehumidification systems

The need for dehumidification across different sectors is driven by the requirement to improve manufacturing efficiency, preserve artefacts and building structures, and protect human health. While specific humidity requirements vary widely between applications, the underlying objective is to manage the interaction between water vapour in the air and the materials, processes or occupants within a space. Understanding these interactions relies on basic psychrometric principles relating to air temperature, moisture content and relative humidity.

This module focuses on dehumidification systems, whether duct-mounted or supplied as self-contained non-ducted units, whose primary function is moisture removal, rather than dehumidification occurring incidentally as part of comfort cooling. It examines the principles and application of two established technologies, condensing and desiccant dehumidifiers, exploring operating characteristics, typical applications, energy implications, and integration considerations.

In buildings occupied by people, humidity is a key determinant of comfort, health and usability. While temperature is often the primary focus of environmental control, excessive or poorly controlled humidity can cause discomfort even when thermal conditions appear acceptable. This can result in occupants being uncomfortable, despite compliance with temperature-based design criteria. High relative humidity impairs the body's ability to regulate heat through perspiration, leading to sensations of stuffiness and overheating, while low humidity can cause dry skin, irritation of the eyes and respiratory tract, and increased susceptibility to airborne infection. Humidity also plays a significant role in indoor air quality. Elevated moisture levels promote the growth of mould and dust mites, both of which are associated with adverse health outcomes.

In modern, airtight buildings, moisture generated by occupants, activities and ventilation air can accumulate unless actively managed, particularly during mild or humid weather, when cooling systems operate intermittently or not at all.

Beyond occupant comfort, uncontrolled humidity threatens the integrity of buildings and their contents. Condensation on cold surfaces can lead to corrosion of metal components, decay of timber, and deterioration of finishes. Environments with sustained internal moisture generation, such as swimming pool halls, are especially vulnerable, and typically require dedicated dehumidification to protect the building fabric and maintain safe and comfortable conditions.

In museums, galleries and archives, humidity stability is often more important than absolute humidity level. Fluctuations in relative humidity cause hygroscopic materials such as paper, canvas and wood to repeatedly absorb and release moisture, leading to dimensional change and long-term damage. Maintaining a stable humidity equilibrium is therefore critical to the preservation of sensitive artefacts.

In industrial environments, dehumidification is frequently driven by process requirements rather than comfort. Excess moisture can disrupt manufacturing processes, degrade product quality and shorten equipment life. In some specialist applications, very low humidity levels are required to prevent chemical reactions with atmospheric moisture.

The two established dehumidification techniques that this CPD considers further are:

- Condensing dehumidifiers, which remove moisture by cooling air below its dew point and condensing water vapour (process D in Figure 1)
- Desiccant dehumidifiers, which remove moisture by sorption, using hygroscopic materials (process C in Figure 1).

Condensing dehumidification is based on cooling air below its dew point so that water vapour condenses and can be removed. In conventional air conditioning systems, this is achieved using cooling coils supplied with chilled water or direct expansion refrigerant.

Standalone condensing dehumidifiers use a self-contained refrigeration circuit. Air passes over an evaporator coil where it is cooled below the dew point, causing moisture to condense and drain away. The dried air is then reheated as it passes over the condenser before being returned to the space, avoiding unwanted cooling of the room.

The performance of cooling-based dehumidification is constrained by coil temperature and the risk of frost formation. As a result, condensing dehumidifiers operate most effectively at moderate to warm air dry-bulb temperatures, typically in the range

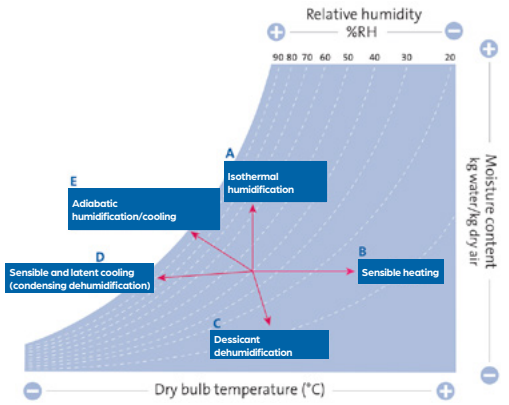

Figure 1: Approximate psychrometric processes (Source: Condair)

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of 15°C to 36°C. Performance decreases at lower temperatures as the cooling coil approaches freezing conditions.

In comfort and building applications, condensing systems are commonly designed to maintain humidity levels in the range of around 45 to 55% relative humidity (RH). Humidity control tolerances are typically wider than those for temperature control, reflecting both sensor limitations and the slower dynamic response of latent loads. Achieving lower humidity levels or tighter control is possible but generally requires increased system complexity and higher energy use.

Under typical comfort conditions, condensing dehumidifiers generally consume less energy per kilogram of water removed than desiccant systems. Specific energy consumption commonly lies in the range of approximately 0.5–1.5kWh per kilogram of moisture removed, depending on operating conditions and system design.

Condensing dehumidifiers are usually simple to install, typically requiring only an electrical supply and provision for condensate drainage. They are commonly used to provide local humidity control directly within a space and may be either fixed or portable units.

Condensing dehumidifiers are well suited to applications where:

- Air temperatures are moderate to warm
- Target humidity levels are above approximately 45–50%RH
- Control tolerances are relatively relaxed.

Common applications include swimming pool halls, commercial and industrial spaces with moderate humidity requirements, and museums or archive stores where humidity stability is required within a moderate range.

Desiccant dehumidifiers remove moisture from air through sorption, typically using a slowly rotating wheel coated with a hygroscopic material such as silica gel. As humid air passes through the wheel, water vapour is adsorbed onto the desiccant surface. To enable continuous operation, the desiccant must be regenerated. This is achieved by passing a separate stream of heated air through another section of the wheel, driving off the absorbed moisture. The warm, moist regeneration air is then exhausted to outside.

Because desiccant systems do not rely on condensation, they can operate effectively across a wide temperature range, typically from approximately –30°C to 40°C. They can achieve low humidity levels and low dew points that are difficult or impractical to reach using cooling-based systems.

Desiccant dehumidifiers also offer tighter humidity control than condensing systems, with control tolerances typically of the order of ±2%RH. In specialist industrial applications, placing desiccant units in series allows extremely low humidity levels to be achieved.

As mentioned above, desiccant dehumidifiers generally consume more energy per kilogram of moisture removed than condensing systems, typically in the range of approximately 1.0–3.0kWh per kilogram. Energy use is dominated by the regeneration heater.

Desiccant units are usually fixed installations. They may be located either within the space being treated or externally, depending on access, temperature and maintenance factors. The regeneration air exhaust must be ducted, with careful attention to condensation risk and drainage.

Desiccant dehumidifiers are well suited to applications where:

- Air temperatures are low or variable
- Target humidity levels are below approximately 50%RH
- Tight humidity control is required
- Low dew points are necessary.

Typical uses include freezer stores, ice rinks, pharmaceutical and electronics manufacturing, and other processes with demanding humidity requirements.

While both technologies remove moisture from air, they are suited to different operating envelopes. Selection is typically guided by four key considerations outlined in the box.

In HVAC applications, dehumidification can reduce overall energy use by decoupling latent (moisture) and sensible (temperature) loads. Where humidity is controlled solely by cooling air below its dew point, systems may

Example process in a condensing dehumidification standalone unit
(Source: Condair)

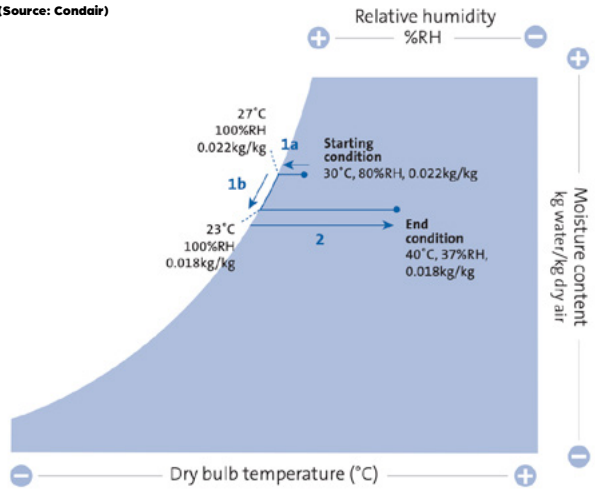

Figure 2: Typical condensing dehumidification process:
1a – Sensible cooling on the evaporator heat exchanger surface. Temperature reduces by 3K to 27°C and humidity increases to 100%RH (reaches dew point). No moisture quantity reduction yet.
1b – Latent cooling on the evaporator surface. Temperature reduces by a further 4K to 23°C, humidity remains at 100%RH, and the moisture quantity reduces by 0.004kg/kg dry air.
2 – Sensible air heating supplied by heat from the compressor and condenser. Temperature increases by 17K to 40°C, and humidity reduces to 37%RH. No change in moisture content.

Example process in a desiccant dehumidification standalone unit
(Source: Condair)

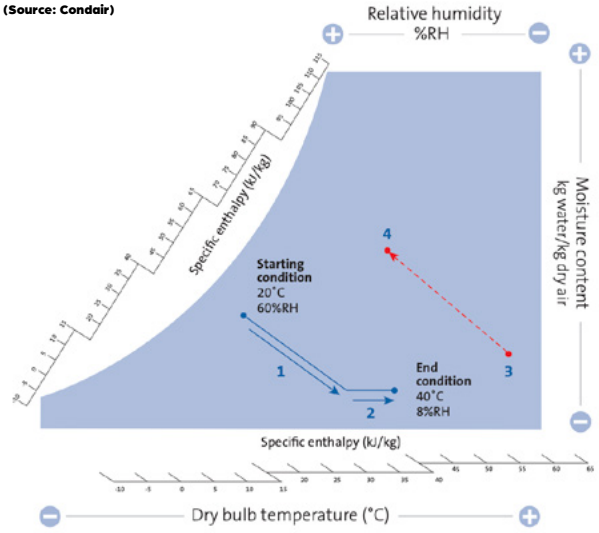

Figure 3: The principles of the desiccant dehumidification process:
1 – Air is drawn in and passes through the desiccant rotor, where moisture is adsorbed. The temperature increases by 13K, due to the heat released during adsorption, and the relative humidity drops by 49%RH (from 60%RH to 11%RH). Moisture is reduced by 0.05kg/kg dry air (0.009 to 0.004kg/kg).
2 – The air temperature increases 7K and the relative humidity drops from 11%RH to 8%RH, the moisture content remaining constant, as the air picks up the residual heat in the revolving desiccant rotor from the hot regeneration process.
3 – Regeneration air is heated to around 90°C to 120°C (the chart shows indicative start and end condition to illustrate the rise in temperature and drop in relative humidity), to dry out the rotor and extract moisture.
4 – Hot wet regeneration air is vented externally.

over-cool the air or require reheat, both of which increase energy consumption.

In some markets, particularly in cooling-dominated climates, dedicated outdoor air system (DOAS) configurations are used to separate ventilation and latent load control from sensible cooling. While such systems are less common in UK practice, the core principle of separating moisture control from temperature control is increasingly relevant as buildings become more airtight and sensible loads reduce. By managing humidity independently, central cooling plant can operate at higher evaporator temperatures, improving overall efficiency.

For desiccant systems, energy use is strongly influenced by regeneration strategy. Heat recovery between exhaust and incoming regeneration air can significantly reduce energy consumption, and the use of waste heat or gas in place of electricity can further improve operating economics.

In practice, dehumidification systems are controlled by monitoring air conditions against a defined setpoint. Control may be based on relative humidity or dew point, depending on the required accuracy and application. For general commercial or comfort applications, simple humidistats may be sufficient. In precision applications, dew point control offers greater accuracy and reduced sensitivity to temperature variation.

Condensing systems typically control capacity by cycling or modulating the refrigeration circuit to maintain coil temperatures below the air dew point. Desiccant systems may modulate capacity through airflow bypass or regeneration energy control, with regeneration exhaust temperature providing a useful indicator of desiccant saturation.

Regular maintenance, including filter cleaning and inspection of seals and drainage, is essential to maintain performance.

When dehumidification is integrated with central HVAC systems, it alters the way a building manages sensible and latent loads. Dehumidification processes release heat – in desiccant systems, adsorption is exothermic, and air typically leaves the unit warmer than it entered; in condensing systems, latent heat is rejected at the condenser and may need to be exhausted externally. Hybrid strategies can offer performance benefits. Cooling-based dehumidification is efficient at higher temperatures and moisture levels, while desiccant systems are effective at low temperatures or low dew points. Combining the two can optimise capital and operating costs.

Lowering the building dew point through dehumidification enables radiant cooling systems, such as chilled beams, to operate safely, and can improve refrigeration efficiency in applications such as supermarkets.

Dehumidification is a critical element of environmental control across a wide range of building and industrial applications. Psychrometric analysis provides a useful framework for bringing these considerations together to understand how changes in air temperature and moisture content interact, but it must be applied to airflow rates and moisture generation rates to determine the required dehumidification capacity. Recognising whether a system is required to manage transient loads, continuous evaporation, or ventilation-driven moisture ingress is key to selecting an appropriate technology and control strategy. Condensing and desiccant technologies each offer distinct advantages and limitations, and neither represents a universal solution. Effective system selection requires an understanding of temperature range, humidity targets, control accuracy and energy economics. Robust moisture load calculations, supported by psychrometric analysis, are essential to avoid over- or under-sizing. Where appropriate, the use of waste heat and heat recovery can significantly reduce energy consumption.

Dehumidification problems in practice often arise not from inappropriate technology selection, but from incomplete understanding of moisture loads and system interaction. A common misconception is that humidity will be adequately controlled whenever temperature setpoints are met. Latent loads are frequently dominated by ventilation air, infiltration or internal moisture generation, and may persist even when sensible cooling demand is low. A frequent issue is underestimating the impact of operating conditions outside design assumptions. Condensing dehumidifiers selected for warm conditions may perform poorly during cooler periods, while desiccant systems may be penalised energetically if regeneration heat is poorly recovered or controlled. Control strategy is critical. Relative humidity sensors in poorly representative positions can lead to unstable operation or excessive energy use. In applications with varying air temperatures, reliance on relative humidity alone may mask underlying moisture conditions, whereas dew point control can give a more robust indication of latent load.

Dehumidification is often treated as an isolated system rather than as part of the wider environmental strategy. Failure to account for the heat released during moisture removal, or for interactions with cooling, heating and ventilation systems, can undermine both comfort and energy performance. Early coordination between dehumidification, ventilation and cooling design is therefore essential.

Ultimately, successful dehumidification depends less on the choice of technology alone and more on informed engineering judgement and thoughtful integration within the wider environmental control strategy. ●

Choosing between condensing and desiccant dehumidification

While both technologies remove moisture from air, they are suited to different operating envelopes. Selection is typically guided by the following four considerations.

1. Temperature

Condensing dehumidifiers are generally preferred at moderate temperatures and operate most effectively above around 15°C to 20°C. At lower temperatures, performance is limited by the risk of condensate freezing.

Desiccant dehumidifiers are generally required for low-temperature operation, as they do not rely on condensation and remain effective in sub-zero environments.

2. Required humidity and dew point

Condensing systems are well suited where the required final humidity is above approximately 45 to 50%RH. They are efficient at removing large quantities of moisture from damp air but are less effective at achieving low dew points.

Desiccant systems are better suited where lower humidity levels or very low dew points are required.

3. Control accuracy

Condensing dehumidifiers typically maintain humidity within a wider control band, often around ±10%RH.

Desiccant systems offer greater stability and precision and are appropriate where tight humidity control is critical.

4. Energy and operating economics

Where operating conditions permit, condensing dehumidifiers are often favoured owing to lower electrical energy consumption.

Desiccant systems become more attractive where low-cost thermal energy is available for regeneration, such as waste heat from other processes. They also discharge warmer air, which may be beneficial in drying applications but can require post-cooling in temperature-sensitive environments.

Module 261

March 2026

1. Why can occupants experience discomfort even when indoor temperatures are within design limits?

- ☐ A Humidity has no influence on perceived comfort
- ☐ B Indoor air temperature changes more slowly than humidity
- ☐ C Low humidity increases sensible heat gains from occupants
- ☐ D Relative humidity impairs the body's ability to regulate heat
- ☐ E Temperature sensors are less accurate than humidity sensors

2. Which mechanism is used by condensing dehumidifiers to remove moisture from air?

- ☐ A Adsorption of water vapour onto a hygroscopic surface
- ☐ B Chemical binding of moisture within a desiccant material
- ☐ C Cooling air below its dew point to condense water vapour
- ☐ D Dilution of moist air with dry outdoor air
- ☐ E Increasing air temperature to reduce relative humidity

3. Which application is most likely to require desiccant dehumidification rather than condensing dehumidification?

- ☐ A A freezer store operating below 0°C
- ☐ B A retail space with intermittent occupancy
- ☐ C A swimming pool hall operating at 28°C
- ☐ D An archive store maintained at 50%RH
- ☐ E An office with standard comfort cooling

4. What is the primary reason desiccant dehumidifiers typically consume more energy per kilogram of moisture removed?

- ☐ A Energy is required to regenerate the desiccant material
- ☐ B They have lower moisture removal efficiency
- ☐ C They operate at lower temperatures
- ☐ D They rely on electric reheaters for supply air
- ☐ E They require higher airflow rates

5. Why is dew point control often preferred over relative humidity control in precision applications?

- ☐ A Dew point control reduces sensible cooling demand
- ☐ B Dew point provides a direct measure of moisture content
- ☐ C Dew point sensors are cheaper
- ☐ D Relative humidity does not vary with temperature
- ☐ E Relative humidity is unsuitable for industrial environments

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Further reading:

- CIBSE Knowledge Series KS19: Humidification
- CIBSE Knowledge Series KS20: Practical Psychrometry
- *ASHRAE Handbook – HVAC Systems and Equipment (2024)*: Chapter 24 (Desiccant Dehumidification) and Chapter 25 (Mechanical Dehumidification).

Product or service of the month

New CPD for commercial heat pump systems

Ideal Commercial Heating's module explores policy, funding and specification

Ideal Commercial Heating has launched a new CIBSE-approved CPD module to support engineers in the design and specification of commercial heat pump systems.

Titled 'Commercial heat pump system design and specification', the latest addition to the training portfolio provides a comprehensive guide to selecting, designing and specifying commercial heat pump and hybrid heating systems.

The course is designed to help building services professionals respond to the accelerating shift away from fossil fuels and towards low carbon heat in commercial buildings.

With heat pumps widely recognised as a key technology in the drive to decarbonise heating, the CPD explores the factors underpinning their rapid adoption. It examines the UK's net zero targets, government strategies and the

evolving policy landscape that is shaping the transition. The module also outlines funding mechanisms available to support low carbon projects, including the Public Sector Decarbonisation Scheme.

Alongside policy and funding guidance, the CPD focuses on best practice for system specification. It covers regulations, design guides and industry standards, equipping engineers with the knowledge to ensure compliance while optimising performance. Technical content includes strategies for reducing heat losses, minimising heating loads and correctly sizing thermal stores.

The seminar addresses key considerations when selecting and positioning commercial heat pumps. Topics include acoustic performance, unit spacing and mounting, refrigerant selection, antifreeze protection, defrost cycles, protection of external pipework, and example schematics for system layouts.

The CPD is aimed at professionals involved in the design and installation of heating systems for commercial buildings, including mechanical and building services engineers, sustainability engineers, consultants, contractors and young engineers.

● **Visit idealcommercialboilers.com/cpd-courses**

Vent-Axia publishes ebook guide to achieving Part O compliance

Vent-Axia has published *A guide to meeting Part O with confidence*, a new ebook to help housebuilders tackle overheating in increasingly airtight homes.

The guide explains Approved Document O requirements, offers a practical design checklist, and outlines ventilation strategies to balance comfort and compliance. Showcasing solutions including the company's Lo-Carbon Sentinel Econiq MVHR range, the ebook supports specifiers in mitigating overheating and meeting Part O and TM59 standards.

● **Visit www.vent-axia.com**

Optimising water quality in closed-loop heating systems

Magnetic International offers a solution for optimised heating water quality in closed-loop systems. Whether commissioning new plant or maintaining existing assets, water condition is critical to efficiency, reliability, and compliance with manufacturer and industry guidance.

Sludge, dissolved gases and incorrect pH can drive corrosion, damage pumps and valves, and reduce heat transfer. The HWR Plus (heating water regulator) addresses these risks, resulting in cleaner system water, improved energy efficiency and extended component life.

● **Visit bit.ly/magnetichwr**

Advanced introduces SmokeGo control panel

Advanced has launched SmokeGo, a new smoke control panel designed to simplify compliant smoke management. Integrating with Advanced's MxPro 5 fire panels, SmokeGo enables precise automatic and manual control of fans and dampers. Approved to EN54 Parts 2 and 4, and compliant with ISO 21927-9 and BS 7346-8, it features four-step configuration, cascade mode and automatic testing, helping specifiers and installers deliver faster, simpler and fully compliant smoke control systems.

● **Visit advancedco.com/product/smokego**

Q&A

Chair of YEN Hong Kong **John Wong** is committed to developing young engineers, strengthening industry collaboration and advancing professional growth through YEN

John Wong is an assistant technical manager at ISS Facility Services and the Hong Kong YEN chair. He is a building services engineer with a solid foundation in the industry developed through academic qualifications and practical experience in consultancy and project administration across Hong Kong and Macau. He is also pursuing professional registration.

Q How did you become involved in YEN and what are the benefits of being involved?

A About nine years ago, my supervisor at university, Mr. M Y Chan, introduced me to YEN.

The networking opportunities that have stemmed from the group have been incredibly valuable. I can connect with fellow young engineers, industry leaders and mentors across Hong Kong and globally.

Professional development within YEN also gives access to technical seminars, site visits and other learning opportunities. The recognition and leadership offerings provide platforms to showcase your projects – through events such as the Young Professionals Exhibition and Competition – and to take on leadership roles, such as committee positions, which help build influence within CIBSE.

Q Which projects are you proud of and what did you learn?

A I am most proud of my work on ONE SOHO, a residential and commercial redevelopment project in Hong Kong. I contributed to the design and implementation of energy-efficient building services systems.

The project required coordination with multidisciplinary teams to integrate building services, energy-saving measures and smart features, to enhance occupant comfort and achieve energy savings.

There were several important lessons learned during this project:

- Collaboration is key: working with diverse teams of architects, contractors and clients taught me the importance of clear communication and aligning goals to achieve project success.
- Problem-solving under pressure: managing tight deadlines and resource constraints honed my ability to prioritise tasks and innovate under challenging conditions, a skill I would apply to future complex projects.

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

A As activities resumed after the pandemic, face-to-face events – such as regular meetings, technical visits and seminars – have restarted. These have strengthened connections and engagement within YEN.

Q What are the biggest challenges the industry faces in your region?

A A major challenge is the lack of talent, because of professionals relocating from Hong Kong in recent years. A key priority of YEN Hong Kong Region (HKR) is to retain talent and strengthen collaboration with other professional institutions.

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

A As chair of CIBSE YEN HKR, my personal objectives include:

- Enhancing member engagement: increasing participation in YEN events by organising more interactive site visits and webinars, and building on the success of past events, such as the YEN Global Conference
- Mentoring young engineers: providing guidance to help members achieve professional registration and develop leadership skills
- Promoting sustainability: advocating for sustainable design practices in Hong Kong's building services projects, aligning with CIBSE's net zero goals
- Strengthening regional impact: fostering collaboration with HKIE and other Greater Bay Area institutions to elevate YEN's influence.

I am most looking forward to connecting with young engineers, sharing knowledge, and leading initiatives that inspire innovation and sustainability in the industry.

Q CIBSE President Vince Arnold's theme this year is about 'paying it forward'. Is there anyone who has helped mentor you or been a role model for you?

A I would like to shout out to Ir Peter Y Wong, a former CIBSE President (2017–18) and a prominent figure in Hong Kong's building services engineering community. His leadership in advancing the profession – particularly his emphasis on going beyond compliance to prioritise integrity and sustainability – has been a guiding influence.

His work on integrating Internet of Things technologies for building services performance, and his commitment to mentoring young engineers through HKIE and CIBSE initiatives, have inspired me to adopt a similar approach in my career and YEN involvement.

I aim to pay it forward by mentoring others, just as he has done for the Hong Kong engineering community. ●

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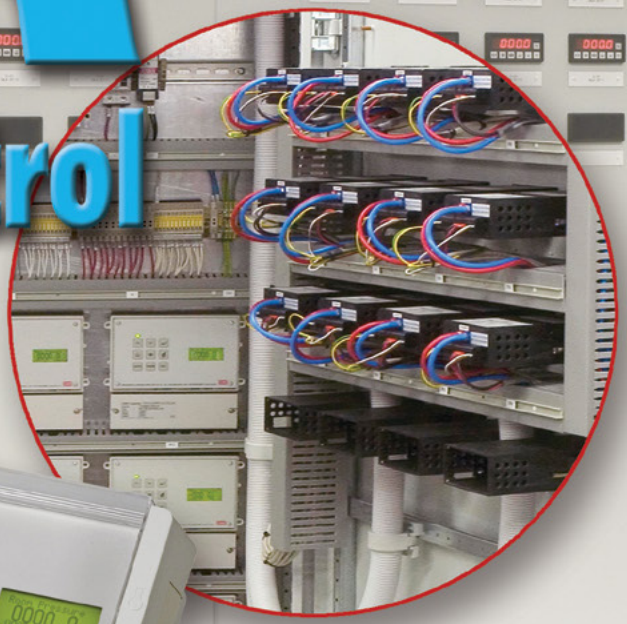

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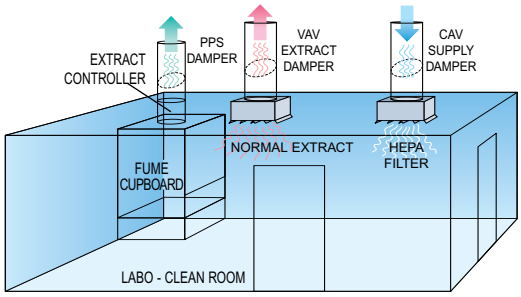

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