cibse Journal

December 2025
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The magazine of the Chartered Institution of Building Services Engineers

Net Zero Carbon Buildings Standard

Avoiding the ASHP carbon trap

Engineering the Middle East

The CIBSE MENA Awards recognise the Jumeirah Marsa Al Arab luxury hotel

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Standard bearer

The failure of the COP30 communiqué to include language on fossil-fuel reduction is widely viewed as a significant setback, indicating a possible retreat or delay in aggressive global decarbonisation efforts.

Oil-producing countries such as Saudi Arabia and Russia refused to support a phase-out, and unlike previous COPs there was no climate-friendly United States to bolster the arguments of a coalition of 90 countries pushing for fossil-fuel reduction.

The recent RICS *Sustainability Report 2025* has also suggested that uptake of sustainable buildings is stalling. It says growth in green property has weakened globally and that the proportion of construction professionals who report not measuring embodied carbon has risen in the past year, to 46%.

The industry-backed UK Net Zero Carbon Buildings Standard aims to buck this trend. Due to launch in early 2026, the Standard aims to provide a benchmark for developers, designers and owners striving for net zero in their buildings.

A recent CIBSE conference revealed how well the initiative has been supported, with 134 organisations putting forward 216 projects to test the Standard during its pilot phase. Feedback from these projects will help inform the final Standard, which will cover a wide range of building types and is already being promoted heavily by consultants who have invested in the extensive cross-industry collaboration that has taken place since the scheme was devised.

This year's crop of entries for the 2026 Building Performance Awards is another reason for optimism. There was a record number of submissions, despite the higher levels of performance data disclosure now required. The judges were particularly impressed with the standard of entries for Project of the Year – Residential, and the fact that best practice for whole life carbon assessment has spread beyond the UK to the rest of the world.

The expanded CIBSE MENA Awards are an attempt by the Institution to establish best-practice engineering in the Middle East and North Africa, which focuses on building performance outcomes. Dubai's Jumeirah Marsa Al Arab resort (cover and page 26) demonstrates how sustainability principles can be embedded in the most complex and ambitious projects in the region.

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Tim Dwyer
This month, the CPD looks at how heat pumps are being integrated into air handling units to support decarbonisation

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COP30 compromise fails to curb fossil fuels

UN executive secretary remains positive about direction of travel despite gas- and oil-rich states limiting the scope of final agreement

The latest UN global climate summit has ended with a compromise deal that omits any mention of curbing the fossil fuels that are driving global warming.

COP30, which was hosted by Brazil in the Amazonian rain-forest city of Belém, concluded on 22 November. In the summit's final communiqué, however, gas- and oil-rich states blocked any mention of reining in fossil fuels.

A trio of South American nations, led by Colombia's delegation, had joined the European Union (EU) in demanding that the final deal include language on a transition away from fossil fuels. However, after a coalition of countries, including Saudi Arabia, said any fossil fuel mention was off limits, the EU agreed – on the final morning – not to block a deal, even though it did not agree with the conclusion.

The summit, which works on the basis of consensual decision, was unable, therefore, to agree on a 'roadmap' or discussion paper about how best to phase out the use of fossil fuels.

Despite being boycotted by the US federal government, COP30 was attended by 194 countries and the next summit will be held in Turkey.

In his concluding remarks at the summit, UN climate change executive secretary Simon Stiell said: 'Many countries wanted to move faster on fossil fuels, finance and responding to spiralling climate disasters. I understand that frustration, and many of those I share myself – but let's not ignore how far this COP has moved us forward.'

Referring to booming investment in renewable energy, Stiell said: 'Our direction is clear: the shift from fossil fuels to renewables and resilience is unstoppable.'

He also pointed to the 194 nations' agreement that 'the global transition to low greenhouse gas emissions and climate resilience is irreversible, and the trend of the future'.

Boiler Upgrade Scheme extends to air-to-air heat pumps

The government has widened the eligibility for its Boiler Upgrade Scheme (BUS) to air-to-air heat pumps and heat batteries. BUS grants had previously been limited to air and ground source heat pumps.

Air-to-air heat pumps effectively work as air conditioners during hot weather, when they provide cooling, plus heating when temperatures are low. Under the expansion of the BUS, consumers will be offered a £2,500 discount on installing an air-to-air heat pump. – just more than half what it typically costs to install one in a flat or small house. Air-to-air heat pumps are smaller than air source devices, so can fit more easily into smaller properties.

The government has also launched a consultation on alternative clean heating solutions for homes, such as infrared heating, solid biomass boilers using agricultural waste, and renewable liquid fuels.

Government schemes have not boosted heat pump deployment, says report

The government's Warm Homes Plan should include a fundamental reset of heat decarbonisation policy, according to a new report by consultancy Stonehaven.

It recommends that the Boiler Upgrade Scheme (BUS), which gives £7,500 grants to support heat pump installations, should be phased out and replaced by a reformed Clean Heat Market Mechanism (CHMM).

The CHMM – dubbed a 'boiler tax' by critics – forces heating boiler manufacturers to install a set proportion of heat pumps for every boiler they sell. The report, however, recommends that the CHMM be opened up to other forms of low carbon heating, such as heat batteries and hybrid heat pumps.

It says that, despite four initiatives to boost heat pump deployment over the past 15 years, the rollout of the technology has not met expectations.

Budget cuts warm homes funding by 25%

Chancellor's axing of Energy Company Obligation is expected to reduce homes' annual energy bills by £150

Public warm homes funding will be slashed by an estimated 25% across the rest of this parliament after Rachel Reeves' decision to axe the Energy Company Obligation (ECO) scheme.

In last month's Budget, the Chancellor announced that the ECO will not be renewed when the current four-year scheme expires in March 2026. According to Budget documents, the energy supplier-funded ECO accounts for approximately 3% of annual electricity and gas bills, and Reeves' decision to axe it is part of a broader package to help households with cost-of-living pressures.

The government estimates that its measures will take around £150 off energy bills from next April onwards.

To cushion the impact of ending the ECO, the Chancellor outlined that the government will provide an additional £1.5bn of capital investment to tackle fuel poverty through the Warm Homes Plan, on top of £13.2bn allocated across the life of this parliament in the summer's comprehensive Spending Review.

However, consultancy E3G has estimated that ending the ECO scheme, which provided around £1.6bn per year for household energy efficiency and home decarbonisation works, will result in total green homes funding being cut by a quarter, from £20bn to £15bn, this parliamentary term.

Hong Kong's deadliest fire in 60 years kills at least 75

A major investigation is under way in Hong Kong after fire swept through the Wang Fuk Court public housing complex in Tai Po on 26 November, killing at least 75 people and injuring 76. The blaze, Hong Kong's worst in 60 years, broke out at 14:51 local time, engulfing seven of eight 31-storey towers. The complex contains nearly 2,000 flats and houses around 4,600 residents. On 27 November, 270 people were still missing.

Three men, aged 52 to 68, including two construction company directors and an engineering consultant, have been arrested on suspicion of manslaughter. Police allege gross negligence relating to scaffolding and foam materials used on the towers.

Warm Homes Plan delay hits Scottish heating legislation

The delayed publication of the UK government's Warm Homes Plan (WHP) has been blamed for Scotland's home heating legislation being pushed back until after next spring's Holyrood elections.

Scottish Housing Secretary Màiri McAllan confirmed on 18 November that the legislation will not be introduced in the Holyrood parliament's current session. The bill could not be published, she said, because the delay to the WHP meant there is lack of clarity on the cost of electricity bills. 'Repeated' delays to the WHP had left 'key questions unanswered', she added.

The Scottish government has published draft legislation, which has been renamed the Buildings (Heating and Energy Performance) and Heat Networks (Scotland) Bill, which McAllan said will be brought forward in the next parliament, subject to the outcome of May's elections.

Morag Watson, director of onshore at Scottish Renewables, said the delayed publication of the bill was 'deeply disappointing'.

McAllan also announced additional grants, from December, for Scottish homeowners of up to £7,500, increasing to £9,000 for those in island and remote rural areas, to incentivise connections to local heat networks.

RICS report shows global demand for green buildings falling

Growth in global demand for sustainable buildings has slowed down, according to a new report from the Royal Institution of Chartered Surveyors (RICS). Published on 11 November, RICS' *Sustainability Report 2025* says that demand for green real estate has notably weakened, particularly across the Americas, Europe, the UK and Asia-Pacific.

It also states that the proportion of construction professionals who report not measuring embodied carbon has risen in the past year, to 46%. This underscores the widening gap between climate commitments and practice, with only 16% reporting that carbon measurement meaningfully informs material choices in project design.

Residents to feel the benefit of latest heat network grants

Around 8,200 residents are set to benefit from improvements to the efficiency of their heating after the awarding of grants through round 9 of the Heat Network Efficiency Scheme (HNES). Seventeen projects will receive a share of more than £7.3m of capital support, including £150,000 to replace the building management system for 19 residential buildings in Stockport. An additional 12 networks have received revenue grant support under the HNES, administered by Gemserve. The latest round brings the total number of residents across England and Wales who are benefiting from HNES support to more than 70,000.

New technical standard to underpin network design

TS1 to replace voluntary code of practice for heat networks

The first formal technical standard for heat networks has been unveiled, supporting the sector's move to regulation. The Heat Network Technical Standard (TS1) replaces the Heat Networks: Code of Practice for the UK (CP1), a voluntary code drawn up in 2020 by CIBSE and the Association for Decentralised Energy.

Funded by the Department for Energy Security and Net Zero (DESNZ), the draft TS1 sets out minimum technical standards. A 'large proportion' of the content is based on CP1, but changes have been made, including developing the standard's structure to align with the Heat Network Technical Assurance Scheme (HNTAS), for which TS1 will serve as the 'principal reference point'. This has involved updating the stages set out in CP1 to fit the HNTAS assessment regimes.

Other changes include 'entirely new' minimum requirements in key technical areas, such as operating pressures, resilience, water quality, insulation and condition of heat networks. The text in CP1 on individual technical requirements has been tightened and clarified.

All retained CP1 minimum requirements have been rewritten to ensure they are suitable for a regulatory technical standard, particularly that the language is in line with ISO guidelines and any ambiguities when conducting assessments are resolved.

New materials originally developed for HNTAS have also been added to TS1, while fresh requirements have been included where clear gaps exist and/or 'significant' shifts in thinking have taken place in the market, industry literature and standards since 2020.

Phil Jones, lead author of CP1 (2020) and DESNZ HNTAS team member, said: 'The move from a code of practice to a "standard" is a key, underpinning reference point for the HNTAS Code documents that are central to implementing the assurance scheme.'

CIBSE Data Centre Group reveals future guidance plans

The CIBSE Data Centre Group says it is aiming to establish best practice around liquid cooling.

Speaking during CIBSE Build2Perform at elementalLONDON last month, Aecom mechanical engineer Felix Cox said the Special Interest Group wants to establish best practice for liquid cooling on temperature ranges, coolant media, filtration and design principles, because existing guidance is minimal.

Panellists from the group also said a TM65 methodology for embodied carbon was urgently needed for data centres because of the 'incredible amount of rare earth materials that go into data centres'. The need for energy efficiency and net zero strategies were also highlighted, with mounting pressure to reduce carbon footprints. Small modular nuclear reactors were suggested as one possible way of lowering carbon emissions.

Other topics discussed during a panel session were the recruitment crisis and the speed of technological change driven by artificial intelligence.

The CIBSE Data Centre Group has gained almost 500 members since its launch in March. If you are interested in contributing to the group, visit: **bit.ly/4p1KmDL**

More than 200 pilots pave way for net zero standard

Insights from industry involvement revealed at conference

A total of 216 projects from 134 organisations have tested the pilot version of the UK Net Zero Carbon Buildings Standard (UKNZCBS) ahead of its launch next year.

The scale of industry involvement was revealed at CIBSE's UKNZCBS conference, held at the Royal College of Physicians last month.

During the event, David Partridge, chair of the Standard governance board, revealed that testing and certification company Bureau Veritas will oversee verifier training and accreditation to ensure independent assessment of buildings. Katie Clemence-Jackson, UKNZCBS CEO, said the appointment would 'bring much-needed robustness and credibility' to net zero claims.

She also announced an 'on track' check at practical completion, in response to feedback from project teams, who wanted a means of demonstrating that buildings were on their way to meeting the Standard. 'At completion, you don't have performance data, so while the check doesn't mean a building is fully aligned, it confirms it's on the right path,' she said.

The event offered insights into lessons from the pilots, with case studies and technical sessions on energy use, embodied carbon and verification methods.

See p18 for more on the conference.

Domestic Building Services Panel migrates to CIBSE

The Domestic Building Services Panel (DBSP) has moved under the umbrella of CIBSE. It will be a dedicated resource within the Institution, funded by the DBSP, that brings together 12 member organisations to support the domestic sector.

Panel publications, including its guidance documents, will now be issued under the CIBSE brand. Further guidance is being developed on heat pumps and systems integration.

CIBSE DBSP chair Andy Mathews said: 'The panel can align its work with the Institution's wider mission of advancing building services engineering, ensuring domestic buildings receive the same level of professional focus and rigour as commercial and industrial sectors.'

Awaab's Law for social homes comes into force

The first phase of Awaab's Law, to improve standards in social rented housing, has been implemented.

The legislation was introduced by the previous, Conservative government following the death in 2020 of two-year-old Awaab Ishak from a severe respiratory condition resulting from prolonged exposure to mould in his family's Rochdale flat. It obliges social landlords, including housing associations and local authorities, to fix emergency health and safety hazards within 24 hours of them being reported.

Social landlords must also investigate significant damp and mould within 10 working days of being notified, and make the properties safe within five working days. For both types of hazards, landlords must confirm the findings to tenants in writing within three working days of inspection.

As part of the reforms, social landlords must now also consider the circumstances of tenants that could put them at risk – including young children and those with disabilities or health conditions. Alternative accommodation must be offered if homes cannot be made safe within the required timeframes.

The government has committed to extend protection to the private rented sector through changes to the Renters' Rights Act, which received Royal Assent in October.

cibse News

Ghana trip for SoPHE Young Engineers Awards winners

Saskia Verkaik and Harry Robbiati will go on site with charity Village by Village

Left to right: Mike Carter, SoPHE chair; Juliana Santos; Saskia Verkaik; Harry Robbiati; Sanjay Modasia, SoPHE vice-chair/SoPHE Contractors Group chair; Paul Marsden, SoPHE Industry Working Group chair

Saskia Verkaik, winner of the Society of Public Health Engineers (SoPHE) Young Engineers Award, and runner-up Harry Robbiati have won a trip to Ghana with charity Village by Village, which collaborated on the awards, to help with a real, onsite project.

This prize was made possible by support from SoPHE Industrial Associates: Geberit; Teekay Couplings; Stormsaver; Grundfos; Polypipe Building Services; European Vacuum Drainage Systems; Aquilar; Horne Engineering; Hydrotec (UK); and JA Brooks Mechanical Services.

The awards were based on the performance of entrants at the SoPHE YEN/Plumbing Centre of Excellence Annual Plumbing Competition, held at London South Bank Technical College earlier this year. SoPHE YEN competed with college learners in hands-on and fault-finding activities, with the aim of bridging the gap in students' learning from domestic to commercial installations. Third place was won by Raveena Carahaa, with Juliana Santos highly commended.

The awards were presented at the 21st SoPHE Annual Dinner, which took place last month in London and brought together more than 300 public health engineering professionals. Michael Darvill was also awarded a SoPHE Honorary Fellowship in recognition of his involvement with the society, which spans more than 20 years. He was the first Industry Working Group chair and has been lead organiser of the annual dinner since 2018.

The night was also an opportunity for the society to launch its new logo, which encapsulates a drop of water, while symbolising two hands clasped together in partnership.

Attendees raised £2,950 for Village by Village to help with its crucial work.

SoPHE would like to thank its Industrial Associates for their continued support and generosity, without which the event would not be possible.

Training

Heat networks Code of Practice

CIBSE, supported by the Department for Energy Security and Net Zero, has developed this training course to ensure that the skills necessary to implement the CIBSE Heat Networks Code of Practice (CP1) are available across the building services sector.

This is a two-day course aimed at practising engineers looking for a detailed understanding of the themes and technical challenges dealt with by the Code, which covers all stages of the development cycle of a heat network project – from feasibility through design, construction, commissioning and operation.

Next dates: 8–9 December
www.cibse.org/training

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

Heat networks Code of Practice	8–9 December
Fire safety in construction	10 December
Advanced simulation modelling for design for performance	10–11 December
Mastering the application of heat pumps	11 December
Analysing heat pump systems	12 December
Earthing and bonding systems	16 December
Leadership identity and self-awareness	17 December
Electrical services overview	18 December
Building services explained	17–19 December

CIBSE's 2026 Training Brochure

CIBSE's 2026 Training Brochure is now available, with a full range of courses to support professional development across the building services sector, complete with updated course information. It will also feature a wide selection of CPD opportunities.
www.cibse.org/training

In December

CIBSE TM70 – Tall buildings drainage design launch

8 December, London

A collaboration by SoPHE Technical committee, academics, engineers and industry partners, TM70:2025 translates experimental testing and validated transient-flow simulations into practical guidance for application.

Light+Intelligent Building Middle East 2026

12–14 January, Dubai

Supported by the Society of Light and Lighting, this event will feature innovative exhibitors and groundbreaking conferences, in the region's largest lighting and building technology exhibition.

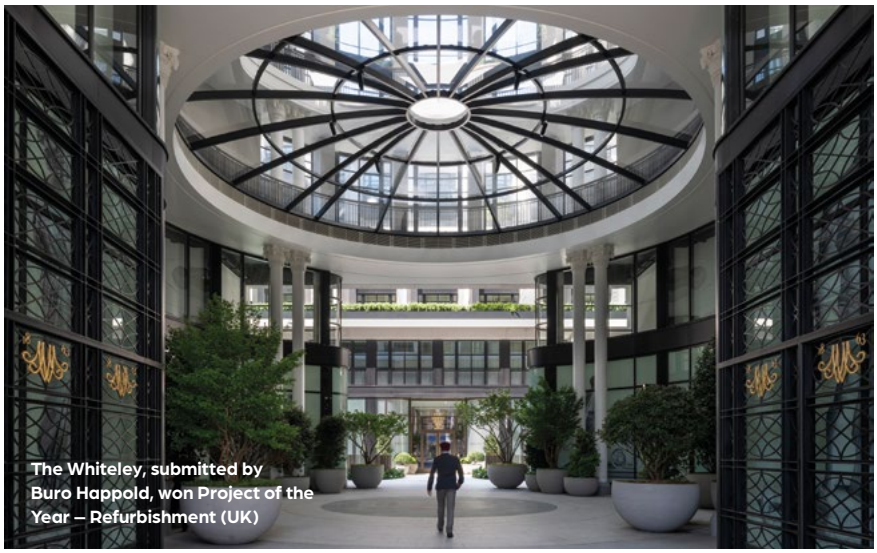
Chain of infection – a reservoir of organisms

13 January, online

CIBSE East Midlands' CPD presentation provides detail on Legionella and Pseudomonas aeruginosa, including favourable conditions and control strategies.

Judges select clear winners at SFE Awards

SFE Façade Design and Engineering Awards celebrate 10th year



The Whiteley, submitted by Buro Happold, won Project of the Year – Refurbishment (UK)

Cutting-edge, creative engineering went hand in hand with sustainability and energy efficiency in the winning projects showcased at the SFE Façade Design and Engineering Awards last month.

Among the technically ambitious schemes was the Zardini building, in Italy, submitted by Maffeis Engineering. It won Project of the Year – New Build (International), and judges said it was a refined and technically rigorous project that balances expressive architectural form with engineering precision.

Project of the Year – Sustainability (UK) went to Eden, A3 New Bailey, in Manchester, submitted by Wintech. It impressed with a unique combination of sustainability, biodiversity and consideration of occupant wellbeing.

Other winning projects had the challenge of designing for specific regional conditions, including the Museum of Anthropology in Vancouver, Canada, which was submitted by Arup and claimed Project of the Year – Refurbishment (International). It was re-engineered to upgrade its seismic performance to resist severe earthquakes, while preserving the original architecture. Project of the Year – Innovation (International), won by Banquet Hall, The Henderson, submitted by Eckersley O'Callaghan, had to consider the wind loads of Hong Kong in relation to its height.

The Zardini building won Project of the Year – New Build International

Jacob Wotton, technical coordinator at the Vistry Group, won the Dissertation of the Year award for *The impact of the Building Safety Act on suppliers and manufacturers in the UK*, and Arup's Mitch Albarran was named Young Façade Engineer of the Year.

The Lifetime Achievement Award was presented posthumously to Simon Webster, a founding member of FMDC, whose work exemplified technical excellence, creative integrity and a deep commitment to collaboration.

This year marked the 10th anniversary of the Façade Awards and a celebratory booklet is available at **bit.ly/CJFacAw25**

Thank you to headline sponsor Hilti. See winners at: bit.ly/CJFacWin25

Embodied carbon register launched

CIBSE Certification has launched the first verified carbon data products register for mechanical, electrical and plumbing equipment.

The Embodied Carbon Verification (ECV) Register brings together verified carbon data from manufacturers in one source, giving designers, specifiers and clients greater confidence in their embodied carbon assessments.

The register offers open access to verified data for a growing list of products. It follows CIBSE Certification's development of the ECV scheme, which is based on the CIBSE TM65 methodology.

● **For more information, visit: bit.ly/CJECVSe25**

CPD Panel issues guiding principles

CIBSE's CPD Panel has published a guidance document for all CIBSE-approved CPD presentations. The document aims to ensure that CPD sessions meet the expected standards of technical quality and deliver genuine learning value.

These guiding principles serve as a checklist to ensure content is clear, relevant and up to date. Presentations need to avoid commercial bias, and base recommendations on evidence and best practice.

● **To read the CPD Panel's guiding principles, visit: bit.ly/CIBSECPDpanel**

Data Centre group seeks volunteers

The CIBSE Data Centre group is on the lookout for people to volunteer to co-author a series of influential guidance documents to shape industry best practices and support professionals in the data centre sector. Current projects include: zero generation strategies guidance; sustainability guidance for data centres; and liquid cooling for data centres.

● **Visit: bit.ly/CJdavol25**

CIBSE celebrates design excellence in Middle East and North Africa

Middle East projects triumph at MENA Awards held in Dubai

Projects demonstrating a commitment to sustainability, innovation and renovation, and the people and companies driving this development, stood out at the CIBSE Middle East and North Africa Awards.

The ceremony took place in Dubai on 30 October and brought together 400 attendees to celebrate the MENA region's achievements in building services engineering. Notable wins included the fit-out of Buro Happold's Riyadh office in Saudi Arabia, which won the MEP Building Performance Award.

The striking Jumeirah Marsa Al Arab resort in Dubai, a 140,500m^2 ultra-luxury destination, won the Mechanical Project of the Year and MEP Project of the Year for Ramboll.

Staff from Ramboll, which won Mechanical Project of the Year and MEP Project of the Year for Jumeirah Marsa Al Arab, and Embodied Carbon Initiative of the Year – Consultants

Al Maryah Tower, in Abu Dhabi, which won Retail Project of the Year for Cundall, was a major upgrade of a long-vacant structure, and set a precedent for how the Middle East can tackle climate and economic challenges by prioritising retrofit over demolition.

There was recognition for individuals who are driving the industry forward, together with those making a mark at the start of their careers. Dhwani Ajit Ashar, from Buro Happold, was named MEP Young Engineer of the Year. 'Dhwani has an excellent future and we look forward to seeing her grow,' said the judges.

Dan Ehrald, of RED Engineering Design, was named Electrical Engineer of the Year, with the judges praising his depth of knowledge.

Other individual winners included: Priscilla Jane Joseph, of Zutari Middle East, Sustainability Engineer of the Year; Sheik Azaz Ahmed, Trilux, Executive of the Year; Nicholas Byczynski, AESG, Executive of the Year; Alreem Alfahim, Arup, Graduate of the Year; Samima Saqib, Arup, Mechanical Engineer of the Year; Nagarajan Thanumorthy, National Engineering Bureau

Winners celebrate victories at the CIBSE Middle East and North Africa Awards 2025

Desert Rock Resort, Saudi Arabia, which won Electrical Project of the Year for WSP Middle East

Consultants, Plumbing Engineer of the Year.

The Student Design Competition, sponsored by Seed Engineering and Polypipe, was presented to Biji Binu, Kiran Krishnan, K Marwa and Khalid Ali, from Manipal University.

The headline sponsor was FJ Group and other sponsors were: Al Sahoo, CVS, GF Corys, Meinhardt, Polypipe, SKM Air Conditioning, Valsir, Victaulic, GHD, Hira Industries, Hira Walraven, Maico Gulf, Huda Lighting, Trilux, Viega and Watertec.

For the full list of winners, visit: www.cibse.org/MENA

Leadership strengthens ties with MENA region

CIBSE President Vince Arnold and CEO Ruth Carter connected with industry leaders, policymakers and members on a visit to the Middle East and North Africa (MENA) region in October.

They were joined by CIBSE MENA chair Imran Shaikh and their visit highlighted the Institution's growing presence in the region. It resulted in CIBSE strengthening relationships, exploring opportunities for technical collaboration and celebrating the achievements of the region.

Arnold and Carter's visit coincided with the renaming of the CIBSE UAE region to CIBSE MENA. Its mission is to set a benchmark for excellence, balancing global standards with local ingenuity.

The trip included a visit to BK Gulf's offices and modular factory in Dubai, where Arnold and Carter saw the strong graduate training programme.

In Riyadh, the CIBSE delegation met the team at the King Abdullah Financial District (KAFD), to explore opportunities to support its ambition to become a sustainable, urban environment. The meeting was a step towards a deeper partnership, with CIBSE looking to support KAFD's Vision 2030 commitments.

The delegation met the Egis engineering team, and signed a memorandum of understanding (MOU) to begin the accreditation of a graduate training and development scheme. CIBSE also signed an MOU with Arup to progress accreditation of the engineer's graduate schemes.

Arnold delivered the opening keynote at the MEP International Conference MENA, emphasising the role of smart policy and regulation, and the need for collaboration.

The CIBSE Decarbonisation Conference 2025, hosted by CIBSE MENA, looked at practical pathways to net zero, with sessions covering cooling, net zero and data centres.

Arnold and Carter also attended the Student Design Competition 2025. The theme, Intelligent Buildings, challenged participants to explore IoT-driven systems, adaptive lighting, smart HVAC and real-time energy optimisation.

In addition, they met the project team for Desert Rock Resort in Saudi Arabia, which won the CIBSE MENA Electrical Project of the Year award.

Young engineers celebrated in ANZ

The achievements of young engineering professionals were celebrated at the CIBSE Australia and New Zealand (ANZ) Young Engineers Awards last month.

Students, graduates, mentors and the businesses that support them were recognised at the event in Melbourne.

Students, graduates and young engineers had to submit video entries that responded to the challenge of reimagining the way building performance is perceived. The winners were:

Mark Griffin Award – Student of the Year: Benjamin Moss, University of Sydney

Haris Moraitis Award – Graduate of the Year: Finn Veeneklaas, WSP

Jack Pirie Award – Young Engineer of the Year: Kimberly Lowe, Aecom

Jeff Robinson Award – Engineering Advocate of the Year: Storm Harpham, Simx

Guest speaker Jack Blackwell, zero carbon buildings officer at the City of Melbourne, outlined the city's sustainability ambitions, while James Moyes, chair of the CIBSE Victoria Chapter, spoke on the CIBSE Presidential theme of paying it forward.

He said: 'Every hour, every idea, every act of generosity strengthens our profession and leaves a legacy for future generations.'

● **See the award-winning entries at:** bit.ly/CJANZAw25

Left to right: Molly Behling, Max McCone, CIBSE YEN Global Chair, Vince Arnold CIBSE President, Anand Tailor

Scotland hosts Global YEN Conference

The Young Engineers Network (YEN), Global welcomed 33 representatives from across the world to Glasgow and Edinburgh recently, for the CIBSE YEN Global Conference Weekend.

Hosted by CIBSE YEN Scotland, the event started with a Stem Outreach session featuring Glasgow Kelvin College. YEN representatives undertook a range of practical sessions, including wiring, soldering, pipe bending and flue testing, while being guided by faculty staff and apprentices attending the college.

The YEN cohort then went on a factory tour to learn about process engineering, waste heat recovery and the role of building services in beverage manufacturing, before attending the highlight of the weekend: the CIBSE Scotland Annual Dinner.

At the dinner, several members of the CIBSE YEN Global Committee were recognised for their contributions. Molly Behling and Anand Tailor were presented with Presidential Commendations for their ongoing roles as communications leads for CIBSE YEN Global. CIBSE Scotland YEN Chair Aidan McGhie also received a Presidential Commendation for his contributions to CIBSE Scotland and YEN on a regional and global level.

The weekend concluded with a visit to Edinburgh for the conference, which took place in The Royal Scots Club. It featured workshops to advance the network's mission, strengthen its integration within CIBSE's broader framework, and develop initiatives to increase the number of young engineers entering the industry.

One year on: CIBSE accelerates decarbonisation at Saffron Hill

One year after CIBSE staff relocated to their new headquarters in Saffron Hill, Farringdon, the Institution is celebrating the successful integration of its team while accelerating decarbonisation and preparing for the creation of its industry-leading Skills Hub in the new year.

Staff moved into the top two floors on 9 December 2024 as part of a Phase 1a refurbishment that focused on improving the office interiors. Project manager Rebecca Drinkwater confirmed that the investment has already paid dividends for the team.

'They've adapted to the space really well, and it's inspired staff. That's worth celebrating,' she said.

CIBSE is planning a follow-up Building Use Studies survey to measure the tangible difference the move from Balham to Saffron Hill has made to occupancy satisfaction.

The focus is now on Phase 1b, the refurbishment of the basement and ground floor to deliver the Skills Hub, members' area and a dedicated conference space, with a target launch set for spring 2026.

Drinkwater revealed that following consultation with a wider group of engineers, CIBSE is accelerating decarbonisation and improving aspects of the building services now, particularly controls.

By improving the BMS, Drinkwater said CIBSE would be able to access data that will enable it to understand the next decarbonisation phase. 'We are taking steps now to put the building on a better footing,' she said.

Q&A

Chair of the CIBSE Benevolent Fund committee **Kevin Kelly** FCIBSE highlights the essential role of the fund, and how you can do your bit to support fellow members

The CIBSE Benevolent Fund offers support to members, former members and their dependants who are experiencing significant need, hardship or distress. It offers grants – one-off or regular payments – to those who might be impacted by illness, bereavement or financial hardship.

CIBSE Past President and chair of the fund committee Kevin Kelly highlights the essential role of the fund and how CIBSE members can help.

Q A Who and how does the Benevolent Fund help?

It helps members, former members and their dependants, who, for any one of a large number of reasons, end up in distress. Current or former members, or their dependants, who paid subscriptions for at least three years can apply for funds.

Q A How do people apply for help and support?

Application can be made by contacting regional committees, societies or CIBSE directly. There is a lot of information on the Benevolent Fund web pages, including details of all the regional almoners.

Q A What happens when someone makes contact with the fund?

Sometimes we get direct contact with the fund, or it comes through CIBSE or regional representatives. We follow up as promptly as we can with the person. Usually, I make contact to understand the issue and then ask the local almoner to make contact in person. They can help fill in a claim form.

We give claimants a sympathetic hearing. Sometimes it is advice that is needed, but often it is financial help that is provided. Only the chair and almoner know the person's name. Payments are made through bank transfer, so these details of the beneficiary are held confidentially by CIBSE Finance.

Beneficiaries' identities are never disclosed online or at management meetings, where decisions are made. We have high ethical standards when it comes to protecting the anonymity of beneficiaries.

Q A Where does the fund get its income?

Income comes from four main sources. The first is a voluntary £10 contribution from members when they renew their subscriptions – currently about 25% of members make this payment, but we would love to see this increase.

There are also returns from investments and contributions from CIBSE regions, which can come from donations at events or sponsorship from events.

More support comes from voluntary one-off contributions from members, which may come through legacy donations and includes members donating their interview fees.

"I would urge people to be aware of any member who may be in distress and could benefit from the help of the fund"

Q A How can CIBSE Members help the fund?

I would really encourage members to consider adding the £10 contribution at renewal time – it really can make a difference to members if they find themselves in changed circumstances, and we are grateful for each and every donation.

I would also urge people to be aware of any member who may be in distress and could benefit from the assistance of the fund. Encourage them to get in touch to see if we can be of help.

Q A How many trustees and almoners are there?

There is one almoner in each CIBSE region, appointed by the regional chair and fund chair. They act as a liaison between each region and trustees, and they are the main contact for members needing assistance in their region. There are currently 10 trustees, some of whom have been nominated by the CIBSE Board and others who are almoners.

Q A How much work is involved for almoners?

They meet quarterly and are expected to liaise with each client in their region before each meeting, so they can give an update on cases. Some regions have up to three clients, while others may have fewer.

Q A Who can contact the CIBSE Benevolent fund?

Anyone can contact the fund for themselves or on behalf of another member, or former member, or their dependants. They can contact me directly at **kevintkelly54@gmail.com** or through CIBSE or regional committees. For more on the fund, or to contact an almoner, visit **bit.ly/CJBENF25** ●

Engineering responsible AI

A landmark report by the National Engineering Policy Centre provides a blueprint for sustainable digital infrastructure. **Anastasia Mylona** explains why CIBSE engineers have a key role to play in minimising AI's environmental impact

Earlier this year, the National Engineering Policy Centre (NEPC) – led by the Royal Academy of Engineering in partnership with the Institution of Engineering and Technology, and BCS, The Chartered Institute for IT – released a landmark policy report, *Engineering responsible AI: Foundations for environmentally sustainable AI*.

This piece of work addresses a critically under-recognised dimension of the artificial intelligence (AI) revolution: the resource use, environmental impact and infrastructure demands of large-scale AI systems. Its findings have direct relevance for building services engineers and infrastructure professionals, touching on data centres, demand for cooling, power supply, materials supply chains and sustainability obligations.

The explosion of AI deployment across sectors has implications that go beyond software. The NEPC report highlights that AI systems and their enabling infrastructure (for example, large language models, computing clusters and data centres) place

growing demands on energy, water and 'critical' materials, resources that are managed (or should be managed) within the built environment. For example: data-centre cooling and compute loads drive increased energy demand; many data centres withdraw potable water for cooling; and manufacture and end of life of server hardware draw on rare materials, impact e-waste and create supply-chain risk.

From a building services viewpoint, this means mechanical, electrical and sustainability engineers must now view AI infrastructure as part of the 'services' system – not just for IT, but for site infrastructure, cooling, power resilience and resource management.

Key recommendations

The NEPC report formulates five 'foundational steps' that governments, organisations and infrastructure providers should adopt to mitigate the environmental impact of AI systems. They are: expand environmental reporting mandates; address information gaps across the value chain; set environmental standards for data centres; reconsider data collection, transmission, storage and management practices; and lead the way with government investment. (see panel, 'Five foundational steps').

Implications for building services engineers and CIBSE members

When designing or specifying data centres, cloud hubs or AI-hosting infrastructure, the 'services' requirement must include water use (cooling), thermal management, electrical demand profiles, resilience and decommissioning/reuse of hardware.

The business case for AI infrastructure should factor in not just compute cost, but resource cost, environmental sustainability, and cost of power and water. Engineers should support metrics around these factors.

Existing certifications and standards may need revision or expansion to explicitly include metrics around AI compute loads and associated cooling/water demands.

Professional engineers should engage with the 'digital infrastructure' agenda as part of sustainability and net zero plans: AI-hosting is a growing part of the built environment. Education, professional development and client

Five foundational steps

Expand environmental reporting mandates: require companies, especially those operating large-scale AI compute infrastructure, to disclose carbon emissions and energy, water and material use.
Address information gaps in the value chain: ensure developers, operators and users of AI systems have access to data about environmental impact and infrastructure demands.
Set sustainability requirements for data centres: embed cooling-water use, critical materials, power efficiency, e-waste recycling into design and operation.
Reconsider data collection, transmission, storage and management practices: ask whether large-scale data hoarding, unnecessarily heavy models or redundant compute are justified, given their resource footprint.
Lead the way with government investment: encourage low-resource AI, efficient hardware and sustainable infrastructure, and procurement decisions that embed sustainability.

briefing must now incorporate an awareness of AI sustainability issues – not just ethical or algorithmic concerns, but the physical/engineering infrastructure side. The NEPC report urges that environmental sustainability should be embedded in education.

Challenges and future directions

While the report makes a strong statement about environmentally sustainable AI, implementation presents challenges. Data centres' energy- and water-use figures are often opaque; operators may classify them as commercially sensitive. The report warns of the risk that AI growth could undermine other decarbonisation efforts if unmanaged.

A further challenge for the building services sector is that clients often focus purely on IT/compute value, rather than infrastructure resource value. Bridging that gap will require technical specification and effective stakeholder communication.

The NEPC also points beyond the near term: future AI systems may demand orders of magnitude greater computation, implying that current design practices will need to evolve. The report is the first in the Engineering Responsible AI programme and signals further work that is planned on how AI systems can deliver societal benefit while aligning with sustainability.

A blueprint and warning

The NEPC's *Engineering responsible AI* report sets a timely and important agenda for how AI deployment must align with environmental sustainability.

As AI becomes more embedded in industry, research and public services, the physical infrastructure that supports it must be designed, operated and managed in a resource-efficient, sustainable way. For engineers tasked with the infrastructure behind the screens, this report offers both a warning and a blueprint.

CIBSE members and building services professionals should explore how the five foundational steps apply to their project scope, and proactively engage in the design of data centres, AI hosting and compute infrastructure systems, with sustainability at their core. ●

Accelerate the switch by closing the spark gap

Reforming electricity pricing is key to speeding up widespread UK heat pump adoption, says Mitsubishi Electric's Graham Temple

We recently exhibited two groundbreaking products at elementalLONDON: our City Multi R32 YXM VRF air conditioning system and our Ecodan CAHV-Z R290 Commercial air source heat pump.

Interest in both was strong, and with the growing push to cut carbon in commercial buildings, these products are well placed to support decarbonisation.

The exhibition followed the launch of our second heat pump report, *Accelerating the switch*, which examines what is needed to drive the commercial and residential heat pump adoption essential for meeting the UK's legally binding net zero targets.

Although barriers to the mass-market adoption of heat pumps remain, the report highlights some encouraging findings.

Research by Dr Ed Manderson, of the University of Manchester, shows that a 7% drop in electricity prices could increase domestic heat pump installations by around 9%.

A similar trend appears in the commercial sector, where rebalancing electricity prices could significantly boost uptake. His research identifies a critical tipping point, with the desire to reduce emissions being outweighed by the reality of energy bills.

To transform how we heat UK buildings, *Accelerating the switch* argues that we must first reform an electricity pricing system that penalises low carbon choices.

The report concludes by calling for urgent action to remove the cost barriers holding back heat pump adoption. This includes:

- Shifting green levies away from electricity to reflect the UK's net zero goals. Current levies add £140 to electricity bills, but just £50 to gas, making heat pumps the more expensive option to run
- Decoupling electricity from volatile gas prices
- Expanding and promoting financial support schemes.

Read the full report at: bit.ly/HeatPumpsMitsubishi

● **Graham Temple is marketing manager at Mitsubishi Electric**

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Piloting net zero

The highly anticipated UK Net Zero Carbon Buildings Standard is set to launch in early 2026, after a year of feedback from more than 200 pilot projects. At a recent CIBSE conference, engineers shared the lessons that have been instrumental to defining the Standard's final version. **Molly Tooher-Rudd** reports

The UK Net Zero Carbon Buildings Standard (UKNZCBS) is almost ready for launch. In the past year, a large body of evidence has been gathered as more than 130 building owners stress-tested the Standard in 200 real-world projects.

These pilot schemes formed the backdrop to UKNZCBS in Practice, a one-day CIBSE conference held at the Royal College of Physicians last month. With version one of the Standard due in early 2026, industry gathered to hear what the pilots revealed and how the Standard is evolving.

The Standard brings together net zero carbon-aligned requirements for all major building types – existing and new build – across the UK. It sets out metrics by which performance is evaluated, and limits and targets that need to be met. These include operational energy use, embodied carbon, onsite renewable electricity and refrigerants, as well as the need to avoid fossil fuel use on site.

Katie Clemence-Jackson, CEO of UKNZCBS

Verification updates

Opening the event, David Partridge, chair of the UKNZCBS governance board, emphasised the unprecedented collaboration driving the Standard's development. 'I've never seen industry come together in such a way,' he said.

He also stressed the Standard's core purpose: closing the performance gap. 'We need to demonstrate real carbon savings, not theoretical ones. This needs to become business as usual, in the same way that you ensure a building conforms to safety regulations.'

Partridge also announced an important development: the appointment of Bureau Veritas as the Standard's verification administrator. It will be responsible for establishing the framework and accrediting verifiers, which will involve registration and evidence compilation, a verifier appointment and review, and, finally, the issuing of a certificate. This will be followed by ongoing reverification, usually annually.

Katie Clemence-Jackson, CEO of UKNZCBS, summarised progress since the pilot version was released, saying testing has taken place across 216 projects from 134 building owners. A major area of focus has been the development of equivalence – now termed 'deeming to satisfy' – which sets out how existing Standards, such as NABERS UK, Passivhaus and Breeam, can conform to aspects of the Standard. 'We don't want people doing extra homework,' said Clemence-Jackson. 'If you're already using a robust scheme, we're looking at how you can achieve multiple standards without duplicating your efforts'.

Another significant update after feedback from the pilots is the introduction of an 'on track' check at practical completion. Because the Standard is outcomes-based, operational performance cannot be proven at handover, Clemence-Jackson explained: '[The check] is not a claim that the building meets the Standard; it's a helpful indication that it's plausibly aligned and on the right path.'

Across the day, the audience heard from project teams that had trialled the Standard.

Driving change in offices

Tom Spurrier, sustainability director at Hoare Lea, shared lessons from retrofit and new-build office pilots. He flagged that embodied carbon limits for new builds, particularly façades, are challenging, and said a delineation approach would be crucial, as tenant energy usage and fit-out are not in the landlord's control.

However, Spurrier also highlighted the refrigerant limits for offices as one of the most effective levers for carbon savings: 'They're not glamorous, but publishing a clear limit genuinely drives change. We've seen design teams rethink HVAC approaches because of it.'

Panellists at the UKNZCBS in Practice conference at the Royal College of Physicians

Passivhaus's educational advantage

Glyn-coch Primary School in Wales from Wilmott Dixon demonstrated how Passivhaus design naturally creates a buffer for the Standards operational limits. Embodied carbon proved more challenging because of anomalies such as science-lab gas use, a potential exemption under review. Timber construction was a real driver in helping reduce embodied carbon.

Doug Drewniak, principal building performance manager at Willmott Dixon, said a key takeaway was that design efficiency often meant embodied carbon efficiency. 'The 2030 targets are ambitious. What's great is the Standard is material-agnostic, which drives innovation in an industry where concrete and steel are essential,' he said.

The challenge of concrete in hospitals

Velindre Cancer Centre, designed by White Arkitekter, aims to be the greenest hospital in the UK. It demonstrated the challenge of aligning NHS requirements for high-intensity services with the Standard's goals. Concrete is unavoidable in radiation areas, but the team explored how to reduce embodied carbon through local sourcing and natural materials and transport choices.

Christian Dimbleby, head of sustainability UK at White Arkitekter, said NHS requirements formed a barrier to timber, but added that there was robust evidence that it can be used and meet compliance. 'We need to be challenging briefs and pushing the boundaries,' he said.

Raising the bar for housing

ECD Architects' (ECDA's) deep-retrofit programme with Cambridge City Council highlighted the difficulty of meeting the Standard limits at scale in social housing. Homes vary significantly, data access is challenging, and deep retrofit is still far from the sector norm.

'The 98% retrofit prediction by 2050 assumed by the model may be optimistic,' said Loreana Padron, regional head of sustainability and associate director, ECDA. 'It will take significant funding to achieve the Standard in this sector.' However, meeting the targets in retrofit homes is possible, she added, where ambition, fabric-first design and better procurement routes exist.

Ross Boulton, interim sustainability director of developments at Landsec, believes the new-build residential sector is under the most strain, with many projects not meeting the compliance limits for the Standard. Regulatory pressure, insurance trends and fire-safety constraints complicate material selection and low carbon design – but that is exactly why the Standard is needed, he argued. 'Circularity, retention and reuse is vital for decarbonising. We have to build less and increase retention through existing building stock,' he said.

Clemence-Jackson urged delegates to support the Standard. 'Use your collective power, start getting buildings on target and help us drive the transformation the industry needs.' ●

For more information on the UKNZCBS, visit: www.nzcbuildings.co.uk

Building foundations

The first version of the UK Net Zero Carbon Buildings Standard is a clear, credible standard that will empower the industry to build better, smarter and greener, says AtkinsRéalis' **Tom Tang**, who has been working on the initiative for the past two years

In the new year, the UK will take an important step towards its climate goals with the official launch of the UK Net Zero Carbon Buildings Standard (UKNZCBS). This is a unified framework that defines what it means for a building to be net zero carbon aligned and marks the culmination of years of collaborative effort across the built environment sector.

Although various organisations have introduced targets and frameworks, the UK has never had a single national approach, despite industry calls to embed whole life carbon assessments into Building Regulations, – such as the proposed Part Z, which would mandate the assessment and limitation of carbon emissions in new buildings.

The Standard aims to change that. It provides a verified status for buildings that meet rigorous carbon performance criteria, covering embodied and operational carbon. This Standard is not yet mandatory, but it is already being embraced by developers, investors and clients who are serious about meeting environmental, social and governance (ESG) requirements, and contributing to the UK's 2030 and 2050 net zero goals.

Developing the Standard

My own journey with the Standard began two years ago, when I was seconded to one of its task groups. Sponsored by my team at AtkinsRéalis, I dedicated half a day each week to this initiative, gradually getting more deeply involved. Initially, I served as technical secretariat for the embodied carbon task group, attending every meeting, taking notes and coordinating actions, but as my expertise in whole life carbon grew, so did my contributions.

One of the most critical aspects of the Standard is the establishment of embodied carbon limits, the numerical thresholds that projects must meet to qualify as net zero carbon aligned. To support this, we collected and analysed

more than 800 datasets from across the industry. I was directly involved in this data collection and analysis, helping to shape the benchmarks that will guide future construction.

Today, I continue to serve on two working groups, helping to fine-tune the Standard ahead of its official release. I work closely with clients, advising them on how to prepare for the Standard and testing its pilot version on live projects.

One of the most anticipated elements of the Standard is its verification process, which is being developed and will be released with version 1 in early 2026. Much like Breeam, this process will allow consultancies such as AtkinsRéalis to become verifiers, assessing projects and awarding the net zero aligned badge. Beyond verification, we'll also support clients in designing and delivering buildings to meet the Standard.

Over the past year, we have worked with a range of clients to test and apply the pilot standard, collaborating with major UK organisations to integrate the Standard into their sustainability guidance and apply elements of the pilot version to ongoing projects.

These engagements demonstrate the growing demand for net zero buildings and the value of having a clear, credible standard. For landlords, the badge can boost rental income and attract tenants with strong ESG commitments. For tenants, it simplifies compliance with frameworks such as GRESB and other global reporting standards.

Challenges ahead

While the Standard is a major step forward, challenges remain, including the complexity of building typologies. The Standard currently defines more than two dozen types, but some, such as transport hubs, don't fit neatly into existing categories. AtkinsRéalis is working with public sector clients to develop tailored approaches for these unique assets.

Another challenge is data quality and consistency. The initial dataset we analysed was messy, reflecting the absence of a unified methodology. As the House of Commons Environmental Audit Committee states, 'the first step must be a requirement to undertake whole life carbon assessments for buildings so the industry can start measuring, and then controlling, for this carbon'. Only then can we drive meaningful reductions.

Finally, there's the question of adoption, because without regulatory backing, uptake depends on market incentives. Fortunately, the momentum is strong, and developers, investors and tenants are increasingly demanding net zero buildings.

The Standard provides the clarity and credibility they need, and it's more than a technical framework; it's a catalyst for change. By providing a clear definition of net zero, it empowers the industry to build better, smarter and greener – and that's a future worth building. ●

● **Tom Tang, sustainability and asset management consultant at AtkinsRéalis**

Intelligence gathering

The CIBSE Build2Perform theatres at elementalLONDON tackled key issues affecting building services, including the challenge of optimising data-centre efficiency in the face of AI's voracious energy and water demands

CIBSE had a substantial presence at the elementalLONDON exhibition and conference last month. There were two dedicated Build2Perform theatres, featuring expert speakers, from across industry, who presented on topics ranging from decarbonisation and building performance to indoor environmental quality and inclusivity in the workplace.

Among the highlights was a packed panel session hosted by the CIBSE Data Centre Group. It delved into the challenges and opportunities of this fast-evolving sector, and explored three of its most urgent talking points: the need for new, future-proof technical guidance; the recruitment crisis; and the speed of technological change driven by AI. The group aims to provide authoritative guidance, share emerging knowledge, and support best practice in data centre design and operation.

Iain MacDougall, head of sustainability solutions at Red Engineering, highlighted that, in 2024, the UK's data centre MEP value surged to £1.05bn – 60% larger than the office sector. With AI rapidly reshaping and expanding digital infrastructure, MacDougall said the group has identified areas of research necessary to address emerging challenges.

Heat recovery and sustainability were recurring themes. MacDougall noted that 'everyone has tried it; very few have prevailed', and he stressed the need for frameworks that work in both political and technical realities.

TM65 is increasingly central to guiding reductions in embodied carbon as facilities grow. 'An incredible amount of earth materials [including rare earth materials] go into data centres. I'd like to see dedicated TM65 for data centres,' said Mohammad Royapoor, head of R&D at Red Engineering.

Energy efficiency and net zero strategies remain urgent. Austin Williamson, technical director at Foreman Roberts consulting engineers, stressed that data centres cannot function without reliable power, yet they face mounting pressure to reduce carbon footprints. He pointed to the need for systems that can deliver resilience while cutting emissions, which will involve redesigned power-distribution networks, microgrids and, potentially, small modular reactors.

The CIBSE Data Centre Group panel session

Liquid-cooling research

Liquid cooling is a major emerging frontier. Felix Cox, mechanical engineer at Aecom, described the industry as being in a period of 'exciting technological evolution, driven primarily by AI workflows and large language models'. With minimal existing guidance, the group's liquid-cooling workstream aims to establish best practice on temperature ranges, coolant media, filtration and design principles.

As innovation accelerates, however, the workforce is struggling to keep pace. With the average EU data centre professional now aged 53, MacDougall warned of an impending skills gap.

Shabna Hayes, regional director at Aecom, added that women remain severely underrepresented within the sector, making up just 8% of the workforce. 'We need to create more awareness of recruiting a wider range of individuals into the sector,' she said.

CIBSE President Vince Arnold gave a keynote on some of the major themes of the event, including the use of AI, retrofitting, decarbonisation, and the transition to low carbon heating and electrification. He stressed the importance of human-centred approaches, including diversity and inclusion, and said catering for a range of populations is essential for a resilient, high-performing built environment.

Inclusive engineering

The importance of inclusion was reinforced in a CIBSE debate on neurodiversity. The panellists stressed that inclusivity is a moral and ethical necessity that also leads to more profit, as having diverse patterns of thought results in more diverse solutions.

Naomi Jackson-Macfarlane, student wellbeing adviser at Imperial College London, highlighted the issue of intersectionality, where barriers are amplified for neurodivergent people from marginalised backgrounds.

Panellists offered solutions on creating a supportive culture. Past CIBSE President Andy Ford FCIBSE encouraged employers to 'get people talking to each other' and provide opportunities for open communication.

Chris Openshaw, co-chair of Divergent at Cundall, agreed: 'Knowing there are people similar to you makes people feel recognised and seen.'

Workspace adjustments were discussed – such as noise-cancelling headphones, less visual distraction and quiet areas – and Chloe Agg FCIBSE, engineering lecturer at Imperial College London, emphasised the power of individual action: 'Offer kindness – it's brilliant for neurodiversity and others.' ●

For more on the CIBSE Data Centre Group, visit bit.ly/CIBSEDataCentres

Standout performers

Judges reflect on the increased use of data and AI among entries for the 2026 CIBSE Building Performance Awards. **Alex Smith** highlights their comments at the recent shortlisting

The highest ever number of entries for the CIBSE Building Performance Awards (BPAs) reflects the growing demand for high-performing buildings in the UK and the rest of the world.

By requiring energy performance disclosure, building rating schemes – including NABERS UK and the UK Net Zero Carbon Buildings Standard – are forcing the industry to be accountable for delivering the operational performance promised during the design phase.

There has been a surge in entries for Workplace of the Year categories (new, retrofit and portfolio), which is likely to be associated with the drive in demand for sustainable offices by occupiers, developers and investors.

Judging for next year's awards took place last month. The panel comprised 53 industry experts representing consultants, contractors, developers and manufacturers. Among the categories judged were two new Building Performance Evaluation awards – one for Products/Innovation and one for Projects.

The judges were particularly impressed by entries in the Products/Innovation category, praising manufacturers for their eagerness to analyse the large amount of data now being produced by buildings. Manufacturers were also complimented on their increasing attention to the reduction of embodied carbon in their products and processes.

Judges said the entries for the CIBSE Embodied Carbon Award – Products and Systems had 'significantly' improved, and there was progress not only in assessing embodied carbon, but also in reducing it. The efforts of manufacturers to understand the supply chain and provide accreditation for their products is impressive, they added.

For the CIBSE Embodied Carbon Award – Services and Projects, the judges noted that there was more evidence of consultants using Environmental Product Declarations and other forms of whole life and embodied carbon-assessment methods and standards. More steps had also been taken to reduce embodied carbon in projects and the judges saw impressive engagement activities in the construction industry to raise awareness of the impact of embodied carbon.

Another particularly strong category this year is Building Performance Consultancy (up to 50 employees). Judges called it 'very competitive and inspiring', and said there were excellent examples of data analysis, post-occupation evaluation, embodied carbon measurement and the use of artificial intelligence to support learning and improvement.

As an individual award, Engineer of the Year is among the most coveted at the BPAs. This year, the judges have been bowled over by the quality of those they have spoken to in face-to-face interviews. They said the shortlisted entrants were outstanding, and judging was particularly difficult because of the depth of experience and knowledge across the finalists. 'The standard was exceptional,' they added (see images right).

The judges also noted the broad range of engineers entering this year and said the important role facility managers will play in nudging the dial towards net zero was 'really brought home to them'.

In the Collaboration category, judges saw how technology was enabling closer relationships between project teams. 'A lesson from this year's entries is that collaboration excellence increasingly relies on balancing human trust and technological

The judges, chaired by Julie Godefroy, CIBSE's head of net zero, will reconvene at the awards ceremony on 5 March 2026, at the Park Plaza in London. Book your table at: www.cibse.org/BPA

To see the full list of judges, visit this story at www.CIBSEJournal.com

Housing hits new heights

The standard of entries for Project of the Year – Residential was exceptionally high, according to the judges, who noted evidence of increasingly sophisticated approaches to performance and occupant wellbeing.

The submissions suggest that high-performance design is 'becoming a norm rather than an exception', said the judges, calling it a positive signal for the future of residential development.

They were also pleased by the increasing adoption of whole life carbon assessment, 'including from entrants outside the UK, highlighting how best practice is spreading internationally'.

Designers were placing more emphasis on passive resilience, the judges added, and they were encouraged by the emergence of true net zero single-family homes, with onsite photovoltaic generation exceeding annual demand. 'This shows that energy-positive housing is now technically and commercially viable,' one judge said.

There is a four-strong shortlist for Engineer of the Year

Above: Miriam Ozanne, regional director, head of performance, Aecom

Above right: Sean Harlow, head of engineering at Savills

Left: Jessica Glynn, associate at Atelier Ten

Right: Phil Draper, managing director at Twenty One Engineering

integration – the entries showed how data and digital platforms are used to enhance, not replace, the relational dynamics that underpin high performance.'

In the Learning and Development category, judges were pleased to see the large amount of resources being made available to the wider industry, and the diverse range of subjects. 'It shows that the whole industry is taking a very healthy approach to knowledge sharing in building performance,' they said.

The judges were pleased to see that all the entries in the Workplace of the Year – New Build category demonstrated how sustainability goals can be achieved even with a challenging brief. In the International category, they were also pleased to see the extensive use of data to verify designs at the earliest stages, with increased cognisance of occupier feedback loops, commissioning strategy and operator requirements.

The judges were particularly impressed with the Project of the Year – Residential category, and an 'increasingly sophisticated approach to performance and occupant wellbeing'. (See panel, 'Housing hits new heights'). ●

CIBSE BUILDING PERFORMANCE AWARDS 2026

The 2026 CIBSE Building Performance Awards will be held on **5 March 2026** at **Park Plaza Westminster Bridge, London, UK**

BEST DIGITAL INNOVATION - ORGANISATIONAL STRATEGY

- CarbonMe – Hilson Moran
- Engentica - EMSD, Government of Hong Kong
- Origin Operations - Hoare Lea

BEST DIGITAL INNOVATION - PROJECT DELIVERY

- CarbonMe – Hilson Moran
- Electrical Loading + Energy Analysis Tool – Etch Associates
- ML Drawing Assistant – Buro Happold
- Schools Net Zero Investment Tool – Mott MacDonald

BUILDING PERFORMANCE CONSULTANCY (OVER 300 EMPLOYEES)

Sponsor: ABB

- AECOM
- Buro Happold
- Hoare Lea

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- Stanhope

COLLABORATION

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- 2 Redman Place - epx
- Decarbonisation through Data-Driven Partnership - BNP Paribas Real Estate
- One Creative environments

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- Jessica Glynn, Associate - Atelier Ten
- Miriam Ozanne, Regional Director, Head of Building Performance - AECOM
- Philip Draper, Managing Director - Twenty One Engineering
- Sean Harlow, Head of Engineering - Savills

FACILITIES MANAGEMENT

- 11-12 Wellington Place - CBRE
- 20 Fenchurch Street - Savills
- 8 Fitzroy Street - Arup
- Hong Kong Children's Hospital - Hospital Authority
- Landsec - BGIS Global Integrated Solutions
- Landsec Workplace Operations - Landsec
- London Bridge City Estate - MAPP

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Coastal companions: The Marsa Al Arab takes its place alongside the Jumeirah Beach Hotel (left) and the Burj Al Arab

Cooling the curve

The smooth, continuous curves of the Jumeirah Marsa Al Arab luxury hotel offer an elegant contrast to Dubai's cluster of imposing towers. **Andy Pearson** looks at the sophisticated engineering behind the façade

The Jumeirah Marsa Al Arab emerges from the Dubai shoreline like the billowing sail of a giant dhow. Its dramatic, double-curved architecture celebrates Dubai's maritime heritage, but beneath this fluid form lies something equally ambitious: a future-focused mechanical, electrical and plumbing (MEP) strategy delivering world-class comfort, resilience and energy efficiency in one of Earth's most demanding coastal climates.

Opened earlier this year, the 12-storey, 386-key luxury resort was designed by Killa Design for client Jumeirah/Dubai Holding. Design and build contractor ASGC appointed Ramboll to deliver the building services engineering.

What followed was an intensive, BIM-led design and coordination effort that pushed the boundaries of digital engineering. The result impressed far beyond the project team: at the 2025 CIBSE MENA Awards, Jumeirah Marsa Al Arab was named Mechanical Project of the Year and MEP Project of the Year.

Project team
Client: Jumeirah/ Dubai Holding
Architect: Killa Design
MEP: Ramboll Middle East
Main contractor: ASGC

For Imran Shaikh, director of MEP and specialisms at Ramboll Middle East, the brief was unambiguous: 'Deliver a luxury resort that embodies the architectural ambition and exceeds international hospitality benchmarks without compromise on performance, comfort or sustainability.'

The building's geometry shaped everything. The tower is sinuous and wavy in plan; its amorphous floor plates diminish in area as they rise. Conventional straight-line horizontal service routes were fractured and vertical risers had to meld seamlessly around the guest rooms while remaining within the architectural volume.

"In Dubai's coastal climate, cooling design is the dominant engineering challenge"

Compounding the challenge was what Shaikh calls 'a clean roof mandate', eliminating any opportunity to place plant and equipment externally. As a consequence, the majority of plantrooms were concentrated in the basement, supported by a critical distribution void on Level 2, above the public spaces.

Killa Design's free-form architecture demanded early ground rules for the service runs. 'We had to establish vertical and horizontal strategies from day one,' says Shaikh. 'Without this, every riser would have been coordinated in isolation, with 10 different consultants involved each time; it would have taken forever.'

To navigate the constraints, Ramboll deployed computational design and full 3D BIM coordination from project inception. Continuous digital workshops between Ramboll, ASGC, the architects and the specialist trades created an iterative cycle of rapid decision-making.

Parametric models were used to test routing scenarios, refine voids and visualise clashes. Structural, architectural and MEP geometries evolved in tandem, allowing opportunities for concealed service routes to be built into slabs, beams and shaped soffits.

This digital workflow extended into construction. Ramboll's site team used the coordinated models to sequence installations, validate mock-ups and flag deviations early. Weekly leadership forums kept all stakeholders aligned across overlapping design and build phases – a necessity in a programme that Shaikh describes as 'intense', with its overlapping construction and design milestones, which required early procurement decisions. The result was a fully coordinated design delivered at speed, with key service strategies locked in early enough to protect the contractor's schedule.

Practical beauty: The client's brief was to deliver architectural ambition without compromising on performance, comfort or sustainability

Climate-responsive design

In Dubai's coastal climate, cooling design is the dominant engineering challenge. Ramboll used early-stage modelling to shape the sinuous balconies and wraparound terraces to shade the floor-to-ceiling glazing and keep cooling loads to a minimum. 'We used shading as much as possible to reduce the cooling load on the building – a delicate balance for a luxury hotel, because, obviously, they want the best views possible,' says Shaikh. High-reflectance finishes on upward-facing surfaces further reduce solar absorption.

The district cooling provider placed strict limits on available capacity, intensifying the need to drive down loads and avoid oversizing. For a Dubai hotel, Shaikh says it is conventional to assume 80% cooling diversity. For Jumeirah Marsa Al Arab, Ramboll refined the load modelling through simulations and operational scenario analysis, to demonstrate that a 65% diversity factor was achievable. 'We had to demonstrate rigorously that the systems would perform under all realistic operating conditions,' says Shaikh.

The chilled-water system operates with a 9K ΔT (5.5°C supply, 14.5°C return) across the plate heat exchangers on both the primary and secondary loops – a substantial improvement over the typical 6–7K ΔT. This wider temperature differential reduces flowrates, enabling smaller pipe sizes, lower pumping energy, reduced frictional losses and more compact secondary equipment.

Chilled water distribution rises from the basement to the Level 2 services gantry, above which risers extend upwards to serve the guest-room floors. Standardised riser modules and corridor service assemblies improved buildability, cut material waste and helped improve safety on site – an innovation that no doubt contributed to the project logging more than 20

Dedicated fresh-air air handling units incorporate dual heat-recovery wheels

million hours worked without a lost-time incident.

Dubai's warm climate eliminates the need for space heating, so guest rooms are served by 2-pipe fan coil units, sized to keep rooms at a comfortable 23°C. The guest room management system (GRMS) detects when the room is unoccupied, raising the cooling setpoint to 27°C to reduce energy use and adjusting the lighting accordingly. When a guest checks in, a signal is sent from the PMS to the GRMS to return the setpoint to 23°C. The GRMS also turns off the cooling when the balcony doors are opened. Cooling, fresh air and other guest-room services are delivered through dedicated risers, to enable maintenance without disturbing guests, which was an operational requirement.

Fresh air treatment is one of the highest energy loads in Gulf climates. At Marsa Al Arab, outdoor air can enter at 34°C dry-bulb and 32°C wet-bulb, carrying significant moisture. Fresh air handling units (FAHU) processes ambient air at 34°C/32°C through an enthalpy wheel, pre-treating and dehumidifying to a neutral humidity condition of 12.5°C/12°C. The sensible wheel then reheats mixed return air to 20–22°C before it is supplied to the space. This approach prevents over-cooling of the guest rooms in winter, reduces humidity and the risk of surface condensation, and cuts HVAC energy consumption 'by up to 30%', says Shaikh.

Fresh air is supplied to lobbies, restaurants and large public areas via AHUs with recirculation facility. Fresh air supply rates to these spaces are controlled by CO_2 and occupancy sensors. Fresh air supply to the guest rooms is constant volume, with extract via bathrooms. Given the risk of contamination from salt-laden sea air, CFD modelling was used to identify appropriate fresh-air intake locations and to avoid recirculation zones, helping maintain good air quality. Kitchens, spas and gyms have dedicated ventilation systems, with treated make-up air to avoid condensation risk at extraction points and treated exhaust to minimise odours.

Ventilation is also provided to the basement car parks at 3ACH under normal conditions; this can ramp up to 6ACH based on CO levels and up to 10ACH in smoke-control mode.

Cold, hot and grey water

District cooling is also used for the potable water cooling. Supply temperatures of the desalinated potable water supply can be as high as 40°C, so the hotel filters the water, and then cools and stores it at a more guest-friendly temperature of around 20°C. Cooling also reduces the risk of Legionella, which is further minimised by the use of copper-silver ionisation units in the storage tanks and automated flushing regimes for pipework in high-risk areas.

Four modular liquefied petroleum gas-fired condensing boilers, having total capacity of 1,856kW, feed eight calorifiers providing 52m^3 of hot-water storage, serving the hotel and

Sailing into the sunset: The Marsa Al Arab and Burj Al Arab are designed to celebrate Dubai's maritime heritage

adjacent residences that were also part of the development.

In the hotel, hot water is divided into high- and low-zone circuits to maintain consistent pressure while minimising pump head. Thermostatic mixing valves cap outlet temperatures at 43°C and low-flow fixtures are used throughout to reduce total water consumption. The building is also pre-plumbed for future grey-water recycling from showers, wash basins and laundry systems. The grey water will be treated to irrigation quality, alongside condensate recovery from the AHUs and treated sewage effluent. Smart sub-metering across all major systems supports ongoing water efficiency and leak detection.

Electrical power is supplied by three Dubai Electricity and Water Authority substations, with busbar distribution to sub-mains on each level. Three diesel generators provide backup power, supporting resilience for a 24-hour hospitality environment.

All lighting is LED, controlled by a DALI dimming system using daylight sensors and occupancy detectors. Exterior lighting uses photocells and timers to minimise energy use.

Operational feedback has been positive and Ramboll continues to support the facilities team as full-year data is compiled. Early indications suggest that the building is tracking close to predicted performance, particularly for cooling loads and exhaust air energy recovery.

"The building is provided with a grey-water treatment system for water reuse and circularity"

Luxury hospitality engineering

Jumeirah Marsa Al Arab sets a benchmark for integrated engineering in complex hospitality environments, with Ramboll's digital-first, collaboration-driven approach enabling the team to deliver systems that support the architectural vision (see panel, page 29). Behind the sweeping curves and shimmering façade lies an engineering strategy shaped by rigorous simulation, clever zoning, high-efficiency cooling, smart controls and a uniquely holistic water system.

It is a reminder that luxurious hospitality is not simply defined by finishes, spaces and views, but also by the invisible systems that deliver comfort, sustainability and operational resilience. No wonder the CIBSE judges were impressed. ●

Digital innovation

One of the project's most innovative contributions was Ramboll's development of a dynamic, physics-driven corridor coordination tool. Using a Grasshopper-based software tool built with the Kangaroo2 physics engine and spreadsheet-driven inputs, the team developed a rule-based method for arranging MEP services in congested corridor cross-sections. The tool:

- **Allowed engineers to drag, drop and reposition services with real-time clash detection**
- **Enforced rules for clearances, insulation and code compliance**
- **Produced rapid, annotated cross-sections ready for CAD export**
- **Reduced design errors and accelerated coordination, even for less experienced engineers.**

This shifted the workflow from manual correction to proactive optimisation, improving the speed, precision and confidence of the engineering process.

● **For more on the CIBSE MENA Awards see p12**

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Targeted protection

The rules around fire protection for fire and smoke dampers need to be interpreted accurately to ensure appropriate measures are taken. A survey by Advanced Air and *CIBSE Journal* reveals engineers' real-life specifications. **David Blackman** reports

The Grenfell Tower disaster, the tenth anniversary of which will be marked next year, has created an unprecedented focus on fire-prevention issues.

Advanced Air has conducted a wide-ranging survey of *CIBSE Journal* readers to find out the level of understanding and approach to fire and smoke damper specification and standards among building services engineers.

Perhaps unsurprisingly, the survey shows that compliance with Building Regulations and fire performance are uppermost in the minds of building services engineers when selecting fire and smoke dampers. Of those who responded to the survey, 83.8% said compliance with Building Regulations is 'crucial'. Nearly as many (82.6%) described fire performance as 'crucial'.

This was much more than the 45.9% who gave the same weight to installation flexibility in terms of compatibility with various wall or ceiling types – and barely a quarter said whole life cost or maintenance access are crucial.

Advanced Air then asked respondents about the typical design or required maximum evacuation time they use in fire strategies for the majority new commercial buildings they design (Figure 1). Respondents were also asked how long occupants in a building should be protected against excessive thermal transfer during a fire incident (Figure 2).

Thermal transfer refers to the heat that passes through a damper during a fire. Fire-resistance tests measure both integrity (preventing flames and hot gases passing through) and insulation (limiting heat transfer and therefore the temperature rise on the protected side). A rating such as EI 60 means the damper has been tested to maintain both of these properties for 60 minutes, preventing flame spread and keeping the unexposed surface below the temperature limits defined in the standard fire-test procedures.

Andrew Sargent, general manager at Advanced Air, believes there is a mismatch between the responses to these two questions. 'It's a bit disjointed,' he says, pointing out that the required maximum evacuation time respondents are using in fire strategies is much lower than the length of time they believe occupants of a building should be protected against excessive thermal transfer. However, Dwyer says there may be no correlation unless individuals who responded with lower maximum evacuation times also responded with longer protection against excessive thermal transfer.

The responses on required maximum evacuation times being used in fire strategies is 'pretty much in line' with what Sargent would expect, but he is surprised about the 18% figure for those factoring in more than 20 minutes to their fire strategies' typical design or required maximum evacuation times.

'Most people would be out of the building within about 10 to 15 minutes at max. If most people are going to be out of the building, why would they want the products to protect against

Figure 1: For the majority of new commercial buildings you design, what is the typical design or required maximum evacuation time used in the fire strategy?

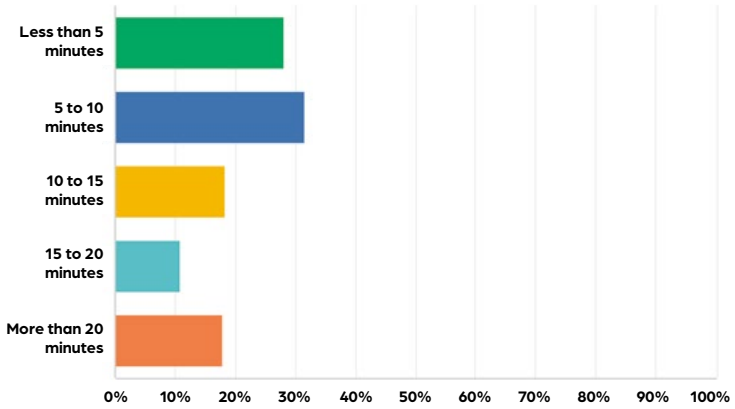
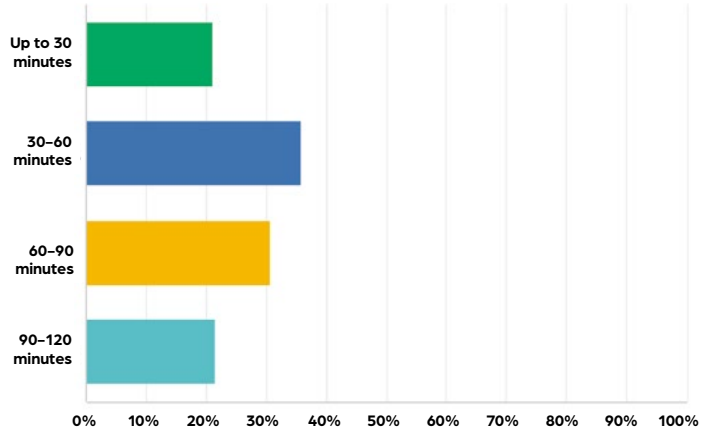


Figure 2: Regarding protection of occupants in a building during a fire incident, how long should they be protected against excessive thermal transfer?



thermal transfer for 90 to 120 minutes?' he asks, adding that the mismatch in responses could be a 'lack of understanding' about the nature of thermal transfer. Dwyer says other reasons could be design-side conservatism, different project types and insurer requirements.

'We've done tests and we want to educate people on what the temperatures really are,' says Sargent. 'There is a great deal of caution among consultant engineers at the moment regarding thermal transfer.'

'Many projects are now taking an increasingly belt-and-braces approach, which can add unnecessary cost in some situations. With clearer information and a better understanding of the underlying thermal-transfer issues, engineers can make more proportionate and well-informed design decisions.'

Asked approximately what percentage of their projects with fire or smoke dampers include a full automatic sprinkler system, 43.6% said less than a quarter. However, fire protection campaigners will be more reassured to find a much bigger proportion (23.3%) said more than three-quarters.

The proportion of projects with fully automatic sprinkler systems isn't as high as Sargent expected, however. Dwyer agrees given the increased attention on fire-safety measures in recent years and the growing emphasis on active fire-protection systems in commercial developments.

In response to how frequently they require clarification or manufacturer-specific data to ensure full compliance with Building Regulations Part B requirements for fire or smoke damper installation, 1.3% said 'never', indicating they believe they have all the necessary knowledge.

This minority of respondents was far outnumbered by the 46.7% who say they 'always' do so because manufacturer certification or documentation is their primary check. In between were the third (33.6%) who replied 'frequently' because it is standard practice to rely on manufacturer data or training, and the 22.7% who said they 'occasionally' require clarification or manufacturer-specific data for complex or non-standard applications.

Quizzed on interpreting the fire damper classification markings based on the testing requirements of BS EN 1366-2, as stated in BS EN 13501-3, 15.7% and 49.8% said they were 'highly' and 'moderately' confident respectively about doing so – but more than a third (36.2%), said they needed further guidance.

Figure 3: Approximately what percentage of your projects with fire/smoke dampers includes a full automatic sprinkler system?

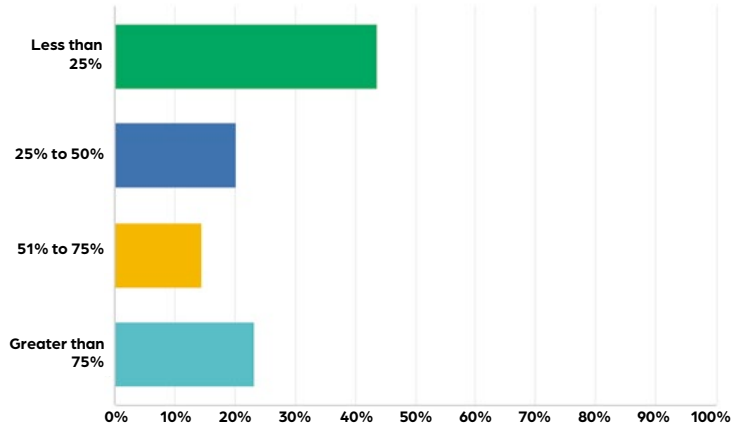
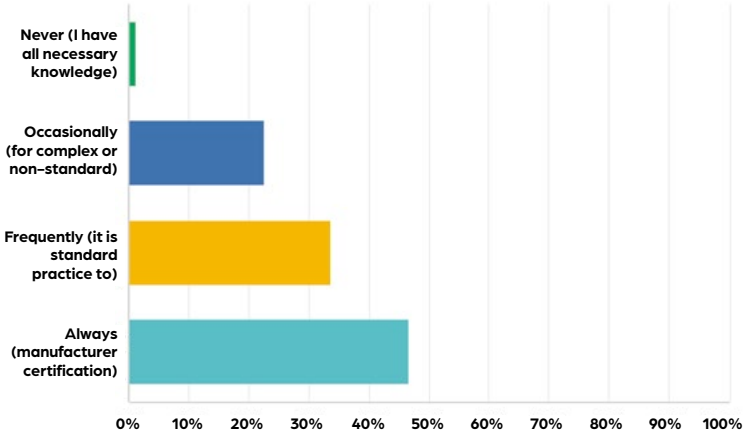


Figure 4: How frequently do you require clarification or manufacturer-specific data to ensure full compliance with Building Regulations Part B requirements for fire/smoke damper installations?



Respondents were less confident about interpreting the smoke control damper classification markings based on the testing requirements of BS EN 1366-10, as stated in BS EN 13501-4.

Around one in eight (13.8 %) said they are 'highly' confident and just less than a half (47.8%) were 'moderately' confident. This was only slightly higher than the 41.15% who expressed a need for further guidance or training.

Any lack of understanding is likely to stem from where respondents get their information, Sargent says. 'We have to get more information to consultants, so when they are making their decisions, it's based on the facts and the best information.

'We're not here to tell anybody what to do. We want to give the consultants the best information they can have when they're making their decisions.' ●

"We want to give the consultants the best information they can have"

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Circle of light

Lighting giant Signify is using 3D printing to enable a more circular approach to manufacturing. **Molly Tooher-Rudd** looks at how the technology could offer customised light fittings with a minimal carbon footprint

Resource extraction, manufacturing and disposal of products accounts for half of the world's greenhouse gas emissions and more than 90% of its biodiversity loss.[1] In response, firms are turning to circular manufacturing models, with a focus on reuse, repair, refurbishment and recycling.

Lighting giant Signify is exploring how circularity can be achieved using 3D printing. Traditional lighting manufacture uses virgin materials, has long supply chains and produces waste at every stage. Signify's myCreation concept, however, prints luminaires close to the customer using recycled polycarbonates, which can be recovered and reprinted repeatedly.

3D-printed luminaires have been installed in travel company TUI's UK stores

Rethinking plastics and circularity

Plastics are often positioned as the villain, but Bart Maeyens, leader for 3D printing at Signify, says the issue is not always the material, but how it is used and discarded. 'We need to harness plastics so they serve us sustainably, not harmfully,' he adds.

Every Signify 3D-printed luminaire contains at least 65% recycled polycarbonate, sourced from industrial scrap and everyday waste, such as used water jugs. Polycarbonate was chosen because it is ultraviolet and fire resistant, durable for up to 20 years, and retains its structural integrity after recycling.

There are trade-offs, however; 100% recycled material can cut lifespan. 'Is it better to have a longer-lasting fitting with 65% recycled content, or a shorter-lived one with 100%?' Maeyens asks. 'Achieving circularity means minimising waste and maximising lifespan.'

Signify is piloting reverse-logistics programmes through which eight-year-old 3D-printed luminaires are returned, disassembled and granulated into feedstock for printing new products for the same customer. Its Environmental Product Declaration states that a carbon reduction of up to 76% is achievable compared with traditional luminaires.

3D printing aligns with the EU Right to Repair Directive, which must be applied by member states by July 2026. This obliges manufacturers to make spare parts available for in-scope products and, rather than holding physical stock, firms can print parts.

Decentralised production is a key benefit of 3D printing. Signify operates five industrial printing hubs worldwide, reducing delivery distances and the embodied carbon of transportation. Luminaires can also be printed to exact sizes, enabling replacement of older, obsolete fittings without waste.

Speed is another advantage. From concept to final product typically takes 14 weeks and digital modelling can happen in days. This agility makes bespoke lighting practical, says Maeyens, who reveals that Signify aims to double printing capacity within three to four years. 'I hope more companies embrace the concept. Circularity only works if everyone does it,' he adds. ●

References:
[1]United Nations, facts and Figures, **bit.ly/UNfactsandfigures**

Intelligent by design

Artificial intelligence (AI) is being used by Signify in the 3D printing process in a number of ways.

It assists in polymer science, rapidly calculating chemical compositions that once required years of testing. In printing, AI optimises the creation of G-code – the instructions a printer follows – continuously learning how to achieve the best strength-to-material ratio with minimal waste.

'AI can print, test, recycle and iterate,' Maeyens explains. 'Within only a few cycles, it figures out how to build using less material while achieving better strength.'

The next wave of innovation looks at detailed virtual replicas of printers that can be tested and improved before any physical hardware is built.

'We can build printers digitally, explore what they can do, and then manufacture the best version,' says Maeyens. 'It saves time, money and a lot of resources.'

SLL's inclusive guide

Lighting for neurodiversity considers the 15% of the population who are not 'neurotypical'

The Society of Light and Lighting (SLL) has released its latest technical guidance, *Lighting for neurodiversity Factfile 19*. Authored by Sophie Parry, it outlines design strategies for creating spaces that are suitable for people who are not 'neurotypical'.

Estimates suggest 15% of people live with some form of neurodiversity, and the NHS reckons one in seven in the UK is neurodivergent, so designers must assume neurodivergent people will be present in any space. Such individuals often experience atypical sensory processing, including hypersensitivity to light. The guidance asserts that appropriate lighting design can pre-empt individual adjustments that may be needed for those whose condition qualifies as a disability under the Equality Act. Timely communication between interior and lighting designers is crucial, as material choices, colour, texture and reflectance must be considered alongside lighting specifications.


Factfile No.19

Lighting for neurodiversity

Controlling glare and uniformity

While illumination levels should comply with BS EN 12464-1, the guidance recommends localised dimming at workstations so affected people can adjust light levels. Controlling discomfort glare is paramount, particularly reducing veiling reflections, which can be distracting or dangerous.

A significant focus is placed on flicker and stroboscopic effects. Compliance metrics for these are established in standards such as IEC 61547-1:2020 and Ecodesign legislation, but the guide highlights that these metrics are only designed to ensure about 50% of the general population is unaffected. A maximum flicker value is only required to be maintained at 100% output, so dimming can push the flicker value above the maximum allowable, exacerbating problems for users. The Factfile recommends hybrid LED drivers to manage flicker during dimming.

Lower correlated colour temperatures (2,700K or 3,000K) can have a calming effect in informal spaces, and granular controls that allow users to adjust illumination levels and CCT are deemed beneficial.

The SLL says research into the effects of poor-quality lighting will continue, to inform specification and design for neurodiverse environments. ●

Factfile 19 is available for free at: cibse.org/knowledge

Initiative lights career path for teenagers

Society of Light and Lighting president Kristina Allison is backing the Steam 'Get curious' lighting programme, which aims to provide 14- to 15-year-old school pupils with work placements in the industry.

The programme is part of Allison's presidential theme, and students will gain experience of professional lighting tools and software in settings such as buildings, theatres, events, television or film. Placements will focus on problem-solving and technical skills, teamwork and confidence.

● Schools, pupils and lighting companies should visit bit.ly/CJSteam25 to find out more.

New emergency lighting standard

The BSI has updated the standard *Emergency lighting – Part 1: Code of practice for the emergency lighting of premises* (BS 5266-1:2025) to cover local area lighting and standby lighting. It also provides a more comprehensive framework for modern building safety needs.

The standard has guidance on identification and use of fire alarm call points and firefighting equipment, and the reduction of risk or panic in enclosed or high-occupancy areas.

● For more, visit bit.ly/47Y9Knl

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New traffic-light approach for IAQ sensors

Visual cues will ensure timely action to improve ventilation

Siemens has launched a fully redesigned range of indoor air quality (IAQ) sensors, now featuring a traffic-light system that makes CO_2 levels clear immediately.

Instead of only showing parts-per-million readings, the sensors use green, amber and red lights to indicate good, moderate or poor air quality in real time.

Siemens' buildings product manager, Ron Purcell, explained that this visual cue will help users in schools, hospitals and care homes to take quick action to improve ventilation, without needing technical expertise.

Poor air quality can negatively affect learning, productivity and health, and the new system encourages proactive management.

The next-generation sensors also measure temperature, relative humidity, CO_2 and total volatile organic compounds with higher accuracy. Touchscreen controls, mobile app configuration and improved aesthetics, available in black or white, make them functional and user-friendly.

Distech Controls drives sustainability at 40 Leadenhall

The newly completed 40 Leadenhall, a 900,000 sq ft mixed-use complex, has been equipped with advanced building management technology from Distech Controls, to help deliver an energy-efficient, future-ready environment designed around occupant needs and wellbeing.

The development consists of two office towers, of 14 and 34 storeys, as well as a Grade II-listed building that has been restored and incorporated into the scheme. It includes office and retail areas, restaurants, a wellness suite, cinema room and fitness studio.

Distech Controls' Eclypse controllers were chosen for their sensors and interfaces, to help the development achieve ambitious sustainability targets, including Breeam Excellent, NABERS 5* and Well Platinum.

The technology is designed to be simple to use, and allows key stakeholders to monitor and manage energy consumption with thousands of real-time data points, as well as maximise operational efficiency.

Sales of UK-made heat pumps up 40%

A third of heat pumps sold in the UK last year were manufactured domestically, new figures show.

According to the Heat Pump Association's (HPA's) factory gate sales data, published last month, 32,920 of the 98,345 heat pumps sold in the UK in 2024 were manufactured here – a 40% increase on 2023. HPA chief executive Charlotte Lee said: 'It's great to see the sector investing in onshoring supply chains.'

Examples of low-GWP ASHPs include Weatherite's R290 heat pump

Swegon R290 heat pump

Avoiding the carbon trap

Research by Max Fordham shows that air source heat pumps with low global warming potential refrigerant risk being penalised under current calculation methods for embodied carbon. The firm's **Lia Minty** discusses how upfront carbon differs according to refrigerant type and proposes a fairer methodology

An analysis of more than 100 air source heat pumps (ASHPs) by Max Fordham has revealed that not all have the same embodied carbon, and that current, generic modelling methods risk unfairly penalising sustainable specifications.

While low global warming potential (GWP) units, such as those using R290, are generally larger and have greater mass, the study found that they often exhibit a lower upfront carbon impact per unit mass compared with equivalents.

This is because the extra mass primarily constitutes lower-carbon body material, rather than high-impact components. Consequently, relying on generic carbon factors significantly overestimates and penalises low-GWP units, underscoring the critical need for assessors to use product-specific data and ensure proxy products are selected carefully to achieve accurate embodied carbon results.

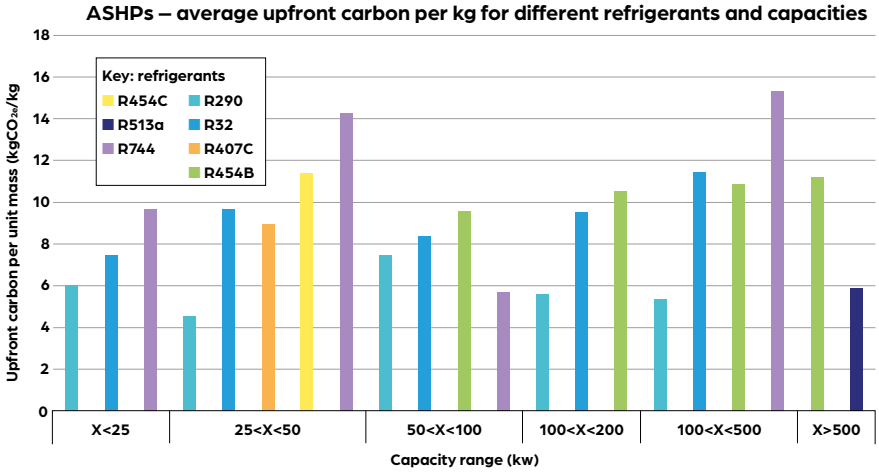


Figure 1: ASHP upfront carbon results per kg unit. Based on mix of EPDs and TM65 mid-level reports

The study also found that few manufacturers offer a full material breakdown of the ASHP units seen. Without this transparency, it is difficult to understand and scrutinise manufacturers' embodied carbon calculations (see panel, 'The importance of data transparency').

This work has been initiated by CIBSE's TM65 verification scheme, which now requires manufacturers to publish their calculations for review.

Low GWP becoming the norm

ASHPs use refrigerants to transfer heat from external air to a heating medium (typically water). Refrigerants are essential to the operation of this 'low carbon' technology, yet there can be significant carbon emissions associated with refrigerant leakage.

The impact of this leakage varies significantly between refrigerant types. Recently, there has been a push from the industry to reduce leakage impacts by moving towards low-GWP refrigerants, such as CO_2 (R744) and propane (R290).

Max Fordham has been adopting R290 units on projects, and observed

that they are generally larger and of greater mass than units of other refrigerant types. This made us question how the refrigerant might influence ASHP body design and if low-GWP units have greater embodied carbon impacts. So we compiled a database of embodied carbon data, studying more than 100 ASHP Environmental Product Declarations (EPDs) and mid-level reports based on the CIBSE TM65 methodology, which estimates embodied carbon when there is no EPD.

To compare a range of unit sizes, carbon results are typically expressed in relation to a product's mass. For a comparison of unit material impact, Figure 1 shows upfront carbon (A1–A3) results, which do not include refrigerant leakage or other lifespan impacts. In the study, we found large differences in upfront carbon between ASHPs using different refrigerants.

As with all types of embodied carbon reporting, it is important to note that the underlying material carbon factors (typically given as $kgCO_{2eq}/kg$ material) can differ wildly and may be the cause of lots of variation. Material carbon factors quantify a normalised embodied carbon of a given material. They are used in embodied carbon calculations to easily translate a material mass into an equivalent carbon dioxide impact.

Without public declarations of the carbon factors used, we will always be limited in our investigations into understanding trends.

Figure 1 illustrates a common trend of R290 reporting lower average upfront carbon per unit mass than other refrigerants. It shows consistent, mid-range upfront carbon totals for R32 and R454B, while R744 (CO_2) varied quite significantly. There was not a clear trend between units of different capacity ranges.

The most notable observation is that R290 units have significantly lower upfront carbon impact per kg than equivalent ASHPs. While the units are generally higher mass, the embodied carbon does not necessarily increase proportionally. A lower embodied carbon rate indicates that this additional mass is in body material (which is comparatively low embodied carbon), while high-impact components – such as heat exchangers or electronics – are probably similar between units.

Additional body material may be related to the increased safety requirements of R290, such as better compartmentalisation and mitigation of spark risks. While total embodied carbon will still generally be higher for R290 units, the difference may not be as significant as feared.

It may also be expected that CO_2 units have different material requirements because of higher operating pressures. While this can be seen in Figure 1, there was not enough data to draw a firm conclusion.

The extent to which these results are dictated by inherent refrigerant differences or other industry developments in unit design is unclear. For example, improvements in acoustic performance will probably influence frame/fan design in newer units irrespective of refrigerant type. The data above also did not account for compressor types or performance differences, so the impact of this is also unclear.

Proxy product selection

The lack of product-specific EPDs within MEP equipment means that product substitutions must be made when we model embodied carbon impacts. These 'proxy products' are chosen to be suitably similar to the intended product, such that the embodied carbon data is also

AquaSnap 61AQ R290 heat pump

Proxy product variation: scaling by mass and capacity

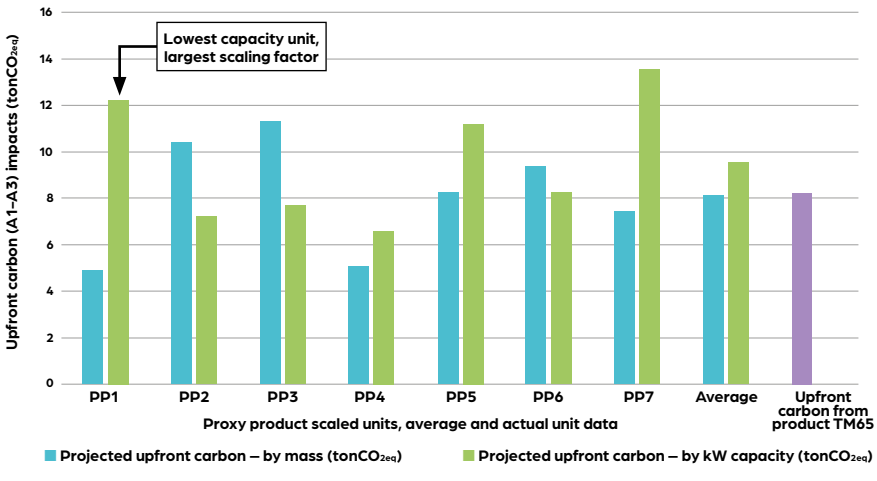


Figure 2: Impact of proxy product scaling on upfront carbon

considered equivalent when scaled for project reporting.

The variation of results in Figure 1 made us question how we model ASHP embodied carbon. Historically, we would model ASHP unit bodies in generic terms and then post-process specific refrigerant leakage impacts. Seeing the variation in upfront carbon rates, however, we realised this would significantly overestimate and penalise low-GWP units.

Proxy product selection and scaling can have drastic implications on embodied carbon approximations, irrespective of refrigerant. Given proxy products are scaled, often per kg, any margin of error can be scaled by a factor of thousands.

Another choice of scaling factor could be per kW output, as this represents a more comparable performance and will typically scale to a factor of hundreds. However, the rated capacity output of a unit will vary by heating vs cooling performance, as well as standard external conditions chosen as a representative output. Both methods are flawed and do not fully capture unit equivalency.

To illustrate the implication of these decisions, several proxy products were chosen to represent a unit with known embodied carbon data. These units were scaled by mass (blue) and capacity (green). Figure 2 shows the variation of projected upfront carbon results when using different proxy products to represent a desired unit (purple). In most cases, there is a notable difference in results when scaled by mass vs capacity, though it is not clear which is most accurate. Note, the lowest capacity unit has some of the greatest variation when scaled to represent a larger unit. Once the proxy products were averaged, the result was much closer to the desired unit (purple). In modelling, we must use a single proxy product rather than an average, but averages can help inform this decision: here, PP6 is sensible.

If proxy products are necessary, selections should be units of the same refrigerant and, ideally, the same capacity range. Assessors should aim to scale the proxy product as little as possible and be wary of using domestic units to represent commercial. It is good practice to undertake sensitivity analyses between data sources and seek advice from MEP engineers to ensure equivalent performance.

After this study, we enhanced our internal modelling processes to incorporate unit type, capacity, and refrigerant sensitivity. Collaboration between our materials and MEP teams has improved modelling accuracy significantly and upskilled both disciplines. Improving the accuracy from product level up gives greater confidence in all levels of modelling, especially optioneering exercises, where the detail of differences can hugely influence project direction. ●

Baxi Auriga R290

● **Lia Minty is an engineer at Max Fordham**

The need for data transparency

Of the ASHPs for which we could obtain embodied carbon data, only a handful offered material breakdown transparency. Material breakdown is a key step in calculating A1 material carbon impacts related to the product and is data that manufacturers have, but do not publish.

The absence of this breakdown makes it difficult to understand and scrutinise embodied carbon calculations completed by manufacturers. Without data transparency, it is impossible to judge which results represent genuine embodied carbon savings or have underreported components.

In analysing the seven material breakdowns we could obtain, there was significant variation in the level of detail provided by manufacturers, even within the same data type.

One key area is electronics, where reporting varied in category and magnitude. Electronic components have an incredibly high embodied carbon impact per kg, so it is important that we report this accurately and consistently.

It was also found that some manufacturers had listed refrigerant as a material component, indicating a lack of understanding of the methodology. There should be more training and guidance provided to manufacturers who complete material breakdowns.

In the move to obtain data for embodied carbon reporting and benchmarking, we must ensure data quality is not overlooked, and strive for data transparency and consistency of reporting.

Publishing product embodied carbon totals may inform averages, but they do not improve understanding of impacts. If manufacturers are making active efforts to reduce embodied carbon emissions, this data should be published to inform best practice.

This work has been initiated by the TM65 verification scheme, which requires manufacturers to publish their calculations for review.

There is an ongoing CIBSE project to collate a centralised MEP embodied carbon database. It is likely that verification and data transparency will form a key part of this structure.

Max Fordham is contributing by sharing our internal product database and lessons learned. We hope this collaboration will lead to a valuable resource in the industry.

Visit: bit.ly/CJEmbVer

GSHP viable in older buildings

Historic England's latest analysis of ground source heat pump retrofits by Max Fordham finds that the technology works well if configured properly

Historic England's latest analysis of the performance of heat pumps in existing buildings, *The viability of ground source heat pumps (GSHPs) in historic buildings*, was published in September and follows the publication of *Air source heat pump (ASHP) case studies – small-scale buildings* in 2023.

While focused on heritage sites, Historic England's research has a relevance far beyond conservation, providing essential insight for building owners considering decarbonising space heating in historic buildings.

Two more sets of case studies are due to be published soon, with a version for ASHPs in large-scale buildings expected this month and one on water source heat pumps due for release in 2026.

Historic England's GSHP report features an assessment of five projects. Engineers from Max Fordham carried out visual inspections of the GSHP installations and associated heating systems, and interviewed building users on their experience of the systems in terms of thermal comfort, noise, running costs and visual appearance.

The report's key conclusions were that closed-loop GSHPs are a viable option for decarbonising heating systems in historic buildings and that they can be deployed without major work to the existing heating system – particularly where conservation, rather than occupant heating, is the main strategy. Future works could further improve efficiency, the report added.

Max Fordham's investigations found that Installing ground collectors was disruptive, but after the ground was restored, the collectors were barely noticeable, with only a small number of manhole covers visible.

The report said issues with performance were associated with the configuration of the system, not the GSHP itself. Engineers also found that the GSHPs had similar noise levels to other heating system components, such as large circulation pumps.

To read Historic England's report, visit bit.ly/CJGSHPEH

A transformational shift

A new paper by Tianzhen Hong and Liang Zhang looks at the rise of AI in building energy modelling – and the implications for practice and policy. **Tim Dwyer** reports

Building energy modelling (BEM) has been an essential tool for engineers since the 1970s, supporting the design and operation of buildings by simulating thermal behaviour, energy use and system performance.

Traditionally, models have relied on physics-based methods, which remain indispensable for their interpretability and compliance with standards. More recently, reduced-order and data-driven approaches have been introduced to supplement these methods.

Now, a new wave of artificial intelligence (AI) is reshaping how models are created, calibrated and applied.

A new paper, 'AI for building energy modelling: a transformation', published in *Building Simulation*, sets out how AI is beginning to alter BEM workflows. Written by Tianzhen Hong, of Lawrence Berkeley National Laboratory, and Liang Zhang, of the University of Arizona, it highlights the opportunities for automation, speed and accessibility, while recognising the challenges of trust, data quality and appropriate use.

The acceleration of digitalisation in the built environment means vast volumes of data are now collected routinely, from smart meters and sensors to design records and open databases. At the same time, computing power has become more affordable and accessible. These trends, coupled with the rapid development of AI, are enabling engineers to rethink the way BEM workflows are organised.

Where once practitioners had to collect inputs manually, assemble models and parse complex outputs, AI offers opportunities to automate these steps and expand the scope of applications.

One of the most striking changes is in the preparation of input data. Traditionally, gathering building information required time-consuming site surveys, drawings or audits. AI methods such as computer vision and natural language processing can now extract characteristics from photographs, satellite imagery, lidar scans or planning documents.

Geometry, façade type, window ratios and rooftop HVAC systems can be identified automatically, reducing the cost and time needed to create models. AI also helps clean incomplete datasets and infer missing values, making them fit for simulation.

Model generation is another area in which AI is making an impact. Surrogate models and deep-learning networks can approximate the results of detailed simulations at a fraction of the computational cost.

Transfer-learning methods allow data from one set of buildings to inform models of another, increasing efficiency when information is limited. Large language models are emerging as particularly powerful tools: by translating natural language descriptions, spreadsheets or CAD drawings into syntactically correct EnergyPlus or Modelica files, they could make model creation more conversational. Rather than laboriously constructing every object and reference, practitioners may soon describe design intent and allow an AI assistant to assemble a consistent, code-aligned simulation file.

CIBSE and ASHRAE's commitment to AI

CIBSE has already recognised the importance of this shift, launching an expert Artificial Intelligence Working Group to guide its response to emerging technologies, policy and ethics.

The group's first task is to develop a formal position statement, before establishing a Special Interest Group that will be open to CIBSE members and the wider building services community. Key areas under consideration include terminology, relevant legislation, ethics

and professional guidelines – all vital to ensuring that AI is applied responsibly.

ASHRAE has also convened a Multidisciplinary Task Group on Generative AI – with Hong among its contributors – to coordinate research, standards and professional guidance. Together, these initiatives show that both institutions view AI as a strategic priority for the profession.

Simulation itself is being reshaped. Researchers are developing protocols that act as universal connectors between AI tools and modelling engines, enabling a more fluid, two-way interaction. This opens up the possibility of re-running simulations with alternative parameters or correcting errors through dialogue with an AI interface. Such developments could lower the barrier for new users and make simulation more accessible to multidisciplinary teams.

The analysis of outputs is another domain in which AI is proving valuable. Simulation generates vast volumes of time-series data that can be difficult to interpret. Generative AI can process these results to produce summaries, benchmark comparisons and even narratives explaining performance trends.

Instead of wading through spreadsheets and plots, an engineer could query a model in natural language – for example, asking why fan energy peaks in spring or how a building's cooling load compares with peers. This ability to turn raw data into actionable insight could embed modelling more firmly into decision-making.

"By shortening learning curves and spreading modelling skills more widely, AI could prove transformational"

AI is also beginning to support software development and education. Code-generation tools can assist developers of BEM engines in testing and debugging, while AI-enabled assistants could help students and practitioners interpret error messages, learn best practice and understand complex workflows. By shortening learning curves and spreading modelling skills more widely, AI could prove transformative.

Despite these advances, challenges remain. Data availability and quality are persistent issues, with many datasets incomplete or inconsistent, as is privacy, especially where sensitive occupant behaviour or energy use is concerned.

Trust in AI models is another barrier: outputs may be opaque, prone to error or hard to reproduce. Standards and benchmarks are lacking, making it difficult to compare approaches or verify claims.

Most importantly, clarity is needed on when AI should enhance physics-based modelling, and when – if ever – it can replace it. Physics-based methods still provide robustness, compliance and interpretability that data-driven models cannot match.

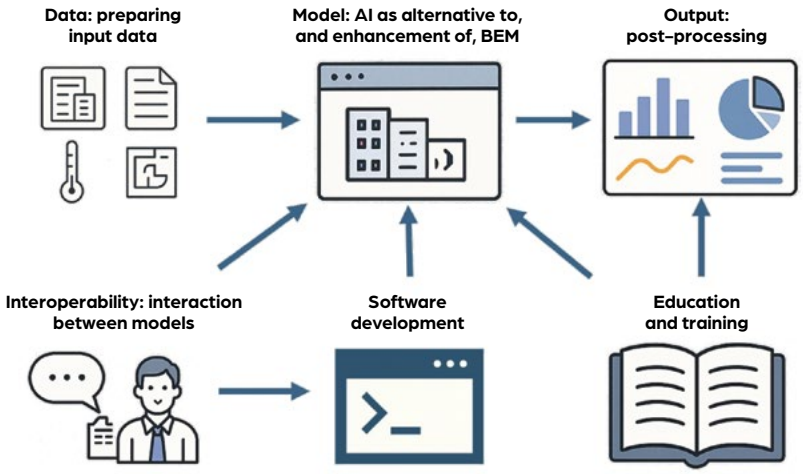


Figure 1: Overview of AI opportunities and applications across BEM (after Hong and Zhang)

Looking ahead, several trends are emerging. Generative design assistants could propose efficient system types, control strategies or façade options tailored to climate and regulation, supporting performance-driven design from the earliest stages.

Autonomous AI agents may soon execute entire modelling workflows with minimal human intervention, which would be particularly valuable at the scale of cities. There is also growing interest in domain-specific models such as BEM-GPT – smaller, specialised foundation models trained on building physics, standards and simulation syntax.

At the operational level, digital twins are likely to benefit from AI by combining live data with models for forecasting, diagnostics and optimisation.

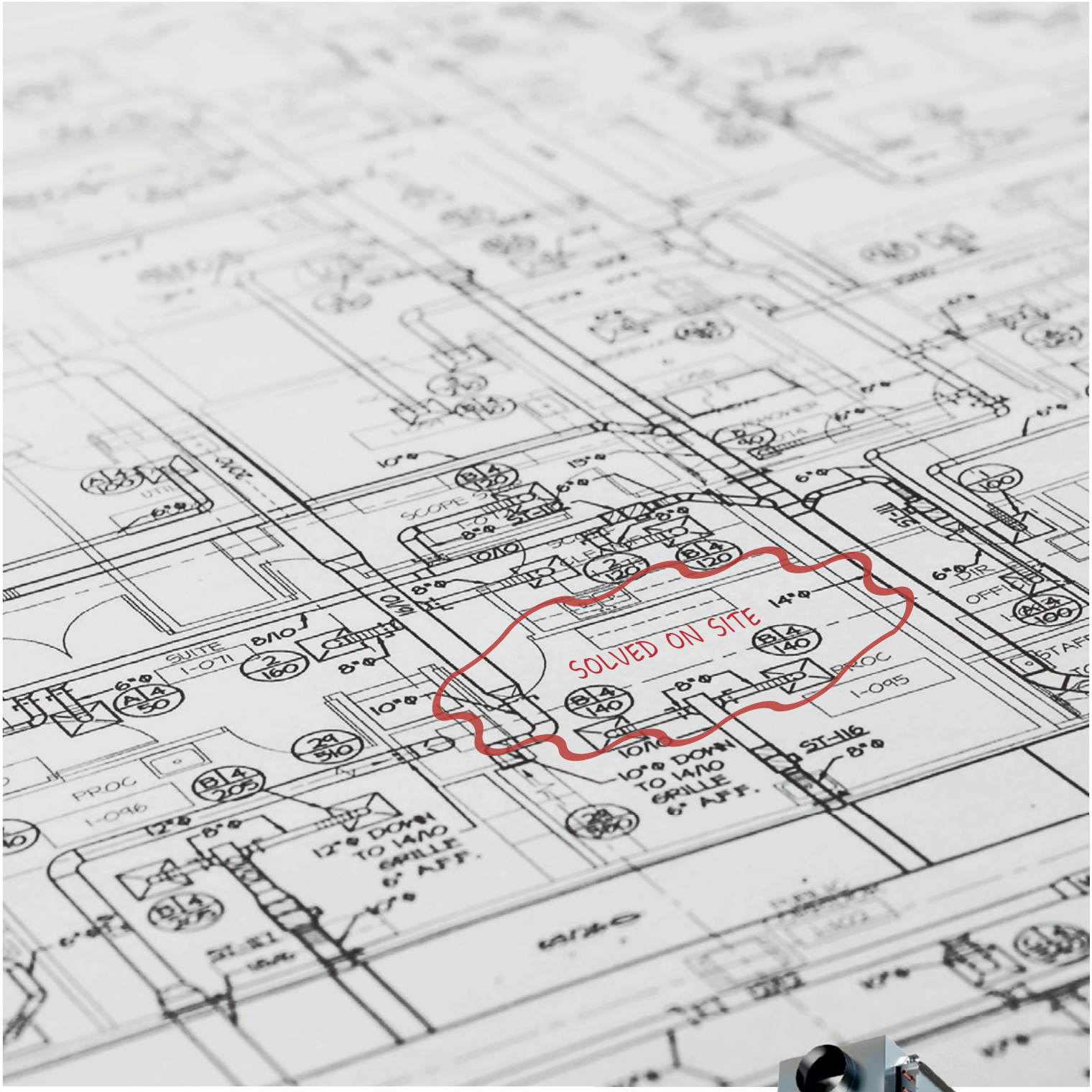
For building services engineers, the implications are clear. AI will not replace the expertise of experienced practitioners, but it will automate routine tasks, accelerate workflows and lower barriers for a broader community of users. Engineers will remain essential for ensuring responsible deployment, validating results and providing the domain knowledge that AI cannot replicate. At the same time, there will be a growing need for professionals conversant in both building physics and data science.

AI represents a powerful extension of the building energy modeller's toolkit. By integrating new methods thoughtfully, the profession can enhance productivity, broaden participation and embed energy modelling more deeply into the design and operation of buildings.

The transformation is already under way – and those who embrace it early will be best placed to deliver the next generation of efficient, resilient and comfortable buildings. ●

Further reading

Hong and Zhang's full paper can be read at:
bit.ly/CJDEC25AIBEM



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CPD programme
Heat pumps

Integration of heat pumps into air handling units

This module explores how heat pumps are being integrated into air handling units to support decarbonisation while meeting customer expectations on performance and comfort

As buildings move away from combustion-based heating, air handling technology is evolving to meet the demand for all-electric solutions. Integrating heat pumps within air handling units (AHUs) allows a single system to deliver efficient heating, cooling and ventilation. This CPD explores how this approach supports both decarbonisation goals and modern expectations for comfort and performance.

Modern AHU designs combine the established functions of filtration, heat recovery and airflow management, and increasingly offer the option of reversible heat pump operation to provide efficient, all-electric comfort conditioning – particularly in commercial and institutional buildings. Such systems are now common in new-build and retrofit applications, driven by advances in component efficiency and control capability, and by regulations and standards promoting high-performance ventilation solutions.

When a heat pump is incorporated with an AHU installation – either as an integral module or as external plant serving the coils – the system becomes capable of delivering space heating and cooling directly through the supply air stream. This integration can take several forms: a factory-assembled weatherproof package containing compressors, coils and fans; an indoor AHU connected to a remotely mounted air-to-water or water-to-water heat pump; or an arrangement that draws heat from the exhaust air stream to supply tempered outdoor air. Each configuration can be adapted to the building's scale and energy strategy, provided that air, water and refrigerant systems are designed as a coordinated whole.

Heat pumps used with AHUs are commonly classed by their energy source. Air-to-air systems extract heat from ambient air and deliver it directly to supply air through a refrigerant coil that serves alternately as condenser or evaporator, depending on the operating mode. This avoids hydronic circuits and is compact, though it requires effective frost protection and defrost control at low outdoor temperatures. Air-to-water systems use a separate heat-exchange loop, generating hot or chilled water that is circulated to one or more AHU coils. This approach offers flexibility and is well suited to multi-zone buildings and retrofits where hydronic coils already exist. In heating mode, air source heat pumps (ASHPs) cannot achieve the same flow and return temperatures as conventional legacy boilers, so coils may need to be enlarged, or additional rows added, to maintain duty. There are, however, benefits in reducing flow temperature, as it reduces the compressor lift across the heat pump and, as noted by CIBSE AM17,[1] each 1K reduction in lift can raise the coefficient of performance (COP) by 2–3% – so, for example, a 10K reduction may increase COP by around 20%. (Compressor lift is the temperature difference between the evaporating and condensing conditions within a heat pump; reducing this lift lowers compressor work and improves overall system efficiency.)

Ground source heat pumps (GSHPs) provide stable operation by drawing energy from boreholes or horizontal ground loops, where temperatures remain practically constant throughout the year. Configured as water-to-water systems, they can feed multiple AHUs through a common heating and cooling network, maintaining very high seasonal performance factors. The installation cost is greater, but operational energy use is correspondingly lower, making this option attractive for large estates or new-build campuses. Exhaust air heat pumps provide another efficient configuration, recovering heat from the extract air to warm supply air or a hydronic circuit. Because extract air temperatures rarely fall below 18°C, frost is avoided and the recovered energy offsets or replaces conventional heat recovery.

In modern packaged AHUs, the combination of a heat pump circuit and energy-recovery device delivers particularly high efficiency. The system is typically arranged so that the supply air first passes through a plate or rotary exchanger that transfers sensible and, potentially, latent energy from the exhaust airstream, reducing the load on the subsequent heating or cooling coil. The heat pump then trims the air temperature to meet the supply air setpoint, providing additional heating or cooling as required. In mild weather, the initial heat exchanger alone may satisfy the load, without activating the heat pump. This dual-stage arrangement not only improves seasonal performance, but also limits frosting, as the heat pump's evaporator coil operates above freezing. Control sequences prioritise the initial exchanger and engage the active stages only when needed.

Packaged AHUs with integral heat pumps are increasingly supplied as fully factory-assembled

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systems. These include all major components – fans, filters, coils, compressors, expansion valves and controls – within a single enclosure that can be installed either outdoors or in a plantroom. Factory-assembled casings typically comply with BS EN 1886[2] mechanical performance requirements, achieving leakage class L2 or better and thermal class T2, indicating low air leakage and good thermal insulation of the unit housing. By delivering both ventilation and thermal conditioning from one assembly, such units simplify installation, reduce plantroom footprint and eliminate the need for separate chiller or boiler plant. Factory assembly ensures consistent performance, and modern variable-speed compressors and electronically commutated (EC) fans allow efficient part-load operation.

For larger or more complex buildings, the same principle applies using central AHUs connected to external heat pump plant. The external units, which are commonly air-to-water heat pumps with integral refrigerant-to-water heat exchangers, supply low-temperature hot water or chilled water to multiple AHUs. The use of such external monobloc heat-pump arrangements removes the need to route refrigerant pipework to the AHU, which is particularly advantageous when using refrigerants designated as A3 (such as R290 (propane)). This configuration provides greater flexibility in plant positioning and maintenance, while the hydronic circuit additionally acts as a thermal buffer to reduce compressor cycling. It can also simplify installation, as no internal refrigerant work is required. Water temperatures are modulated according to room loads, with higher temperatures supplied only when demanded by the AHU heating coils. When several AHUs share a common circuit, supervisory controls can adjust the flow temperature from the heat pump dynamically to satisfy all loads at the lowest possible lift in temperature, thereby improving system COP. (See the boxout, 'Smart plant integration', for an example of how coordinated control can optimise AHU and heat pump performance.)

Regardless of configuration, several design fundamentals remain constant. Coils must be selected for the lower temperature differentials of heat pump operation and sized to maintain required heating and cooling capacity at reduced flow temperatures. For hydronic coils, freeze protection may be required when outdoor temperatures fall below zero, achieved either through antifreeze mixtures, preheat coils, or airflow bypass during extreme cold.

Frost formation on air source coils can significantly reduce efficiency. Reverse-cycle defrost remains the most common mitigation method, but modern systems use sequential or demand-based defrost to minimise disruption. In packaged units with multiple refrigeration circuits, coils defrost alternately so that warm supply air is maintained continuously. In mixed-air systems, partial recirculation or preheating of outdoor air can also prevent frosting under cold, humid conditions.

Control and sequencing are central to efficient operation. Supply air temperature is maintained by modulating compressor capacity, refrigerant flow or water-valve position, and is often linked to outdoor temperature (weather compensated) to reduce flow temperature in mild weather. Humidity control can be achieved by reusing condenser heat for post-cooling reheat, avoiding additional electric load. When both heat recovery and a heat pump stage are present, control logic should prioritise the initial heat exchanger, enabling the heat pump only when recovery cannot meet the setpoint. During suitable conditions, free-cooling bypass dampers allow outdoor air to deliver cooling without compressor operation.

Safety and protection devices – including freeze thermostats, pressure cut-outs and anti-short-cycle timers – are vital for reliability. Integration with the building management system (BMS) allows monitoring of compressor status, fan speed and energy performance, as well as coordinated start-up to avoid electrical demand peaks. CIBSE AM17[1] highlights that careful commissioning and seasonal tuning are essential to achieve design performance. Poorly sequenced controls, such as maintaining unnecessarily high water temperatures or simultaneous heating and cooling, can significantly degrade efficiency.

When these control principles are applied effectively, monitored data (from UK and Europe) show that seasonal

Smart plant integration

Coordinating the operation of air handling units and central heat pump plant through smart plant integration control can significantly enhance overall efficiency. Instead of maintaining fixed design-day water temperatures, the system continuously adapts heating and cooling setpoints to reflect the combined demand from all connected AHUs. Each 1K rise in chilled water temperature can reduce compressor energy use by around 3%, while a 1K reduction in heating water temperature can save about 2.5%. Over a typical year, this adaptive control can readily achieve 10–15% energy savings compared with constant-temperature operation. By harmonising the behaviour of plant and ventilation systems, smart integration also smooths compressor cycling, simplifies installation, and maintains stable indoor comfort while improving seasonal carbon performance.

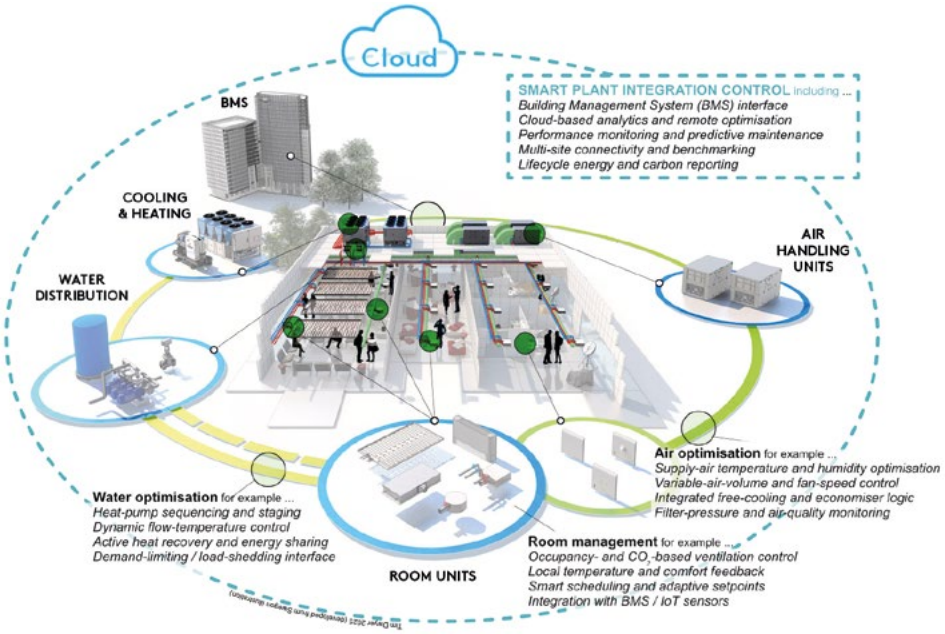

Figure 1: Schematic representation of smart plant integration control linking air, water and room systems. The framework supports dynamic optimisation of heating, cooling and ventilation functions through shared data, enabling energy-efficient coordination between AHUs, heat-pump plant and occupied zones (Developed from Swegon illustration)

performance factors (SPF) for ASHP AHUs typically range from 3.0 to 4.5 in heating mode and 2.5 to 4.0 in cooling mode, with GSHP and exhaust air systems performing even better. Continuous monitoring and periodic review of trend data allow operators to refine temperature setpoints, defrost strategy and scheduling, helping to maintain the expected seasonal performance in day-to-day operation.

Maintenance requirements for heat pump AHUs are broadly similar to those for conventional air handling systems, with additional attention needed for the refrigeration components. Filters, fans and dampers follow standard intervals, while coils and compressors require inspection for cleanliness and refrigerant integrity. Outdoor coils must be kept free of debris to maintain heat transfer, and technicians should be familiar with safe refrigerant handling and diagnostic procedures. Component life expectancy should be broadly similar to conventional systems, with scroll compressors typically achieving 15–20 years of service. Electronic controls may require software updates or replacement mid-life to maintain cybersecurity and manufacturer support.

The initial cost of a heat pump-equipped AHU is higher than that of a traditional system with separate boiler and chiller plant, but installation is simpler and faster, and operational savings can be significant. The elimination of natural gas infrastructure, flues and combustion air requirements offsets part of the capital cost, and operating efficiencies of three or more units of heat for each unit of electricity deliver competitive running costs, even at current energy tariffs. As the electricity Grid continues to decarbonise, carbon intensity and whole-life emissions will reduce further, strengthening the case for all-electric ventilation and conditioning.

The success of any installation ultimately depends on coordinated design and commissioning. The air, water and refrigerant systems must be treated as a fully integrated thermal process, with coil selection, airflow paths and control sequences tuned to operate efficiently across seasons. Electrical supply and peak-load management must be considered early in the design process to ensure capacity for compressors and controls. In retrofit projects, the potential to reuse existing AHUs with new low-temperature coils or external heat pump plant can provide an effective decarbonisation step with less disruption.

A commercial installation at a UK retail site, as detailed in the boxout 'Retail retrofit', replaced gas boilers with external monobloc air-to-water heat pumps using a low-global warming potential (GWP) natural refrigerant. The seasonal COP values exceeded 4 and the installation achieved a 74% reduction in equivalent carbon impact compared with gas heating. The project also illustrates how locating the refrigerant circuit outdoors can enable and simplify the safe use of A3-designated refrigerants – those that are designated 'low toxicity' (practically, R290 is non-toxic in normal use) but high in flammability – while delivering high efficiency and very low environmental impact.

Once commissioned and optimised, integrated heat pump AHUs can deliver stable comfort, high indoor air quality, and measurable energy and carbon savings. They provide a straightforward, scalable route to electrification of heating and cooling in non-domestic buildings and – when designed and commissioned in accordance with prevailing standards – these systems offer efficient, reliable and fully electric solutions, reducing emissions while maintaining environmental quality. ●

Retail retrofit

A UK retail site retrofit demonstrates the practical application of natural refrigerant heat pumps for low-temperature heating. The project replaced around 250kW of gas-fired boiler capacity with externally mounted, factory-built air-to-water units using propane (R290), achieving equivalent heating performance while eliminating onsite combustion. Two fully inverter-driven, reversible air-to-water R290 heat pumps provide a combined heating capacity of 256kW with a 23% turndown ratio. These particular systems, shown in Figure 2, include ATEX-rated leak detection and onboard safety management. The design incorporates two independent refrigerant circuits for staged operation and defrost control, variable speed compressors for smooth modulation and low starting current, and a wide operating envelope capable of maintaining 60°C leaving-water temperature at –10°C outdoor temperature. This system serves the comfort heating application with a 45°C supply and 39°C return temperature. Continuous optimisation through BMS-linked remote monitoring – adjusting compressor sequencing, setpoints and pump operation – yielded a further 15% energy reduction.

Figure 2: Externally installed air-to-water monobloc heat pumps using propane (R290, A3 refrigerant, GWP ≈ 0.02) supply 40–55°C heating water to AHUs in a UK retail installation achieving a seasonal COP ≈ 4.5 (Source: Swegon)

Module 259

December 2025

1. **What is the principal benefit of integrating a heat pump directly within an air handling unit (AHU)?**

- ☐ A It allows greater air recirculation to reduce outdoor air intake
- ☐ B It enables combined heating, cooling and ventilation from a single all-electric system
- ☐ C It increases ductwork velocity and static pressure
- ☐ D It raises the achievable supply water temperature for existing coils
- ☐ E It reduces the need for filter replacement

2. **How much can the coefficient of performance (COP) typically increase when the heat pump temperature lift is reduced by about 10K?**

- ☐ A Around 10%
- ☐ B Around 20%
- ☐ C Around 30%
- ☐ D Around 40%
- ☐ E Around 50%

3. **Why is an external monobloc configuration particularly suitable for heat pumps using A3-designated refrigerants such as R290 (propane)?**

- ☐ A It increases refrigerant charge for improved compressor cooling
- ☐ B It keeps the refrigerant circuit outdoors, reducing indoor flammability risk
- ☐ C It lowers the acoustic output of the evaporator fans
- ☐ D It maximises heat pump efficiency by allowing higher condensing temperatures
- ☐ E It removes the need for refrigerant leak detection in outdoor plant

4. **When smart plant integration control links multiple AHUs with shared heat pump or chiller plant, what level of energy saving is reportedly typically achievable compared with fixed-temperature operation?**

- ☐ A 20–25%
- ☐ B 30–35%
- ☐ C 2–3%
- ☐ D 5–8%
- ☐ E 10–15%

5. **In the UK retail retrofit case study, replacing gas boilers with R290 air-to-water heat pumps achieved which of the following outcomes?**

- ☐ A 20% lower energy use, but unchanged carbon emissions
- ☐ B Improved comfort with no measurable efficiency gain
- ☐ C Reduction in ventilation heating load only
- ☐ D Seasonal COP above 4 and a 74% reduction in equivalent carbon impact
- ☐ E Seasonal COP below 3, but with comparable emissions

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References:

[1] CIBSE AM17: 2022 *Heat pumps for large non-domestic buildings*, CIBSE 2022.

[2] BS EN 1886: 2007 *Ventilation for buildings – Air handling units – Mechanical performance*, BSI 2007.

Net zero at Newcastle's Callerton Academy

Gilberts Blackpool has helped the new £39m Callerton Academy, in Newcastle, achieve net zero carbon in operation (NZCIO) through advanced hybrid and natural ventilation systems. The three-storey, 1,400-pupil school was designed to 'fabric first' principles and incorporates green technologies, including a heat pump, PV panels and a green roof.

Gilberts' Mistrale Fusion Deo MFS-HR hybrid ventilation with heat recovery, combined with Mistrale 75 natural ventilation units, now supports airflow across the building. The MFS-HR system exceeds Department for Education criteria, cuts ventilation energy use by up to 20%, and reduces the heat pump size and photovoltaic panel requirement by 7%. It is also best in class for thermal performance (<1.0W·m^{-2}·K^{-1}), air tightness and air leakage (<3m^{3}·h^{-1}·m^{-2}) Roof-mounted penthouse louvres provide zero-energy stack ventilation to the upper floors, with bespoke design modifications easing installation.

Gilberts' say the hybrid system has exceeded sales expectations since launch and continues to shape low carbon school design.

● **Visit www.gilbertsblackpool.com/natural-ventilation-solutions**

New CPD module explores commercial DHW systems

ACV UK has added a new CIBSE-approved CPD module to support building services professionals navigating rapidly evolving commercial domestic hot water (DHW) system design. The 45-60 minute session covers regulation updates, technology choices, demand profiling and strategies to balance carbon reduction, reliability and cost. Available online, in person or at ACV's Expert Academy, the module complements existing CPDs on material selection and electric boiler decarbonisation.

● **Visit www.acv.com/gb/page/cibse-accredited-cpd-course**

Vent-Axia backs Healthy Homes standard

Vent-Axia has welcomed the government's new Healthy Homes standard, which sets out design guidance to improve indoor air quality, comfort and energy performance in new housing. The standard recommends high-efficiency MVHR systems designed to Passivhaus principles. Vent-Axia says its Lo-Carbon Sentinel Econiq range meets these requirements, offering accredited heat recovery, low noise and a newly published Environmental Product Declaration.

● **Email steve.pearce@volution-group.co.uk**

Season's greetings from the UK Jung Pumpen team

Pump Technology's UK Jung Pumpen team sends festive wishes for a happy Christmas and a prosperous new year. Led by contracts manager Matt Camille, the Berkshire-based authorised team provides expert support for engineers. Email layout drawings, or contact Matt by phone or Teams, for tailored pumping system selections and product descriptions.

● **Call 0118 9821 555 or email Matt@pumptechnology.co.uk**

Sustainable cooling upgrades at crown court

A 200-year-old East London crown court has had a major air conditioning upgrade using five Panasonic 170kW ECOi-W R32 air source heat pumps installed in cascade. The new installation improves energy efficiency by 50%, protects equipment with hydraulic separation and plate heat exchangers, and operates quietly and reliably. The modular system ensures long-term sustainability for the site.

● **Visit bit.ly/panasonicproducts**

Smart fan helps meet Awaab's Law

Vent-Axia is helping landlords tackle damp, mould and poor indoor air quality with its new Lo-Carbon Revive 7 Switchee-enabled smart fan. The system offers real-time monitoring, early detection of condensation and tamper-proof performance. Energy efficient and near-silent, the fan supports compliance with Part F regulations and reduces maintenance costs.

● **Visit www.vent-axia.com/social-housing**

Intelligent fire panels for Canterbury Student Village

Advanced has supplied its MxPro 5 intelligent fire panels to Canterbury Student Village, in Kent, as part of a £3.5m project to enhance fire safety. The networked panels provide high-performance, multi-protocol protection for student housing, plantrooms and high-risk areas while the buildings remain occupied. The system supports wired, wireless and hybrid devices, and integrates with access control, lifts and AOV systems.

● **Visit www.advancedco.com**

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FLOWGRID AIR VOLUME SENSOR

- Accurate average air volume measurement
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- Low velocity detection from 0.5 m/s
- Frame made in galvanised metal or stainless
- Standard mounting flanges 20-30-40 mm
- Height manufactured in 100mm increments
- Width manufactured in 50mm increments
- Length 300 mm to fit the CMR Dampers
- Sizes 3000 x 3000mm have been manufactured
- Custom made sizes can be manufactured
- 35 Years field application experience

CMR FLOWGRID

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.

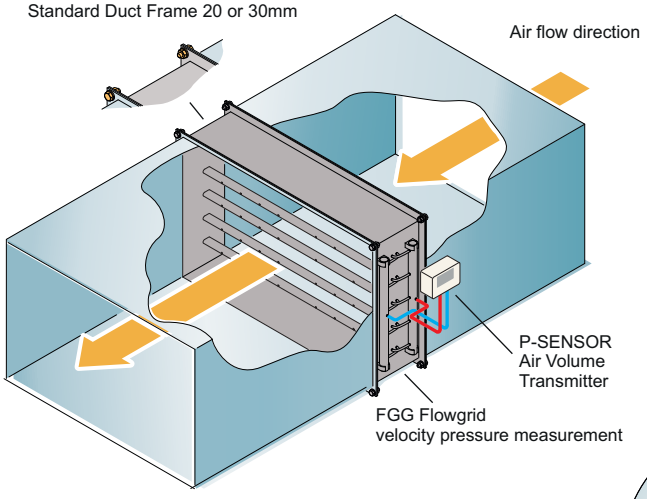
Another great advantage of the FGG Flowgrid is, that it can measure bi-directional as it is manufactured equally on both sides. This means, the air flow is measured in one direction and should there be a reverse flow, this can be detected and measured when using the CMR P-SENSOR.

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

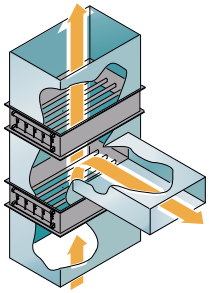
The Flowgrids are installed in many projects such as

Commercial Buildings - Industrial Production Plants - Pharmaceutical Production - Validated Monitoring Systems Hospital Isolation Rooms - Operating Theatres - Data Centres

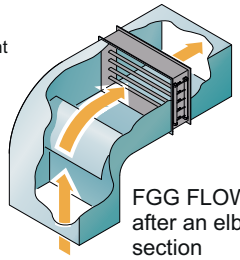
FGG FLOWGRID and P-SENSOR providing accurate average air volume measurement in ducts.



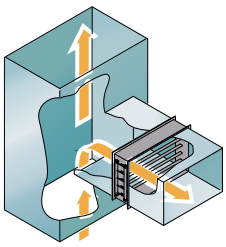
P-SENSOR
With LCD display
and keyboard



FGG FLOWGRID
before and after a
T- duct section



FGG FLOWGRID
after an elbow duct
section



FGG FLOWGRID
in a T- duct section

CMR is ISO 9001 and UKAS accredited

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