cibse Journal

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

Industrial revolutions

Greening Manchester's mighty steam engines with modern building services

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CPD Special with this issue

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Trustpilot

Fitting legacy

The Young Engineers Awards were not just notable for the excellence of the graduate presentations, but also for the last appearance of Ewen Rose and Professor Tim Dwyer FCIBSE at the helm. The friends co-founded the awards 30 years ago, when CIBSE Past President Kevin Mitchell became the inaugural winner. The pair received their own accolade on the night: a Presidential Award for Exceptional Service from current President Vince Arnold.

In his valedictory speech, Dwyer said how heartened he was to see that presentations in the CIBSE ASHRAE Graduate of the Year category were grounded in social purpose as well as engineering excellence. Winner Hannah Gray demonstrated both of these in her presentation on how engineers can make carbon reduction real, measurable and meaningful. She said it was their duty to increase their carbon literacy and inspire other disciplines to embrace low carbon design.

Among the judging criteria was a requirement for engineers to demonstrate the vision and communication skills to advocate for sustainability. With her erudite speech and elegantly designed slides, Gray demonstrated this in abundance.

A treat for engineers is the refurbished Power Hall at the Science and Industry Museum in Manchester, which houses some of the giant steam engines that powered the Industrial Revolution. The latest exhibits are an electric steam boiler and ground source heat pumps, part of a services strategy by consultant Max Fordham that generates low carbon steam to power the original heritage machines.

The museum's iconic machines inspired Iain Shaw to become an engineer, so it is fitting that he helped design its decarbonisation strategy. As well as swapping a gas-fired steam boiler for all-electric plant, the design captures waste heat from the old working machines, helping to cut carbon further.

Be sure to read our CPD Special this month, which features three new CPDs and the details of dozens of CPD providers. Our feature on a CIBSE heat pump briefing, on page 38, reminds us how essential continual learning is, with speakers sharing anecdotes of poor practice in commercial heat pump retrofits.

NABERS UK certification is one antidote to poor performance. Buildings with NABERS UK ratings, such as 11/12 Wellington Place, have been rigorously assessed and monitored to ensure design intent is realised in actual performance.

● **Alex Smith, editor asmith@cibsejournal.com**

Editorial
Editor: Alex Smith
Tel: +44 (0)1223 378034
Email: asmith@cibsejournal.com
Technical editor: Tim Dwyer
Reporter: Molly Tooher-Rudd
Designer: Kevin Reed
Chief sub-editor: Jo Halpin

CIBSE Journal is written and produced by
CPL One
Tel: +44 (0)1223 378000
www.cplone.co.uk
1 Cambridge Technopark, Newmarket Road, Cambridge CB5 8PB.

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Advertisement sales
Display and sponsorship Jon Morton
jon.morton@redactive.co.uk
Tel: +44 (0) 20 7324 2786
Products & services Daniel Goodwin
daniel.goodwin@redactive.co.uk
Tel: +44 (0) 20 7880 6217
Recruitment advertising
cibsejournaljobs@redactive.co.uk
Tel: +44 (0) 20 7880 6215
Advertising production Jane Easterman
jane.easterman@redactive.co.uk
Tel: +44 (0) 20 7880 6248

Contributors

Sam Baptist
On highlights from the autumn party political conferences, and how CIBSE is engaging with government

Bill Wilson
Looks at a report by Buro Happold that outlines the opportunities for waste heat to provide heat for London buildings

Dylan Ryan
YEN Republic of Ireland chair on building relationships and driving growth in the Irish engineer community

Tim Dywer
This month's CPD looks at the processes in a new PAS that underpin modern methods of construction

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22

Contents

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For cibse
Journal production manager: Nicola Hurley
Tel: +44 (0)208 772 3697,
nhurley@cibse.org

CIBSE, 222 Balham High Road, London SW12 9BS
Tel: +44 (0)208 675 5211

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UK must adapt now to 2°C global warming

Extreme predicted temperatures will require strong adaptation policies, warns Climate Change Committee

The UK must prepare for temperatures beyond the long-term temperature goal set out in the 2015 Paris climate change agreement, the Climate Change Committee (CCC) has warned.

In a letter to floods and water minister Emma Hardy, the chair of the statutory climate adviser's adaptation committee, Baroness Brown, writes that it is 'clear' the UK is 'not yet adapted for the changes in weather and climate that we are living with today, let alone those that are expected over coming decades'.

She says planning for global warming levels reaching 2°C above pre-industrial levels by 2050 – beyond the Paris agreement's 1.5°C goal – should be a 'minimum level'.

Additional warming beyond 2050 is currently expected and 'extreme outcomes' remain possible – for example, if the climate response to greenhouse gas emissions is 'higher than anticipated'.

While 'significant progress' on the cost of low carbon technologies has reduced expectations of future warming, reaching 4°C above pre-industrial levels by the end of the century 'cannot yet be ruled out' and should be factored into adaptation planning, according to the letter.

'Significant changes' in the UK's weather and climate at 2°C global warming includes the chances of an officially defined heatwave doubling from 40% each year in recent decades to close to 80%.

In addition, average peak rainfall across the UK is expected to rise by up to 10–15% on the wettest days, increasing peak river flows by up to 40% in some river catchments.

Sea level rise will also continue and accelerate, with 15–25cm of additional sea level rise expected by 2050 for UK coastal cities.

Strong adaptation objectives will be required to build up resilience to extreme temperatures, the CCC recommends.

BSR's new unit hitting target for majority of applications

The Building Safety Regulator (BSR) has revealed that the majority of Gateway 2 applications in its newly established Innovation Unit (IU) are meeting or exceeding the 12-week statutory target for new-build applications.

The unit was introduced in August as part of a package of reforms to address significant delays and high rejection rates in the application process.

The BSR says the IU is now managing 27 new-build applications with 6,192 housing units. It focuses on fast-tracking new-build applications for homes in high-rise buildings and has a new operating model, with dedicated in-house multidisciplinary teams (MDTs) managing and assessing individual applications.

The original MDT model relied on external or outsourced delivery for a portion of the specialised technical assessments.

In total, the BSR is progressing 152 live new-build applications, representing 33,670 housing units across England. An additional 253 live remediation applications are also being processed, covering an estimated 22,304 housing units.

Planning is 'building flooding risk into landscape', say MPs

The planning system is 'not keeping pace' with the 'modern realities' of flooding, MPs have warned.

In a new report on England's resilience to flooding, published on 13 October, the House of Commons Environmental Audit Committee says the planning system must treat flood risk as a 'strategic constraint' and direct development to areas less likely to be inundated. It says: 'In its current form, the planning system is not keeping pace with the modern realities of flooding, but is instead building risk into the landscape.'

NAO finds widespread failure in domestic retrofits

Major issues discovered in government insulation schemes

Nearly all of the external wall insulation fitted under the latest round of the government's flagship energy efficiency scheme has had to be fixed, a damning report by the National Audit Office (NAO) has revealed.

Parliament's public spending watchdog examined recent failures with the quality of installations secured via the energy supplier-funded Energy Company Obligation (ECO) and the Great British Insulation Scheme(GBIS), introduced by the previous government.

Its report, *Energy efficiency installations under the Energy Company Obligation*, states that poor installation work resulted in an estimated 22-23,000 homes having major issues that needed fixing. This is 98% of the external wall installations under the latest phases of ECO.

The NAO's audit of projects carried out under ECO 4 and GBIS showed that up to 13,000 homes with internal insulation (29% of the total) also had major issues that needed fixing.

Up to 2,000 homes with external wall insulation had issues that posed an immediate health and safety risk, the report found, including exposed live electrical cabling and blocked boiler ventilation.

The NAO report states that nearly all of the faulty installations have been remediated, at a cost of up to £18,000 per property.

Private rental flats must achieve EPC 'C' in Scotland by 2028

New rules requiring a Band C Energy Performance Certificate (EPC) for all new private tenancies in Scotland by 2028 will come into force next year, the Scottish government has confirmed.

The new Energy Performance of Buildings (Scotland) Regulations 2025 will come into effect on 31 October 2026. All private rented properties will have to achieve EPC 'C' standard by 2028 for new tenancies and 2033 for all existing tenancies. In England, private rented properties need only achieve the lower 'E' rating.

The new Scottish EPC includes a heat-retention rating metric for homes, and uses the Home and Simplified Building Energy Models for calculating domestic and non-domestic bands respectively.

Installer confidence in heat pumps rises, but demand gap remains

UK heating engineers are increasingly preparing to install heat pumps, but low consumer demand is still holding back the market, according to Baxi's fourth annual Installer Skills Survey.

The poll of nearly 400 installers, conducted with consultancy Talan, found that 59% are already developing heat pump skills or intend to do so in the next few years, up 8% from 2024.

Confidence has also grown, supported by record levels of training, with more than 1,000 installers attending Baxi courses in the past year. However, 60% still cite a lack of demand as the biggest barrier to installation, while almost half blame paperwork linked to government schemes.

Plumbers commit to heat pump training

More than 90% of plumbers and heating installers will be trained in heat pump installation within the next 12 months, according to City Plumbing's *Taking the temperature* report.

A survey of 500 industry professionals shows that 58% have already trained and a further 34% plan to do so in the next 12 months. Those aged 25 to 34 are most likely to have undergone training (69%), but the proportion of plumbers trained in heat pump installation varies widely around the UK, from 75% in Wales to 21% in Northern Ireland.

Almshouse wins Stirling Prize

The Royal Institute of British Architects has awarded its annual Stirling Prize to United St Saviour's Charity's Appleby Blue almshouse. The 57-apartment scheme in Bermondsey, for people aged over 65, was designed by Witherford Watson Mann and is devised to be naturally ventilated. Skelly & Couch and AWA Consultants provided environmental and M&E engineering services.

Energy consumers minister Martin McCluskey

Government delays Warm Homes Plan

Departments pushing back on energy efficiency plans, according to reports

Publication of the government's Warm Homes Plan (WHP) has been postponed amid reports that Whitehall departments are at loggerheads over key features of the initiative.

Chancellor Rachel Reeves' summer Spending Review allocated £13.2bn to the plan to upgrade five million homes during the current parliament, and its launch date had been pencilled in for 22 October.

The Department for Energy Security and Net Zero (DESNZ) pledged to publish the WHP in October, and this was confirmed by energy consumers minister Martin McCluskey at a Labour Party conference fringe event in September. However, during DESNZ ministers question time on 14 October, McCluskey said the plan would now be rolled out 'before the end of the year'.

Industry groups had already received a message from DESNZ that the WHP's publication was to be pushed back, potentially to early December, after the Budget on 26 November.

The postponement follows reports that other government departments have been pushing back on proposals in the WHP to improve energy efficiency standards in private rented housing and remove policy levies from the electricity bills of heat pump users. It also follows McCluskey's replacement, in September, of Miatta Fahnbulleh, who had overseen the development of the WHP since her appointment as energy consumers minister last year.

The delay to the WHP also leaves DESNZ with a headache about how it will address emissions from home heating in its next Carbon Budget Delivery Plan, which the government must publish before the end of October.

Responding to the delay, Jennifer Humphries, director of clean tech and climate at consultancy Seahorse Environmental, said: 'The government's decision to further delay the Warm Homes Plan is disappointing.

'The government needs to deliver a clear, consistent strategy for lowering energy bills while achieving its climate ambitions.'

Three trade bodies merge into new organisation

Members of the UK's three heat pump trade bodies have committed to come together into a single association for the sector.

The merger unites the Heat Pump Association (HPA), Ground Source Heat Pump Association (GSHPA) and Heat Pump Federation (HPF), and the new body will be called the Heat Pump Association UK (HPA UK). It will launch in January 2026.

To celebrate the amalgamation, the HPA is offering free membership for the remainder of 2025 to all new members who commit to sign up for the 2026 calendar year.

The intended benefits of the move include 'strong and consistent' representation to government and stakeholders, a single point of contact for industry collaboration and engagement, as well as 'clear messaging and greater visibility' for heat pumps.

The entire assets, liabilities and operations of the GSHPA and HPF will transfer to the HPA, which will then rebrand as HPA UK at the beginning of next year.

Mark Wilkins, HPA chair, and Laura Bishop, GSHPA chair, will co-chair HPA UK until September 2027.

Waste-heat project could warm 300,000 homes

Scheme to use heat from Riverside incineration plant

Waste-management giant Cory has unveiled plans to pipe heat into central London from an incineration plant on the outskirts of the capital.

The project would use industrial waste heat drawn from the firm's Riverside 1 plant, located in the London Borough of Bexley.

Water warmed by the waste heat will be pumped into giant tunnels from Bexley, on the Thames estuary, into south-east and central London, creating a new heat-transmission main. The heat would then be transferred to distribution networks and supplied to individual buildings via smaller hot-water pipes. Future plans for the network include connecting with other heat sources.

Cory said the scheme is the first heat infrastructure project to be designated as nationally significant by Ed Miliband, Secretary of State for Energy Security and Net Zero.

The company estimates that the project will supply heat to around 300,000 homes across the capital, meeting the entire annual demand of the City of London and approximately half of the City of Westminster.

Veolia is extending a heat network that uses energy derived from waste treated at the company's South East London Combined Heat and Power facility. The network will provide heat to 1,618 households in a new six-block development by Greystar, in Bermondsey.

US proposes watering down F-gas rules

Manufacturers have criticised proposals by the US Environmental Protection Agency (EPA) to water down F-gas rules by rolling back refrigerant phase-out dates.

The EPA wants the new start date for global warming potential (GWP) limits in retail refrigeration equipment to be pushed back five years, to New Year's Day 2032.

The Air-Conditioning, Heating, and Refrigeration Institute says this would disrupt planning and investment by US manufacturers, which have already retooled production, certified new equipment and built supply chains around the current schedule.

A delay would also reopen the US market to outdated, high-GWP equipment, giving foreign firms a competitive advantage and penalising US manufacturers.

cibse news

New TM65.4 tackles embodied carbon in office HVAC

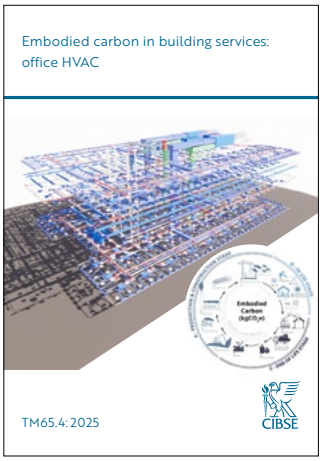
Guidance focuses on the embodied carbon of heating, ventilation and air conditioning systems in a five-storey building

CIBSE has published *TM65.4 Embodied carbon in building services: office HVAC*, a new guide that provides vital insights into the life-cycle embodied carbon impact of the heating, ventilation and air conditioning (HVAC) typically used in UK office buildings.

Developed by Introba, and sponsored by CIBSE and Introba, the research investigates the embodied carbon of HVAC equipment and design strategies at product and system levels, helping engineers, designers and sustainability professionals make informed decisions that support net zero design goals.

The guide draws on manufacturers' data and applies TM65 methodology to calculate embodied carbon impacts.

It focuses on the embodied carbon of HVAC systems in a typical new-build, five-storey office building in the UK, comparing two timeframes: a typical building service life (60 years) and a tenancy period (12 years). This approach highlights how design strategies influence carbon outcomes over time and supports decision-making at different stages of the building life-cycle.



TM65.4 represents an important first step towards understanding the embodied carbon implications of different HVAC design strategies in office environments.

Where Environmental Product Declarations are not available, the results of this study can provide useful benchmarks at the early design stage.

***TM65.4 Embodied carbon in building services: office HVAC* is available at www.cibse.org/knowledge**

A webinar introducing TM65.4 is taking place on **19 November.** Register at **www.cibse.org/growyourknowledge**

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 needed to implement the CIBSE Heat networks Code of Practice (CP1) are available across the building services sector.

This two-day course is 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.

For more information: bit.ly/CJCIBSIstc

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

Mechanical services explained
12–14 November
3–5 December

Leadership identity and self-awareness
17 December

Electrical services overview
18 December

Fire safety management
5 December

Fire safety in construction
10 December

Overview of IET wiring regulations
10 November

Fire safety in purpose-built blocks of flats
11–12 November

Air conditioning inspection for buildings
12 November

Energy Savings Opportunity Scheme
13 November

Power system harmonics
17 November

Introduction to heat networks and Code of Practice
18 November

Implementing BS 8519:2020 for life-safety, fire-fighting and critical applications
19 November

Understanding the law for engineers
25 November

Below-ground building drainage
27 November

Energy surveys
28 November

Introduction to the Building Safety Act
2 December

Design of ductwork systems
2 December

Standby diesel generator
3 December

International building services projects
4 December

Heat networks Code of Practice
8–9 December

Mastering the application of heat pumps
11 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

Electrical services overview
18 December

Building services explained
18–19 December

Training courses in development

CIBSE Training has an exciting pipeline of new courses currently in development. By registering your interest early, you will be able to enjoy a one-off discount code for 15% off your purchase once the course has launched.

Courses in development include: Networking skills; Client retention; Introduction to the principal designer and principal contractor roles; AM18 – medium-voltage distribution; Building Regulations – the Future Homes and Buildings standards.
www.cibse.org/training

Hilson Moran scoops Employer of the Year prize

Consultant wins overall title at Young Engineers Awards

Hilson Moran was named overall CIBSE Employer of the Year at last month's Young Engineers Awards, having also taken the medium-sized company accolade.

Noquet Building Services won the small firm category, while Aecom was named best large company.

Hilson Moran impressed the judges with its Hilson Moran Academy, which includes mentoring schemes to support employees throughout their careers, across all levels and job roles. The academy recognises the value of mentors in bridging the skills gap and offering knowledge and experience for the advancement of mentees.

Noquet, founded less than two years ago, has embedded development, mentorship and continuous learning into its culture, and built strong foundations to support, train and inspire its early career engineers.

Aecom has offered more than 500 opportunities across vacation placements, industrial roles, sponsorships, apprenticeships and graduate positions in the past year alone – roles that are supported by a suite of structured resources and programmes to foster professional growth. The company has also launched a digital learning platform.

This year's award entries showcased more involvement with STEM, and partnering with schools and colleges, and there was an increase in submissions from small and medium-sized businesses. The judges were impressed with how some organisations have established facilities for internal knowledge sharing, from small workshops to dedicated training centres. There were also frameworks for continual learning and development, particularly in relation to the Building Safety Act and sustainability.

The CIBSE Employer of the Year Awards celebrate companies that actively support and nurture young engineers, promoting their development through training, mentoring and initiatives that prioritise them within their business.

www.cibse.org/yea

Large Employer of the Year, Aecom

Small Employer of the Year, Noquet

Overall Employer of the Year, Hilson Moran

In November

SFE Façade Design and Engineering Awards

5 November, Old Billingsgate, London.

The SFE Façade 2025 Design and Engineering Awards recognise excellence and achievements in façade engineering, raising the profile of, and drawing attention to, the importance of this discipline. The shortlist has been announced.

UK Net Zero Carbon Buildings Standard (UKNZCBS) in practice

6 November

This one-day conference brings together the country's most forward-thinking developers, designers and policymakers to turn pilot results into real-world action. With speakers David Partridge, chair, UKNZCBS governance board, and Katie Clemence-Jackson, CEO, at UKNZCBS.

bit.ly/CJNZCBS25

SDE Digital Awards

19 November, NLA The London Centre

The annual Society of Digital Engineering (SDE) Awards recognise those working in the built environment who contribute to the digitalisation of what we do, where we live and how we experience it.

bit.ly/SDEAW25

Build2Perform Live

19-20 November, elementalLONDON at Excel London

CIBSE's Build2Perform Live will take place across two theatres. Sessions will cover the future of heating and cooling, head decarbonisation, climate resilience, health and wellbeing guide for net zero, data centres in a net zero future, and NABERS UK.

Book a free place at: elementallondon.show

CIBSE ECV scheme drives embodied carbon transparency

Evolve Water is employing CIBSE Certification's Embodied Carbon Verification (ECV) scheme to verify its CIBSE TM65 calculations. The methodology is being used to quantify and reduce embodied carbon in the company's water conditioning equipment. The insights gained through CIBSE TM65 have shaped the company's internal practices, with embodied carbon now considered alongside cost and performance when it selects materials. It has become a shared language across departments and the supply chain. Evolve Water has achieved ECV for a range of 22 products.

Consultation on water efficiency standards opens

CIBSE is seeking contributions to a response to the consultation on proposals to tighten the water efficiency standards, to ensure new housing developments are built to be more water efficient. A failure to implement demand-management measures in response to water scarcity could result in more than 61,000 houses not being built, according to the government, costing the economy £25bn this parliamentary term.

● To contribute to CIBSE's response, visit: bit.ly/CJcons by 25 November. The consultation closes on 16 December.

New campaign to tackle embodied carbon

A communications campaign focused on embodied carbon has been launched by CIBSE, which has established itself as the go-to authority on the topic. Central to this is TM65, which sets out a methodology for estimating embodied carbon in MEP systems. By launching this campaign, CIBSE aims to raise awareness of the importance of reducing embodied carbon in tackling climate change. The campaign can be found online at bit.ly/CJEmCaCo25

CIBSE partners with Futurebuild 2026

CIBSE has again joined forces with Futurebuild for 2026. The event will take place on 3–5 March at Excel London, and will bring together architects, contractors, policymakers, suppliers and manufacturers for three days of CPD-accredited content.

CIBSE will be hosting three dedicated sessions at the event, with details to be confirmed. You can also visit CIBSE on stand B36

● To register for the free event, visit www.futurebuild.co.uk

CIBSE honours research excellence in building services engineering

Medals awarded for winning papers from *Building Services Engineering Research & Technology*

Technical papers exploring hybrid ventilation, future weather predictions, dynamic modelling, digital twins and domestic energy use have been recognised with CIBSE awards. Authors of winning papers, which appeared in *Building Services Engineering Research & Technology (BSER&T)* journal in 2024, were handed medals at the CIBSE President's Awards Dinner last month.

The inaugural Brian Moss Fan Makers Award was won by Daniel Godoy-Shimizu, Ivan Korolija, Yair Schwartz and Dejan Mumovic (University College London), for the paper 'Producing domestic energy benchmarks using a large disaggregate stock model'. This presents an analysis of metered gas and electricity use from more than 800,000 dwellings, and new gas and electricity benchmarks have been produced based on the rich database.

The new award grants a bursary of £5,000 and was launched in 2025 to support innovation and learning in building services, and to celebrate the legacy of CIBSE Past President Brian Moss OBE. The other awards for technical papers were the:

Dufton Silver Medal for fundamental research in building services research and development, presented to Matthew Waterson and Gary R Hunt for their paper 'Night cooling by hybrid supply ventilation – analytical predictions of airflow rates and the hybrid ventilation triangles'. The paper investigates hybrid ventilation – specifically the rates of airflow achieved by the simultaneous combination of 'stack-driven' natural displacement ventilation and a mechanical supply. The results challenge the perception that a hybrid approach is superior to solely natural, and mechanical strategies.

Barker Silver Medal for an outstanding paper on application and development, won by Matthew E Eames, Hailun Xie, Anastasia Mylona, Jake Hacker and Ruth Shilston for their paper 'A revised morphing algorithm for creating future weather for building performance evaluation'. The study describes an improved method of predicting future weather data as 'bounded morphing algorithms'. The approach was found to be more reliable in producing future weather data that preserves the underlying climate signals and, ultimately, produces more plausible future weather conditions.

Carter Bronze Medal for the most highly rated paper, awarded to Nishesh Jain, Esfand Burman and Dejan Mumovic, for their paper 'CIBSE TM54 energy projections III: a case study using dynamic simulation with detailed system modelling'. The paper explores important aspects described in the revised TM54, which recommends three modelling approaches that a project can follow depending on its scale and complexity: quasi-steady state tools; dynamic simulation with a template HVAC system; and dynamic simulation with detailed HVAC system modelling.

Napier Shaw Bronze Medal for the most highly rated research paper, awarded to Mariam Elnour, Ahmad M Ahmad, Shimaa Abdelkarim, Fodil Fadli and Khalid Naji for their paper 'Empowering smart cities with digital twins of buildings: applications and implementation considerations of data-driven energy modelling in building management'. The study proposes deploying data-driven digital twins for smart buildings by using the available building's technology and IT infrastructure to complement and augment existing functions.

CIBSE members can read *BSER&T* for free at www.cibse.org/knowledge

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CIBSE presents medals for outstanding contribution

Four Golds among 19 medals presented at President's Awards Dinner

Nineteen exceptional CIBSE members have had their dedication to and passion for the building services industry recognised with medals at the President's Awards Dinner.

Four Gold, four Silver and 11 Bronze medals were presented to those whose exceptional contributions to the Institution and the industry have made a significant impact.

The four Gold medals went to Derek Clements-Croome, Kevin Kelly, Richard Rooley and Peter Wong.

Professor Derek Clements-Croome's service to CIBSE and its predecessor, the Institution of Heating and Ventilation Engineers (IHVE), spans nearly 70 years. A pioneer in intelligent buildings and occupant wellbeing, his leadership across CIBSE committees, working groups and education initiatives has made a global impact. A former CIBSE vice-president and founder of the Intelligent Buildings Group, his work has shaped guidance, research and accredited programmes that continue to influence the sector today.

Professor Kevin Kelly has dedicated more than 30 years to CIBSE, holding leadership roles, including Ireland chair, president of the Society of Light and Lighting, CIBSE President in 2021, and chair of the Benevolent Fund and Inclusivity Committee. A strong advocate for education, inclusivity and sustainability, his work has transformed engineering education in Ireland, strengthened international collaboration, and advanced energy management practices across the sector.

Peter Y Wong has held numerous leadership positions, including CIBSE President, Hong Kong Institute of Engineers (HKIE) president, and founding chair of the HKIE Building Services Division. Renowned for his passion and vision, Wong has inspired colleagues to view engineering as both a science and an art. His dedication, energy and influence have left a lasting legacy on the profession in Hong Kong and beyond.

Richard Rooley has been a prominent figure within IHVE and CIBSE for more than 50 years, serving on the Board and multiple committees. He founded the Team Build competition, served as the first non-US President of ASHRAE in 2003, and is one of the few CIBSE members elected as a Fellow of the Royal Academy of Engineering. Rooley's distinguished career spans technical leadership, community engagement and thought leadership, making him a deserving recipient of the Gold medal. ●

Silver medals were awarded to: Stanley Chow, past chair of CIBSE Hong Kong for two years, whose visionary guidance propelled the Region forwards and continues to ensure CIBSE's relevance in Hong Kong; **Farah Naz**, a leading sustainability professional, who has been chair of CIBSE UAE and of WiBSE, and is currently a member of CIBSE Council; **Anthony Ownsworth**, an SLL past president and past chair of CIBSE Scotland, as well as pioneer of the SLL Masterclass series; and **Dr Richard Peters**, authority on vertical transportation, co-founder of the Lift and Escalator Symposium, and lead author of CIBSE Guide D.

Bronze medals were awarded to: Gary Chiang, Mahroo Eftekhari, Jonathan Grimshaw, Ruth Kelly Waskett, Helen Loomes, Laura Mansel-Thomas, Leon Markwell, Paul Marston, John McLean, David Mooney and Austin Williamson.

The winners of the 2025 Ken Dale Award were also presented with their awards on the night. Klaudia Rudzionek and Charlotte Hodgson were joint winners of the bursary, which supports early career CIBSE members research global engineering innovations. (**bit.ly/CJKenDale25**)

A number of awards for technical papers were also presented (see Technical Papers on page 13).

For more on this year's CIBSE medal recipients, visit: bit.ly/CJPresAw25

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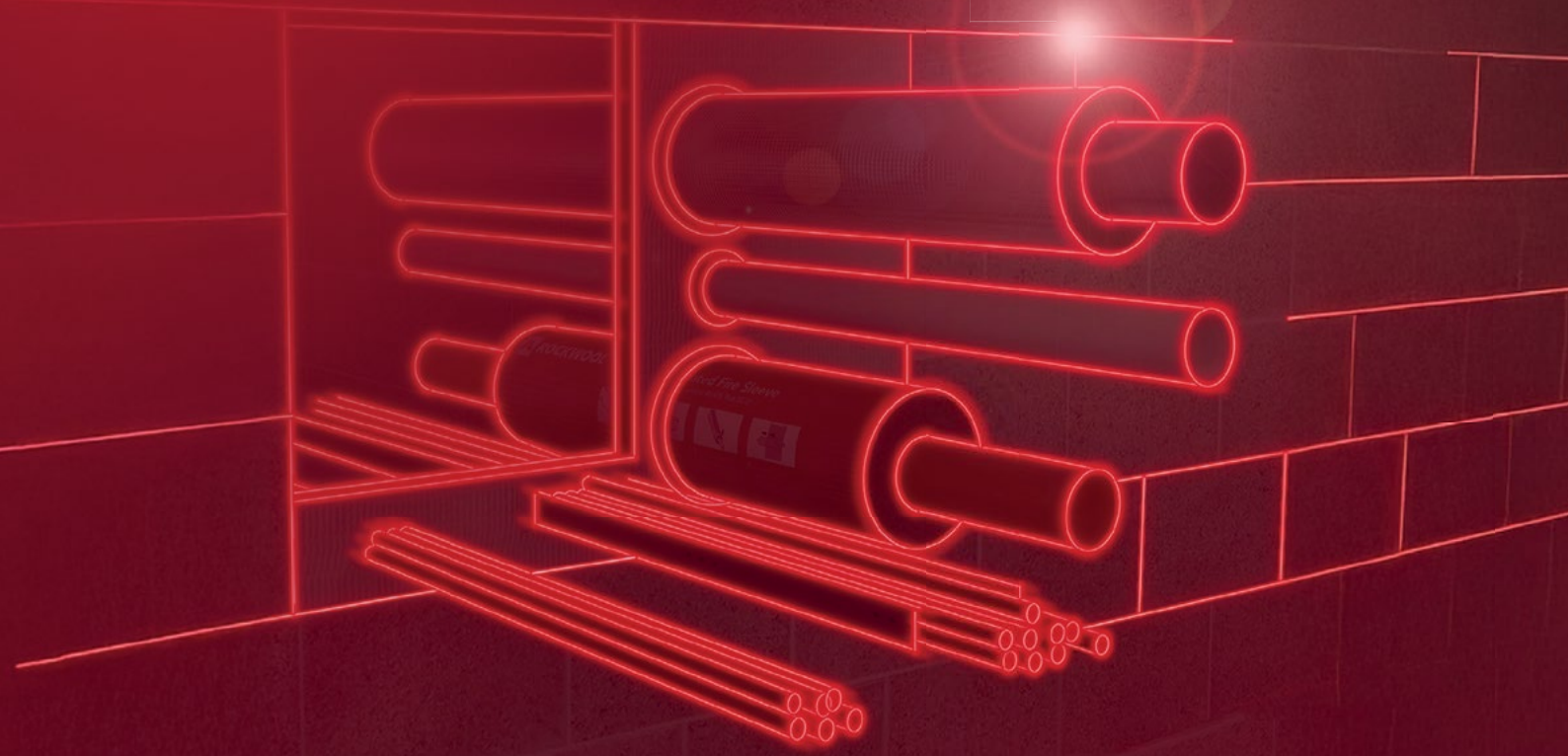

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Net zero, skills and safety dominate policy debates

The autumn political party conferences in the UK showed a commitment to skills and the built environment, says CIBSE's **Sam Baptist**

Every autumn, the major UK political parties hold annual conferences, bringing together members, trade union representatives and parliamentarians. These gatherings are an opportunity for parties to debate policy priorities and engage with businesses, charities and other organisations on shared challenges.

With an opportunity to engage directly with ministers, MPs, peers and key policy influencers, CIBSE attended the conference of the governing Labour Party. It gave us the chance to discuss with government the key issues that go to the heart of what we do – from skills and competence, to net zero and the energy transition, building safety and housing delivery.

Keynote speeches from government ministers included several policy announcements of relevance to CIBSE and the wider sector, including:

- A new target for getting two-thirds of young people into university or onto a 'gold standard' apprenticeship
- Acceptance of the recommendations made by the New Towns Taskforce for 12 new towns, including proposed locations, that aim to deliver 300,000 homes over the next decade. The government confirmed that work would start on three new locations by 2029.
- Reintroduction of means-tested maintenance grants, supporting students from low-income households taking priority technical courses at levels 4–6 under the lifelong learning entitlement.

CIBSE's engagement at conference

Beyond monitoring announcements, CIBSE attended several policy and industry events to raise the profile of the Institution and champion our members' expertise. These included:

- A National Engineering Policy Centre (NEPC) event on the investment in skills required to deliver the government's Industrial Strategy
- A Building Research Establishment (BRE) panel on sustainable buildings in the hospitality sector and the role of Breeam and CIBSE-administered NABERS UK
- An Institution of Engineering and Technology (IET) roundtable on employer skills needs and apprenticeship pathways
- A session by UK innovation agency Nesta on the transition to low carbon energy.
- A Joint Industry Board (JIB) event, chaired by Baroness Wendy Alexander, on developing a future-ready construction workforce and raising competence standards.

Highlights from other UK party conferences

Conservative

- Party leader Kemi Badenoch MP announced a pledge to abolish stamp duty for primary residences in England.
- There was a focus on reforming planning rules and Building Regulations to drive supply and lower costs.
- The shadow energy secretary said the party would repeal the Climate Change Act, replacing it with a 'Cheap Power Plan' to cut bills.
- Proposals to double the apprenticeship budget from £3bn to £6bn by scrapping 'rip-off' courses.

Liberal Democrats

- Leader Sir Ed Davey called for action on housing, energy bills and the environment, pledging to halve energy bills by 2035.
- Pippa Heylings MP, energy and net zero spokesperson, argued that growth and net zero ambitions can align – calling for zero carbon building standards, green skills investment, and a National Climate Assembly.
- Housing spokesperson Gideon Amos MP advocated for a 'rent to own' model to expand affordable housing.

Reform UK, The Green Party, and nationalist parties such as the SNP and Plaid Cymru also held conferences.

Why this matters

These conferences provide invaluable insight into the direction of travel for the UK's governing party and those seeking power. They also offer CIBSE a direct channel to influence future policy outcomes on issues at the core of our mission: building safety, energy efficiency, net zero, skills and sustainable growth.

Over the coming months, CIBSE will continue to engage with government ministers, shadow ministers and parliamentarians from all parties to ensure building services engineering is recognised as a key enabler of the UK's economic, environmental, energy and building ambitions. ●

● **Sam Baptist is head of government affairs at CIBSE**

Future-proof your next VRF project

A smaller footprint and move away from R410A means embodied carbon in the new City Multi R32 VRF YXM range is reduced by 74%, says Mitsubishi Electric's **Graham Temple**

The latest innovative product to join the market-leading City Multi air conditioning range is the new R32 YXM VRF, which features our patented 2-pipe design to reduce brazing points on projects.

Available to specify now and to install from spring 2026, the City Multi R32 VRF YXM range delivers a high-efficiency, versatile solution for a wide range of applications across new-build and retrofit projects.

The brand-new chassis design, which has a 6% smaller footprint than the market average, uses R32, to offer a 74% reduction in embodied carbon compared with R410A.

Still delivering City Multi's renowned versatility with our familiar plug-and-play solution, the modular system offers capacities of 22kW up to 113kW in both heat pump and heat-recovery systems.

Perfect for offices and high-rise buildings, hotels, education, retail and health care facilities, a single outdoor compressor can support up to 50 indoor units, to offer exceptional scalability.

Ideal for tight ceilings, the flexible piping configuration, with improved 113m vertical extension, and the unique 2-pipe system simplifies installation and maintenance.

With a wide choice of ceiling cassettes, concealed ducted units, wall-mounted and ceiling-suspended units, the system offers a versatile climate control solution for any building, with energy efficiency and controllable comfort at its heart. It also includes a BS EN378 Part 3-compliant, low-level leak detector, with an extended life of 30 years.

The City Multi R32 YXM VRF has been improved across the board to deliver a significant reduction in both running costs and operational carbon, improving payback periods and run costs, while offering market-leading low noise levels.

New defrost technology, better ramp-up time and enhanced heating capacity ensure that the system delivers the highest levels of seasonal efficiency.

Simultaneous heating and cooling deliver consistent comfort across multiple zones while supporting decarbonisation goals.

To find out how to future-proof your next project, download our latest infographic at: bit.ly/CJMEYXM25

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

30 years of success and inspiration

The triumphant 30th Young Engineers Awards was a fitting tribute to co-founders **Tim Dwyer** and **Ewen Rose,** who announced that they would be stepping down as host and head judge of the annual awards

The 30th anniversary of the Young Engineers Awards shattered previous records to become the most successful in the event's history.

There were a record number of entries from apprentices, undergraduates and graduates in the building services industry, and more than 230 attended the awards ceremony at UCL's Senate House in central London.

The event, which incorporates the Employer of the Year accolades, honoured the event's co-founders Ewen Rose and Tim Dwyer FCIBSE, who, after three decades of organising the awards, are stepping down as host and chair of judges respectively.

For their dedication to the awards, both were presented with the President's Award for Exceptional Service to CIBSE by CIBSE President Vince Arnold.

Dwyer described how the event grew from a small graduate awards ceremony in Harrogate to today's large-scale celebration of engineering talent.

He told the audience: 'Over the years, we've seen the event flourish and the engineers it celebrates go on to lead education, practice, research and policy across the world. It's been a privilege to serve as chair of judges.'

Graduate of the Year Hannah Gray with CIBSE President Vince Arnold and ASHRAE President Bill McQuade

The 30th winner of the CIBSE ASHRAE Graduate of the Year Awards was Hannah Gray, University of Edinburgh and Foster + Partners.

The 10 finalists had to give a live presentation on the theme 'Engineering for impact: how can we make carbon reduction real, measurable and meaningful?' and the judges rated Gray's most highly.

'Hannah stood out for her clarity, composure and depth of understanding, communicating complex ideas with confidence and purpose,' said Dwyer.

Central to her presentation was a call for engineers to improve their carbon literacy to help them understand how their designs affect building carbon emissions.

'The next generation of engineers need to become sustainability engineers, regardless of their job title,' she said.

'As young building services engineers, we're taught to size docs and select pumps, but how often are we taught to assess the carbon impacts of these choices ourselves?'

Carbon reduction has to be a core design parameter, added Gray, describing it as being as fundamental as cost, comfort or safety.

'With carbon literacy, we can make better choices ourselves and educate other disciplines on the impact of their choices,' she said.

An inspiring legacy

Head judge Tim Dwyer on 30 years of the Young Engineers Awards

The co-founders of the awards, Tim Dwyer FCIBSE and Ewen Rose, are stepping back as organisers after 30 years. Dwyer told the audience how much pride and optimism the awards had given him.

'What started as a relatively informal venture has grown into one of the industry's most respected and enduring showcases,' he said, adding that he has been inspired by how much graduates' presentations touch on the potential for engineering to provide social benefit.

'The themes of recent submissions are consistent: technical excellence grounded in social purpose, an instinct for collaboration, and a clear determination to make buildings and communities genuinely better,' Dwyer said.

'It's heartening to see how often graduates combine professional skills with empathy and public service.'

'As building services engineers, we influence more than just our own systems; we impact glazing, structure and architecture.'

Gray said the growth in performance data will help inform and validate design decisions. 'If we can combine carbon literacy with our digital skills, we can turn project data into design intelligence,' she said.

Second place in the Graduate category went to Andrea Mackenzie, of the University of Bath and FairHeat, who spoke passionately about how heat networks had the potential to decarbonise buildings.

Third was Rachael Gilbert, of University of Lancashire and Troup Bywaters + Anders, who argued that social engagement was key to encouraging communities to adopt and champion carbon-reduction projects.

The other winners were: Ritika Maladkar, University of Nottingham and Laing O'Rourke, Undergraduate of the Year; Lucy Kedian, CPW and University College Birmingham, Apprentice of the Year Level 3–4; and Adia Sadeqee, MZA Consulting Engineers, Apprentice of the Year Level 5–7.

The success of women in the competition reflects an increasingly broad and rich field of talent, according to Dwyer.

'The judging criteria remain the same: technical excellence, clarity of communication and professional engagement,' he said. 'What has changed is opportunity.

'More inclusive routes into the profession mean the best candidates – women and men alike – can demonstrate their capability and purpose on an equal stage.' ●

CIBSE ASHRAE Graduate of the Year:
Winner: Hannah Gray, University of Edinburgh and Foster + Partners
Runner-up: Andrea Mackenzie, University of Bath and FairHeat
Third place: Rachael Gilbert, University of Lancashire and Troup, Bywaters + Anders

CIBSE Apprentice of the Year Level 3–4:
Winner: Lucy Kedian, CPW
Runner-up: Isobel Powers, WSP

CIBSE Apprentice of the Year Level 5–7:
Winner: Adia Sadeqee, MZA Consulting Engineers
Runner-up: Callum Chamberlain, Hoare Lea

CIBSE Undergraduate of the Year:
Winner: Ritika Maladkar, University of Nottingham
Runner-up: Serra Ardor, University College London

CIBSE Apprentice of the Year Level 5–7 winner Adia Sadeqee

CIBSE Apprentice of the Year Level 3–4 winner Lucy Kedian

Undergraduate of the Year Ritika Maladkar

CIBSE ASHRAE Graduates of the Year 1996–2025

2025: Hannah Gray – University of Edinburgh and Foster + Partners
2024: Helen Meutermans – University of Sheffield and AtkinsRéalis
2023: Francesca James – University of Cambridge and FairHeat
2022: Sana Hafsa – Heriot-Watt University and AESG
2021: Lucy Sherburn – University of Sheffield and FairHeat
2020: Jennifer Cox – Heriot-Watt University and Aecom
2019: Laura Luckhurst – Sheffield University and Cundall
2018: Reanna Evans – Leeds Beckett University and NG Bailey
2017: Raphael Amajuoyi – Loughborough University and Hurley Palmer Flatt
2016: Antoni J Sapina Grau – Brunel London University and WSP/Parsons Brinckerhoff
2015: Ryan Rodrigues – London South Bank University and Hurley Palmer Flatt
2014: Emilia Targonska – Loughborough University and Hoare Lea
2013: William Holley – University of Nottingham and Buro Happold
2012: Lee Tabis – Leeds College of Building and NG Bailey
2011: Angela Malynn – London South Bank University and Arup
2010: Michael Gardner – Coventry University and Pick Everard
2009: Emma Marshall – Northumbria University and RPS Gregory
2008: Morwenna Wilson – University of Bristol and Arup
2007: Richard Unwin – London South Bank University and Overbury
2006: Michael Norton – London South Bank University
2005: Nigel Banks – Sheffield and Faber Maunsell
2004: Kai Lim – Imperial College and Faber Maunsell
2003: Dominic Shortland – London South Bank University
2002: Richard Kemp – University of Nottingham and Hoare Lea
2001: Ciara Ahern – Dublin Institute of Technology
1999: Ruth Kelly – Dublin Institute of Technology and AMEC
1998: Sophia Kauntz – Arup
1997: Matthew Pilgrim – Arup
1996: Kevin Mitchell – South Bank University and AMEC Design

Rising to the challenge

Early career engineers gathered for the first *CIBSE Journal* IEQ Design Challenge, in partnership with Zehnder, exploring ways to design spaces for health, comfort and sustainability. **Molly Tooher-Rudd** reports

Young engineers are stepping up to shape the future of healthy, comfortable and sustainable buildings. Indoor environmental quality (IEQ) – vital for occupant health, comfort and productivity – was at the heart of a new hands-on challenge to inspire the next generation of building services professionals.

On 9 October, graduate, undergraduate and apprentice engineers, along with those in the first 10 years of their careers, gathered at UCL's Senate House for the first *CIBSE Journal* and Zehnder Group UK Young Engineers IEQ Design Challenge. The event invited participants to compete in an engaging design exercise, with a £2,000 prize up for grabs. The challenge formed part of the celebrations marking 30 years of the CIBSE Young Engineers Awards.

Teams were asked to design and model an indoor space, with a focus on wellbeing and IEQ. It was an opportunity to apply technical knowledge in a practical context that encouraged problem-solving, innovation and teamwork.

Stuart Smith, commercial director at Zehnder Group UK, kicked off the day by emphasising the importance of holistic design. 'We need to be more thoughtful about the indoor environment and ensure that the systems that go into it work in harmony. IEQ encompasses air quality, thermal comfort, acoustic comfort – even visual comfort,' he said.

Smith outlined why it is vital to understand and consider IEQ in projects. 'Our buildings are more airtight than ever, trapping pollutants as well as heat, but without effective ventilation and the right balance of heating systems this can lead to huge issues with damp, mould and overheating. Poorly controlled environments cost more, can damage the fabric of the building, and impact occupant health.'

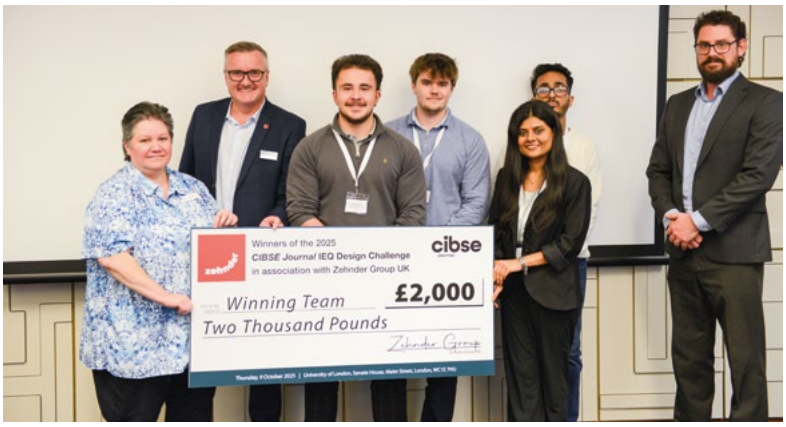
Nicola Rivers, climate division head at Zehnder Group UK, echoed this. 'Part O of the Building Regulations and overheating go hand in hand with IEQ. Since the regulation was launched in 2022, alongside Part L and the London Plan, engineers have had to consider modelling for almost every property type.'

The winning team, High Spec, present their solution to the judges

Zehnder's Stuart Smith presents the £2,000 prize, with fellow judges Ellen Salazar and Adam Taylor

The challenge

The task was to design a ventilation and heating solution for a two-bedroom apartment on the second floor of a 15-storey city centre tower. The building faced multiple



Six teams of young engineers competed in the Design Challenge

environmental challenges: a main road outside, a bus stop, nearby nightclubs and restaurants, and south-facing windows. Although insulated to Part L standards, the apartment had already failed TM59 and Part O assessments.

Teams had to address four critical IEQ domains: indoor air quality (IAQ), and thermal, acoustic and visual comfort, with priority given to IAQ and thermal comfort. Solutions needed to provide sufficient ventilation, regulate heating and cooling efficiently, mitigate noise and maintain visual comfort. Ceiling-void restrictions, duct sizing, noise and energy efficiency were additional constraints.

With just two hours to develop a solution, the six teams immersed themselves in the challenge, drawing on a blend of technical expertise, creativity and practical knowledge.

Henry Ibitolu, a recent PhD graduate in net zero building engineering from the University of Edinburgh, said that the day was 'very intellectually challenging and a great networking opportunity'. Although his area of expertise isn't IAQ, he had 'learned some fascinating things about HVAC systems and how they come together to create a comfortable indoor environment'.

The event tested participants' communication and problem-solving skills, and Ikechukwu Umeokoli – mechanical engineer at AtkinsRéalis – explained that it had prompted him to use information more efficiently. 'We had to focus on picking out what was pertinent,' he said. 'It also emphasised how crucial it is to clearly communicate ideas to other engineers who may not share your specialism.'

The teams presented to a panel of industry experts – Adam Taylor, CEO at ARM Environments and chair of IAQ group, BESA, Ellen Salazar, head of building services at CIBSE, and Zehnder's Stuart Smith – who evaluated each design on its creativity, feasibility and technical rigour (see panel, 'Winning solution').

Salazar was impressed by the participants, commenting that 'everyone had generated very good solutions in a short time. The collaboration across teams was impressive.'

Taylor highlighted the high level of understanding on display: 'The teams pulled key details out of the brief and translated them into coherent, consistent designs,' he said. 'IEQ is often overlooked because engineers work in silos. Encouraging young engineers to think holistically is vital. The winning team combined innovation with feasibility.'

Smith remarked on the depth of detail that emerged during the day. 'The winning team really shocked me with the level of detail they considered in just two hours – from duct sizes to airflows. This shows how important it is to engage early with young engineers and give them opportunities to explore IEQ in depth.

'There is so much potential here for the future of IEQ design.' ●

Winning solution

Winning team High Spec – made up of Gabriel Constante, a mechanical design engineer at 361 Degrees, Deepsi Shah, studying for an MSc in environmental design of buildings at Cardiff University, Dylan Sanders, graduate mechanical design engineer at Derry Building Services, and Muhammed Nasir Islam, apprentice engineer at CC|BE – impressed the judges with a detailed, integrated approach to indoor environmental quality.

Their design centred on a smart building management system to monitor temperature, humidity, CO_2 and noise, automatically adjusting heating and ventilation through smart thermostatic radiator valves and automatic opening vent windows for adaptive night cooling.

A reversible heat pump was selected to provide heating and cooling without the need for an external condenser. In addition, argon-filled glazing, to limit solar gains, NOx filtration and acoustic attenuation were chosen to enhance air quality, comfort and sustainability.

'The biggest challenge was making sure every aspect of comfort worked together without compromising practicality,' said Shah. Constante added that the team 'listed key objectives, brainstormed ideas and built a solution that considered every detail, from duct sizing to solar gain'.

Office 11&12 is part of the Wellington Place estate in central Leeds, close to the city's railway station

Aiming for the stars

The 11&12 Wellington Place office development in Leeds has made history by becoming the first new building in the UK to achieve a 5-star NABERS UK energy rating. For the engineering team, it's just the beginning, as they push for even greater efficiencies to future-proof the investment

'Five stars is excellent, but that's just the starting point for us. We see this building as having a lot more to give,' says Brad McHale, principal mechanical engineer at Arup. McHale is talking about the speculative office building 11&12 Wellington Place, Leeds, which has made history by becoming the first new building in the UK to achieve a NABERS UK 5* Energy Rating.

'There's been a big monitoring piece during the NABERS' UK reporting period, which has given us access to lots of data from within the building. It also means we have lots of opportunity to further optimise its operation,' McHale adds.

NABERS UK is an adaptation of the highly successful rating programme NABERS that operates in Australia. Administered by CIBSE in the UK, NABERS UK Design for Performance (DfP) provides a rating, from one to six stars, for new-build offices, with six stars classed as 'world leading'. Unlike design-based energy ratings, NABERS UK measures and rates the energy use of offices in operation – requiring ongoing monitoring, validation and improvement – resulting in long-term energy savings and carbon reductions. This makes it much more accurate than an Energy Performance Certificate as a guide to a building's energy performance. As McHale explains, it also helps identify areas for savings and improvements to minimise the gap between a building's design intent and its actual operational energy use.

Office 11&12 is part of the Wellington Place estate, a mixed-use development of 15 plots of office, leisure and retail space by developer

Project team

Client: Federated Hermes MEPC
Architect: TP Bennett
MEP engineer & NABERS consultant: Arup
Main contractor: Wates
Breeam: Mainer Associates
Project manager and quantity surveyor: Gardiner and Theobald
Structural engineer: Curtins

MEPC/Federated Hermes, located close to Leeds railway station. It was conceived as two separate buildings, each comprising a steel frame, a rigid concrete core and composite concrete floor decks. As their design evolved, however, a glazed link was added to the fourth floor and to the floors above, to create larger floor plates on the upper levels. The building services still serve the blocks individually to allow floors to be sub-divided for letting.

Arup has been involved with the Wellington Place Estate from the outset, having been appointed to provide MEP services to 11&12. Alex Price, associate at Arup, says the consultancy's initial MEP scheme, designed before the Covid-19 pandemic, was 'typically based on a 4-pipe fan coil unit [FCU] system served by a gas-fired boiler and electric chillers'.

Post-pandemic, NABERS UK had just been launched and the developer made the decision to commit to achieving a 5-star NABERS UK energy rating for the scheme's base build, to help future-proof its investment. Arup's role was duly increased to include 'NABERS UK consultant'. To achieve the 5-star target, there had to be a significant reduction in the scheme's operational energy demand and its reliance on fossil fuels had to end.

Fundamental to the NABERS' rating process are detailed energy models and simulations to demonstrate to independent assessors that the proposed design is capable of achieving the 5-star energy target in operation.

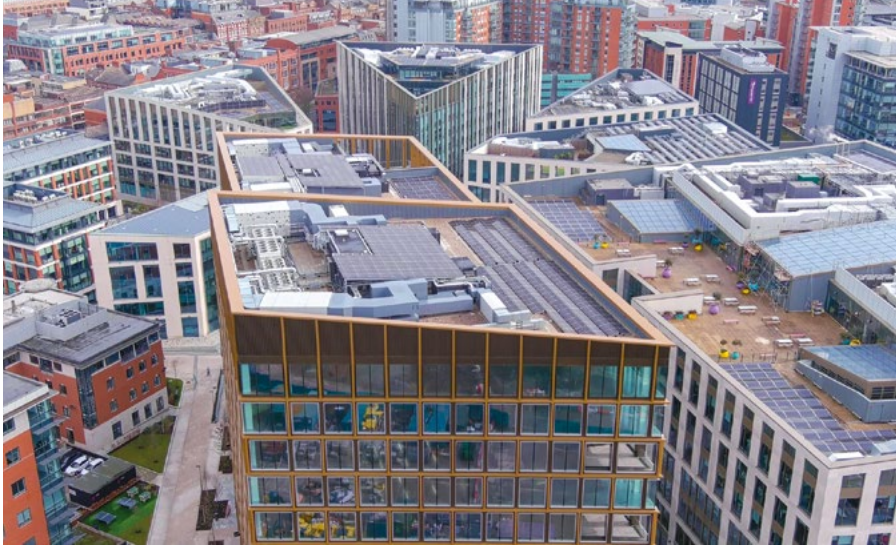
The building had already received planning approval and the Cat A services design was under way, so any enhancements had to be achieved without significant changes to the form or appearance of the 21,200m^2 blocks.

'We had to work very closely with [contractor] Wates to establish the exact equipment their supply chain was proposing to use to develop our model,' explains Price. 'We also had to establish the control strategy, operating temperatures, and how the BMS was going to be set up so that we could run the model and work out where improvements had to be made to ensure the building would achieve 5 stars.'

Enhancing the existing design was a

Performance data

Total energy use: kWh per year	2,390,261
Floor area m^2 NIA	24,929
Upfront carbon kgCO_2e·m^2 (A1–A5)	522
Peak electricity demand kW·m^{-2}	Not available
Annual PV kWh per year	122,621
Water use m^3 per year	11,379



PVs and plant on the rooftops of 11&12 Wellington Place

The benefit of energy monitoring

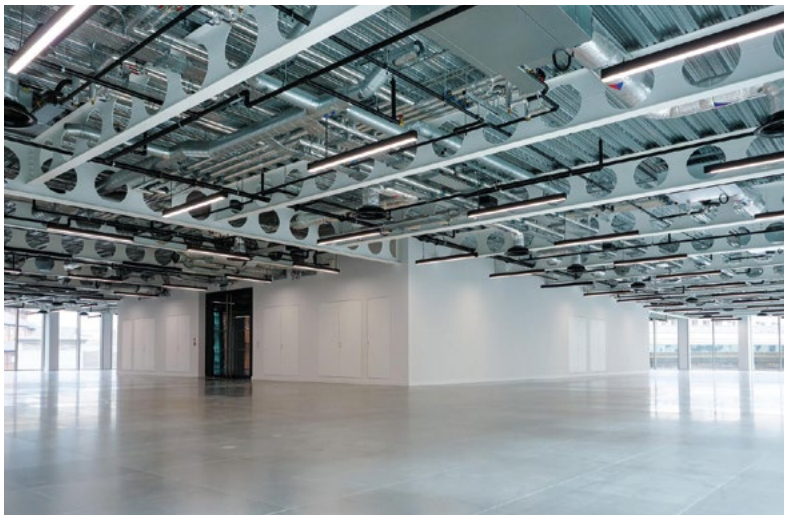
By David Freestone, director at CBRE Leeds Office, and Connor Mann, assistant building manager

As property managers, CBRE implemented a proactive, data-driven strategy during the NABERS UK energy monitoring and operational assessment period. While the extensive metering initially presented some challenges, it became a key advantage – helping detect and resolve performance anomalies quickly through weekly review meetings with the energy team at NG Bailey.

Collaboration with occupiers ensured that tenant fit-outs and operational adjustments were managed without compromising data integrity. We set clear parameters within the BMS, limiting occupier control of environmental settings and requiring formal change requests. This provided traceable evidence for all adjustments and maintained a consistent monitoring baseline. Regular engagement with occupiers reinforced awareness of the importance of stable energy performance to support the shared goal of achieving the NABERS UK rating.

Control and strategy optimisations included correcting circuits misallocated during fit-outs, resolving 24/7 FCU operation and implementing an air source heat pump (ASHP) lead/lag strategy (cutting usage by 21.8%), and using an optimised ASHP schedule (reducing energy by 40.9%).

Aligning interlocked optimiser start times with plant availability further reduced consumption. Overall, the monitoring period strengthened operational control, enhanced transparency and delivered efficiency gains, establishing a firm foundation for performance improvement. The IDR rating review process helped ensure tools and metering were in place to enhance management capabilities, and the accreditation process assisted collaboration across energy management strategies.



Heating and cooling is provided through ceiling-mounted 4-pipe FCUs

challenge, especially as Arup had to build in a buffer for when the design was reviewed. 'With 11&12, we were already at work-stage four, so we knew what systems were going in and there was limited impact we could make to the overall services strategy,' adds Price. 'We aimed for 5.5-stars with our model, knowing there is a buffer for variations in the building's real-life operation.'

Having such a detailed energy model enabled Arup to quickly review the impact of proposed changes to the building envelope and services design. For example, it was clear that the thermal performance of the building's envelope would need to be enhanced.

The model showed this could be achieved by upgrading the full-height, double-glazed units to high-performance triple-glazed units, without changing the building's appearance. In addition, the area of roof-mounted solar photovoltaic (PV) panels was increased from 500m^2 to 700m^2 to generate additional electrical power.

The gas-fired boilers were replaced with two roof-mounted Daikin 4-pipe air source heat pumps (ASHPs), each sized for 66% of total load. Each of the R134a units contains two, separate refrigerant circuits with an inverter-driven compressor on each. There is a cold heat exchanger/evaporator, capable of supplying 794kW of cooling at 13/7°C (at 35°C ambient) and a hot heat exchanger/condenser supplying 632kW of heat at 45/50°C (at -4°C ambient). The ASHPs are capable of heat recovery from the cooling circuit when supplying both heating and cooling.

From the rooftop, the heating and cooling pipework drops down a riser in the central core of each block to serve ceiling-mounted 4-pipe FCUs on the office floors.

Arup's energy model of its proposed design was assessed by an independent design reviewer (IDR), which, in this case, was Buro Happold. The assessor reviewed the scheme and made recommendations for how the design could be enhanced. 'We went through the feedback, some of which we were able to take on board, some we were not because of project and programme constraints,' says Price.

Once the design was finalised, the IDR's report was submitted to a NABERs-accredited assessor, who confirmed the design's ability to achieve the targeted energy performance once the building was occupied and operational. It was then awarded a Design Reviewed Target Rating of 5 stars so construction could begin.

The blocks' construction was completed in March 2023. For NABERS in-use energy consumption to start, the building has to be 75% occupied by tenants. It is down to individual tenants how they fit out and operate their floors, so Arup provided guidance to ensure tenants keep within strict design limits. It was not long before the building was fully let, including to Arup, which moved into the building in 2024.

Once all the tenants were in situ, the NABERS Energy process began. The team had just 12 months to optimise the building's operation to substantiate that it was performing in line with the energy model so it could be awarded a 5-star performance rating.

Every week, building manager CBRE and controls specialist NG Bailey review the metered data and compare the readings with those projected in Arup's energy model (see panel, 'The benefit of energy monitoring'). 'We

'Five stars is the starting point for us' – Brad McHale

The area of roof-mounted solar PV was increased to generate additional electrical power

have a monthly meeting with them to see where we can make improvements,' says Price.

The biggest step-change with NABERS, according to McHale, is that you have to be 'much more tuned into' the system controls.

'In the past, as long as the fan coil units were delivering the required heating and cooling output, you could argue that the system was functioning correctly. For NABERs, the system had to function correctly and we had to work out how to maximise its energy efficiency to help meet the performance standard,' he says.

As a tenant, Arup is also assessing how the building's performance could be further optimised. 'Moving onto levels three and four of the building is a massive opportunity for learning,' says McHale. 'We've done an internal study of our demise and we have a lot of optimisation suggestions that we want to share with the landlord, which could be applied building-wide.'

With the building services operation optimised, Hoare Lea verified its energy performance as part of the NABERS UK certification process. In September 2025, the scheme was awarded a 5-star NABERS Energy rating for in-use energy consumption after 12 months occupancy. Impressively, it also achieved Breeam Outstanding and a Fitwel level 2 rating. (Fitwel is a US developed building certification system that focuses on health and wellbeing.)

The 4-pipe air source heat pumps

The 5-star energy rating demonstrates that the building is performing as intended, but the team is aiming higher. 'CBRE and NG Bailey want to see further improvements,' says McHale.

'They did most of the work to optimise its performance, but we were involved in conversations with them about where further efficiencies could be made and those conversations are continuing.' McHale is considering how the heating and cooling systems could be further optimised: 'We now understand what that peak-load occurrence looks like on the heating system, which should allow us to shave a couple of degrees off the top end of the heating system [flow temperature] to improve the efficiency of the heat pumps.'

The team is looking at the chilled water flow and return temperatures. Currently, these are set at 7°C flow/14°C return. 'It might be possible to optimise this system by increasing the chilled water temperatures and still be able to meet peak building-load requirements,' McHale says.

Another option being assessed is the fresh air supply and its potential to provide passive cooling. 'We have a fresh air supply from the air handling units that supplies at a fixed temperature, but we're looking at adopting a dynamic temperature setpoint driven by demand on the floor plate,' explains McHale. 'The idea is that we could get enough passive cooling potential to prevent us from having to run the chilled water circuit under certain circumstances.'

Further enhancements could be made, he adds: 'That's why we say 5 stars is the starting point, because we're keen to see just how much more this building has to give.'

They won't have long to wait. The next NABERS certification review is in June 2026. By then, the team hopes to be able to target a 5.5-stars rating for energy in use. 'We've set a baseline, now the aim is to keep improving on that,' Price says. ●

Saffron Hill to be rated under NABERS UK

While NABERS DfP has been developed for new buildings, NABERS Energy for Offices measures and rates the actual energy use of existing offices.

CIBSE will be applying NABERS UK Energy for Offices to its head office at Saffron Hill, London. This will allow the Institution to measure and rate the building's energy performance based on actual operational data for the existing building. It will then use the insights gained from the certification process to inform a refurbishment and improvement plan for the office.

CIBSE expects the exercise to reduce its carbon footprint and operational energy use, while the ongoing assessment process will drive continuous improvement over time. In so doing, the Institution is demonstrating its commitment to NABERS UK, as its administrator, while holding itself accountable to the same high standards it promotes.

NABERS UK has recently expanded to include ratings for whole buildings and individual tenancies. Currently, NABERS UK only rates the energy performance of offices. In Australia, however, NABERS is used to rate the performance of apartment buildings, data centres, shopping centres, public hospitals and hotels. The ratings also extend beyond energy to cover water, waste, indoor environmental quality and carbon neutrality. Currently, 19 buildings are registered under NABERS UK Energy for Office ratings, and CIBSE hopes to continue increasing its scope and offering. The Institution is keen to hear from users of the scheme about how it can be further expanded to support their needs.

Visit cibsecertification.co.uk/nabers-uk for more information.

Rethinking hospital ventilation

UK hospitals must take a hybrid approach to ventilation if they are to achieve infection resilience and net zero carbon goals while also minimising costs, according to **Frank Mills** at a recent CIBSE Healthcare Group event. **Tim Dwyer** reports

Hospitals present a unique challenge for building services engineers: to deliver safe, healthy internal environments, with clean air that reduces the spread of infection, while meeting the NHS goal of net zero carbon.

At a CIBSE Healthcare Group event in London last month, Frank Mills FCIBSE argued that both aims require a fundamental review of how ventilation in healthcare buildings is designed and operated.

Health Technical Memorandum (HTM) 03-01[1] remains the main UK guidance for healthcare ventilation. It was prepared before the Covid-19 pandemic and makes little reference to airborne transmission. During the early stages of the pandemic, government advice focused on surface transmission and largely ignored ventilation, even though Covid-19 is a respiratory disease. Ventilation was not mentioned in UK government guidance until 2022, Mills noted.

HTM 03-01 sets out minimum standards for air-change rates in clinical areas and assumes the use of 100% outdoor air. Compliance should, in theory, deliver clean air and reduce infection risk. However, the document assumes that outdoor air is sterile and free from dust or pathogens, which is not correct. The Department for Environment, Food and Rural Affairs' (Defra's) air-quality review[2] confirmed that many UK locations fail to meet international standards for particulates and gases. Even rural air can be contaminated by agricultural activity.

Meeting the HTM air-change requirements demands large air-handling systems, long duct runs and high fan power. This leads to high capital and operating costs, plus significant embodied and operational carbon. Up to a quarter of a typical hospital's floor area may be dedicated to ventilation plant and risers. The resulting energy use conflicts with the NHS Net Zero Carbon programme[3], which targets zero emissions for Scopes 1 and 2 by 2030-32 and Scope 3 by 2050.

HTM 03-01 identifies natural ventilation as the preferred option, followed by mixed-mode and, finally, mechanical systems. Mills described this hierarchy as outdated and impractical. Natural ventilation only works if occupants open windows and, often, they do not. Even in hot weather, sealed or closed windows prevent effective air movement. Mixed-mode systems that combine open windows with mechanical supply can also lead to high energy use, as both indoor and outdoor air must be conditioned.

Mills compared this approach with ASHRAE Standard 170[4], which governs healthcare ventilation in the US, where hospitals are generally fully mechanically ventilated and may recirculate up to 80% of air through high-efficiency filters and ultraviolet germicidal irradiation (UVC) air scrubbers. Air-change rates are similar to UK guidance, but the strategy allows large energy and carbon savings, and cleaner interiors.

Mills proposed a hybrid model, using smaller primary systems to provide two air changes per hour of outdoor air, with local air cleaning to achieve the equivalent of six or more clean air changes in ward areas. Such systems could reduce plant size and eliminate the need for boilers – and, consequently, a gas supply. He suggested internal heat gains in hospitals should provide much of the heating load, with recovered heat maintaining supply air temperatures.

Local air cleaning using UVC and air filters

Figure 1: Ceiling-recessed air cleaners use the Coanda effect to distribute air effectively and, at high air-change rates, can achieve very clean room conditions. The units recirculate air after removing viruses, bacteria, mould and any particulates. Recirculating the same air saves energy and reduces carbon impact. This unit has been developed under an NHS-led workstream

gained attention during the pandemic response. NHS-approved standards for these devices are now available online[5], covering both portable and ceiling-mounted units. Mills described trials at Maidstone Hospital, where rapid-assessment wards used ceiling-mounted UVC units to deliver sterilised air above each bed. Measured pathogen levels dropped significantly and the scheme eliminated ambulance queuing caused by infection-control delays.

Ceiling-mounted units, as shown in Figure 1, overcome many of the problems of portable devices, such as trailing leads, lack of power sockets and inconsistent placement. They can be installed as part of the building infrastructure with minimal disruption, even within occupied spaces.

Mills drew attention to the fact that HTM 03-01 does not cover non-clinical areas, such as corridors, receptions, cafeterias and offices, which often lack mechanical ventilation. These can make up half of a hospital's area and may be heavily occupied. Site visits showed that staff workstations, patient trolleys and visitor areas often occupy circulation zones with stagnant air.

Mills warned that these neglected areas contribute significantly to poor indoor air quality and infection spread. In some cases, they are being used for clinical purposes, such as wound dressing, and as holding areas for patients awaiting a ward space. He noted that CIBSE design codes have advice on these other areas, but are not really intended for hospitals.

Mills concluded that all occupied areas of hospitals must have engineered ventilation. Natural ventilation should be replaced by controlled mechanical systems that use energy recovery and partial recirculation. Local UVC and/or Hepa air cleaning should be standard in new and refurbished hospitals. By adopting this approach, future healthcare buildings could be designed with smaller plant spaces, lower embodied carbon and no fossil-fuel boilers. Mills referred to a care-home project where waste heat from a variable refrigerant flow cooling system provides all domestic hot water at 60-65°C without the use of a boiler.

He concluded that intelligent ventilation using filtration, recirculation and heat recovery can deliver clean, safe air while supporting the NHS target for net zero carbon hospitals. ●

'Developments in IAQ for healthy and low carbon buildings', held last month, is one of the events organised by the CIBSE Healthcare Group. Visit bit.ly/CJHGSIG

● **Frank Mills FCIBSE is an engineering specialist in healthcare ventilation, a member of the NHS Future Standards working group, and a past chair of the CIBSE Healthcare Group, and has contributed to CIBSE and ASHRAE Covid advisory initiatives.**

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Manchester hotel fits propane heat pump

Carrier AquaSnap 61AQ heat pump is first to be fitted in UK

The Radisson Hotel Manchester City has become the UK's first hospitality venue to install Carrier Commercial HVAC's new AquaSnap 61AQ heat pumps, strengthening its position as a verified net zero hotel.

The 61AQ system has been designed to operate with natural refrigerant R290, offering ultra-low global warming potential and high energy performance.

Four 120kW modular units, providing 480kW of total heating capacity, were crane-lifted onto the hotel's rooftop.

According to Simon Pearson, area engineering director at Radisson Hotel Group, the new system complements the hotel's 100% renewable energy use and low carbon operations.

Carrier's managing director, Andrew Paddock, said the 61AQ's advanced engineering enables businesses to cut carbon emissions without compromising comfort. Linked to Carrier's Abound HVAC Performance platform, the installation provides real-time monitoring and predictive maintenance, delivering a quiet, energy-efficient and future-ready solution.

Each unit features inverter-driven compressors and variable-speed fans, allowing the system to adjust output according to real-time demand – a key advantage for maximising seasonal efficiency and controlling energy use.

Historic East London crown court upgrades cooling systems

A 200-year-old listed building housing an East London crown court has undergone a major air conditioning upgrade to replace its ageing, inefficient chiller system.

Five Panasonic 170kW ECOi-W R32 air source heat pump units deliver a sustainable solution that has improved energy efficiency by 50% while preserving the building's heritage.

The project overcame challenges posed by the site's historic pipework and limited space, with hydraulic separators and a plate heat exchanger installed to protect the system from corrosion and poor water quality.

The modular, low-noise units operate efficiently across a wide temperature range,

ensuring reliability and comfort, according to Panasonic. The installation provides a future-ready solution for this landmark civic site.

Special features

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Cooling

Low carbon commercial heating solutions at elementalLONDON 2025

Baxi will showcase its latest low carbon heating and hot-water technologies at elementalLONDON, at Excel London on 19–20 November.

The event will inform professionals tackling energy efficiency and carbon reduction in commercial and large-scale residential projects.

Baxi's offering will include the Auriga HP+ air source heat pump, AquaHeat HIUs and Quinta Ace hybrid-ready boilers.

Visitors can also explore the company's new CHVAC controller for advanced system integration.

Powered by the next industrial revolution

An innovative low carbon heating system – designed by Max Fordham and centred on water source heat pumps and an electric steam boiler — now powers Victorian steam engines at the Science and Industry Museum in Manchester. **Andy Pearson** reports

The Science and Industry Museum in Manchester stands on one of the most significant industrial heritage sites in the world – the terminus of the Liverpool and Manchester Railway, the world's first purpose-built passenger line. What took place here in 1830 revolutionised trade, travel and technology. It was where science met industry, sparking the modern era.

The museum's site includes the world's oldest-surviving passenger railway station and the first purpose-built railway goods warehouse. Among its landmark buildings is the Power Hall, built in 1855 as the shipping shed for Liverpool Road Station. Since 1983, it has been home to a collection of working steam engines that once powered the mills and factories of the Industrial Revolution.

Now, after a major refurbishment, the Power Hall is again celebrating engineering innovation – this time through technologies that are shaping the low carbon revolution.

Alongside one of the UK's largest collections of fossil fuel-powered engines, visitors can see how a scheme designed by Max Fordham is using four water source heat pumps (WSHPs) and an electric steam boiler to provide low carbon heat and power to the Grade II-listed hall.

Project team

Client: Science and Industry Museum
Architect: Carmody Groarke
Main contractor: HH Smith & Sons
M&E engineer: Max Fordham
MEP contractor: Murray Building Services
Structural engineer: Conisbee
Borehole consultant: Advisian
Heritage consultant: Donald Insall Associates
Fire engineer: Design Fire

A personal connection

Max Fordham's involvement with the museum began in 2019, when director Iain Shaw was invited to visit it by an architect friend. It was a return to a formative place for Shaw. 'I remember visiting as a child,' he says. 'The smell of hot oil, the rhythmic pulse of the engines being driven by steam; there's a visceral sense of Victorian innovation. It's the place that

inspired me to become an engineer.'

At the time of his visit, plans were being developed to refurbish the 108m-long Power Hall to protect the structure and heritage. A 4MW gas boiler was being used to generate steam for the engines, but the system was inefficient: waste heat from the oily steam condensate was discharged to the atmosphere via a cooling tower and the condensate water was dumped to drain. A steam-fed space heater had stopped working, leaving the hall unheated.

During his tour, Shaw also visited the 1830 Warehouse, another of the site's original buildings. Within it was a well that once supplied water to the steam-powered cranes used to load goods from the railway. 'As soon as I saw the well, I said, "there's groundwater down there we could use",' recalls Shaw.

By the end of the visit, he had sketched out a concept for a fully electric, closed-loop steam system that could provide low carbon steam to the exhibits, and space heating to the Power Hall and the 1830 Warehouse. The proposed design was built around three interlinked systems:

- An electric steam boiler to supply the historic engines
- Boreholes providing a water source for heat extraction and rejection from the steam condensing process
- WSHPs to supply low carbon heating when the steam system is offline.

Performance data

Total energy use	5,577,000kWh per year
Floor area	2,470m² NIA
Upfront carbon	kgCO_2e.m uncalculated
Peak electricity demand	0.364kW.m^{-2}
PV peak capacity	None
Water use	None (no consumption within Power Hall)
Refrigerant type	R410
Refrigerant GWP	2,088

The concept was developed in partnership with the museum to form a bid to the UK government's Public Sector Decarbonisation Scheme, administered by Salix Finance. The scheme projected annual carbon savings of 515 tonnes, based on the Grid carbon factor at the time.

In 2021, the museum secured £4.3m to decarbonise the Power Hall and 1830 Warehouse, and Shaw's low carbon services concept became a central element of the Power Hall restoration project, led by architects Carmody Groarke.

Preserving history, upgrading performance

The building's refurbishment included major conservation work: repairs to the historic roof timbers; a new insulated roof, using vapour-permeable wood-fibre insulation compatible with the building's original breathable fabric; and reinstatement of the salvaged natural slates. Arched windows and rooflights were replaced with double-glazed units to improve efficiency while maintaining the original appearance. Inside, energy-efficient LED lighting was installed and the central loading platform reinstated.

Externally, new boreholes were drilled beneath the listed cobbled courtyard. A trench was excavated for a new high-voltage cable to power the electric steam boiler.

'We were fortunate,' says Shaw, 'that the archaeological survey didn't uncover anything that prevented us from proceeding with the boreholes or trench.'

Two 80m-deep abstraction boreholes in the museum's Upper Yard draw groundwater from the aquifer for heat supply and rejection. Originally, a single borehole had been predicated to provide sufficient water for the scheme, but this proved not to be the

The Grade II-listed Power Hall was the shipping shed for Liverpool Road Station

case, so a second borehole was drilled. This provided the expected volume of water, so the original borehole is now used as a backup. A third borehole, in the Lower Yard, returns water to the aquifer after it has passed through the heat-exchange systems.

The design also makes use of a Victorian brick culvert to discharge any surplus groundwater that cannot be reabsorbed by the aquifer to the adjacent River Irwell. The Environment Agency requires that the discharge water temperature remain below 23°C.

Steam goes electric

At the heart of the Power Hall's new heating and exhibition system is a 780kW electric steam boiler, powered by green electricity. The boiler provides steam to the pistons that drive the historic engines via two circuits – one high-pressure and one low-pressure.

With no technical data for the 19th-century machinery, Max Fordham's team had to estimate the engines' steam consumption and condensate production during startup and steady running.

'What we've got is a standard electric steam boiler connected to Victorian engines, with only a vague idea of how they perform,' says James Cornes, principal engineer at Max Fordham.

Close collaboration between the engineers, the MEP contractor Murray Building Services, and the museum's technical team was critical. 'Getting the engines to run properly on the new system was quite a challenge,' Cornes adds.

A new steam pipework system collects the oily steam/condensate mix and returns it to the boiler using gravity. The condensate mix passes through filters and a skimming tank to separate the oil before the steam condensate flows through a heat exchanger that cools it to liquid and valuable heat is captured.

'You have to turn the steam back into liquid before you can put it back in the boiler, so there is abundant heat to recover and reuse,' says Shaw.

In winter, the heat recovered from this process via the heat exchanger provides space heating for the Power Hall through a separate loop (see Figure 1).

The new steam plant and heat pump installation are all on display as a new exhibit

A museum volunteer prepares the Durn Mill steam engine to run

Heating the hall

Four WSHPs connect to the Power Hall heating loop. Depending on the loop's temperature, the recovered heat can be used directly for heating or upgraded by the heat pumps to around 50°C. This heat is piped to fan coil units hidden beneath the reinstated platform, delivering displacement heat to the lower part of the hall. This arrangement ensures the temperature at engine level remains above dew point, preventing condensation on the historic machinery.

'The space heating isn't provided for visitor comfort,' Shaw emphasises. 'It's to protect the exhibits.'

After passing through the WSHPs, the Power Hall heating loop transfers its remaining heat to the borehole water via another heat exchanger. The warmed groundwater is then piped to the 1830 Warehouse, where another WSHP extracts further energy to provide space heating for that building before the borehole water is reinjected into the aquifer, or discharged to the river.

Smarter, leaner operation

When the museum first opened, the gas-fired steam generator ran continuously from the moment the doors opened until the last visitor left, with all engines operating. Under the new low carbon regime, all the engines remain connected to the steam circuit, but not all the engines run. Their running schedule has also been rationalised to a maximum of three hours per day.

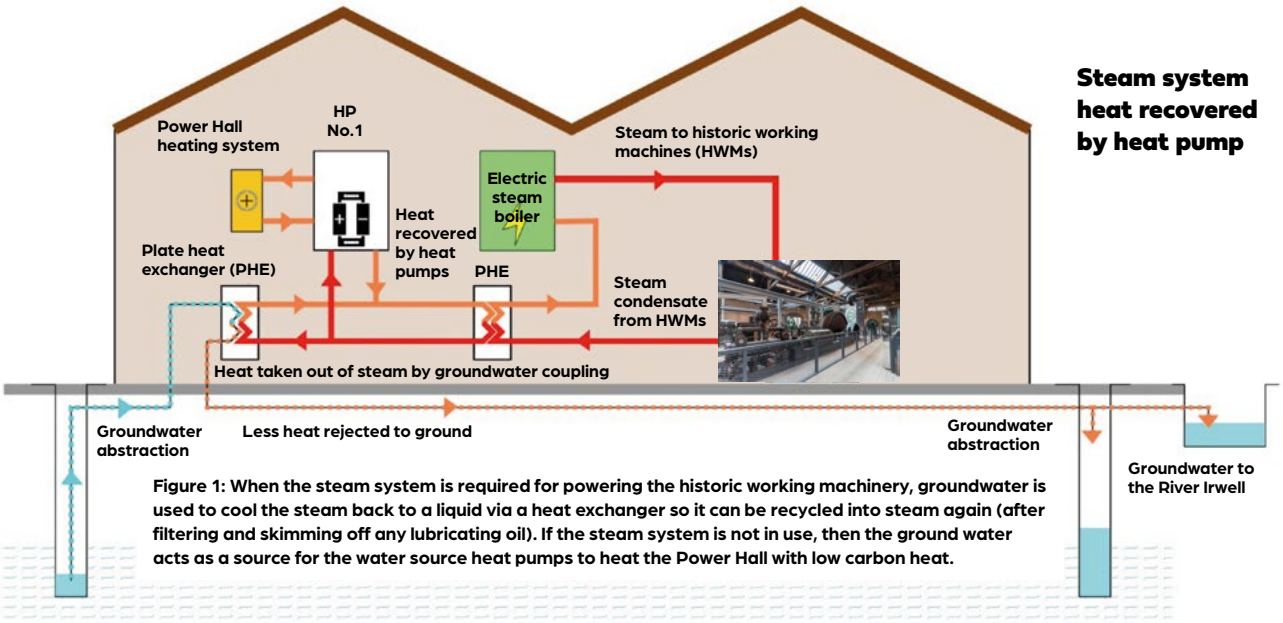

Figure 1: When the steam system is required for powering the historic working machinery, groundwater is used to cool the steam back to a liquid via a heat exchanger so it can be recycled into steam again (after filtering and skimming off any lubricating oil). If the steam system is not in use, then the ground water acts as a source for the water source heat pumps to heat the Power Hall with low carbon heat.

'It reflects a more considered approach to energy consumption,' Shaw explains.

When the steam boiler is offline, the heat pumps are sized to provide space heating using heat obtained from the borehole water. 'We take a bit of heat out of the groundwater, elevate it with the heat pump, and use it to heat the Power Hall,' Shaw says.

In summer, when there is no need for space heating, the steam boiler will continue to provide steam to the exhibits, and borehole water will continue to remove heat from the condensate circuit before it is returned to the steam boiler.

Without the additional demand from space heating, more heat is rejected into the groundwater circuit. To ensure that water is returned to the aquifer at the correct temperature, the building management system (BMS) automatically increases the abstraction pump speed, boosting flowrates up to 20 litres per second.

'The system relies on the three subsystems being fully integrated through the BMS,' Cornes explains.

Environmental control and visitor comfort

The refurbished Power Hall also benefits from discreet environmental control measures. To prevent overheating from solar gain and heat generated by the engines, the architects concealed motorised louvres within the timber panelling surrounding the glazed arched openings. These open automatically under BMS control to enhance natural ventilation when internal temperatures rise.

The new steam plant and ground source heat pump installation are all on display as a new exhibit in the Power Hall, detailed in collaboration with Carmody Groarke. It is part of the Listed Building Consent, which required the story of the decarbonisation to be told.

The Power Hall reopened to the public on 17 October, revealing a striking juxtaposition: Victorian steam engines powered by modern, low carbon technology.

The new exhibit includes an interactive touchscreen that explains how the heat pumps, boreholes and electric steam boiler work together to deliver renewable heat to the historic building.

For visitors, the latest exhibit provides a tangible link between the mechanical ingenuity of the 19th century and the sustainable engineering of today. As Shaw reflects: 'It feels entirely fitting that the birthplace of the first Industrial Revolution is now home to the technologies driving the next one.' ●

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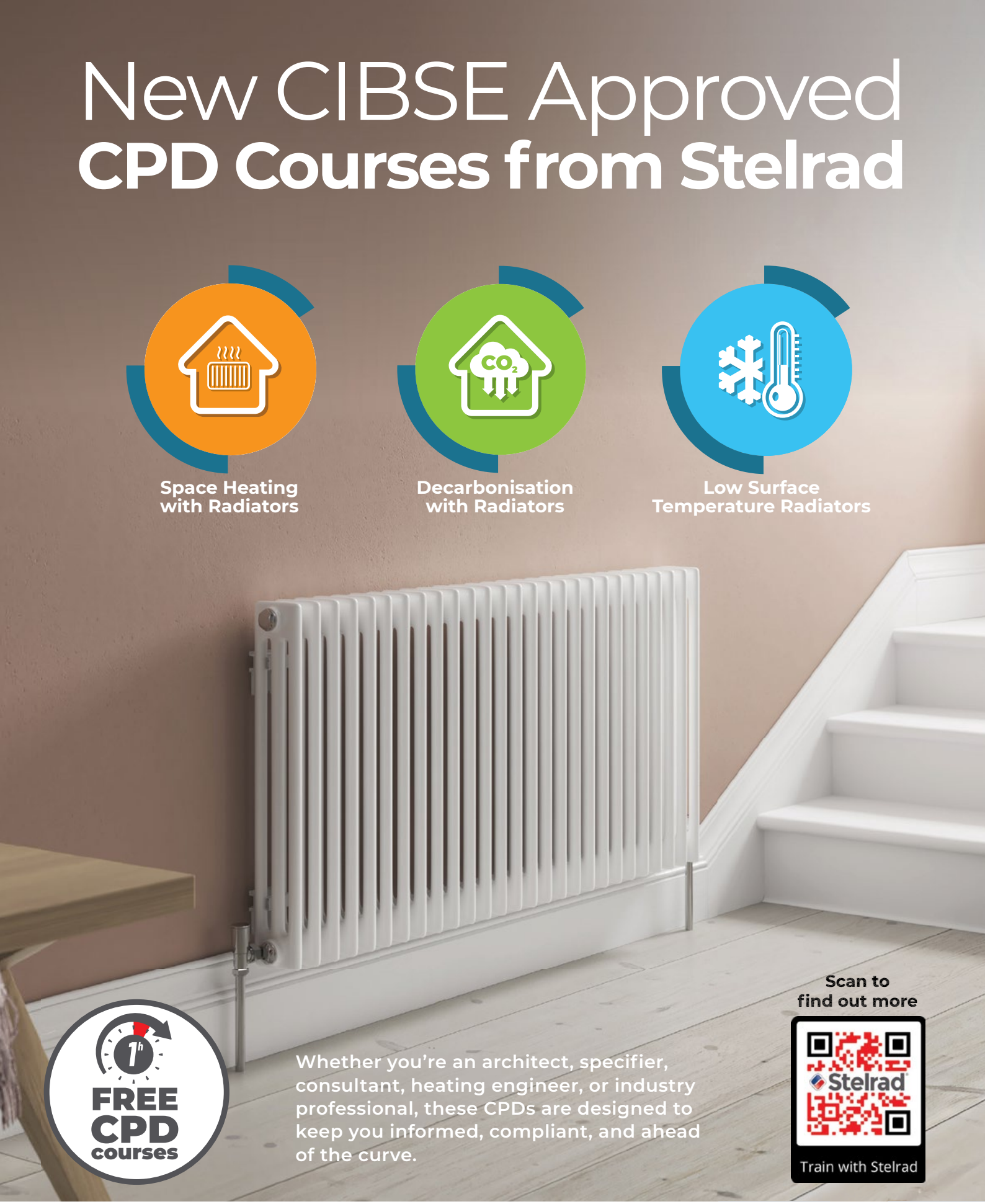

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Commercial heat transition

A packed CIBSE briefing looked at how heat pumps can be applied effectively in commercial buildings. Speakers explored design quality, retrofit challenges and the policy drivers needed to unlock the market. **Molly Tooher-Rudd** reports

As the UK intensifies its efforts to decarbonise heating in buildings, the spotlight is increasingly turning towards heat pumps – not only in homes, but across the vast and complex landscape of commercial and public buildings.

The latest CIBSE breakfast briefing, held at Aecom's London office on 24 September, explored this rapidly evolving field, focusing on the application of heat pumps in non-domestic buildings. It brought together three leading voices from the sector: Roger Hitchin, independent consultant and long-time contributor to the International Energy Agency's (IEA's) heat pump programme; Laura Bishop, director and co-founder of Hillside-Infinitas; and Josh Bird, director at Rethink Buildings.

Understanding the market

Opening the session, Hitchin provided an overview of the UK's non-domestic heating landscape. 'About one-third of heat use in the UK is in the non-domestic sector,' he explained. 'New build represents a comparatively small portion of that. The real opportunity lies in the existing building stock.'

He noted that the majority of non-domestic boiler sales are replacements, rather than new installations, adding: 'That tells us where the market is and where we need to be headed.'

To help practitioners navigate this evolving space, Hitchin highlighted a range of CIBSE guidance. 'AM17, published in 2022, remains a key resource for large non-domestic heat pump installations,' he said, 'and a new supplement focused on retrofit is just starting. TM51, on ground source heat pumps, is being revised and so is TM39, on building energy metering.'

He also pointed to new IEA and Department for Energy Security and Net Zero initiatives, including Annex 60, which focuses on retrofitting heat pumps in large buildings. 'Next year, we'll have a new web tool providing guidance for building owners. It will link to real case studies, something the market needs.'

The road ahead, however, is not straightforward. 'Costs remain a major constraint,' Hitchin cautioned. 'The Public Sector Decarbonisation Scheme showed that financial incentives can be effective, but the complexity of choice and the performance risks are still high. Installer experience varies widely and systems are often poorly designed.'

He underlined that retrofitting a heat pump is not the same as replacing a boiler. 'Compatibility is key, particularly emitter capacity. Many businesses offering heat pump installations simply don't have the expertise. It's key we improve this if we are to progress.'

Design matters

Bishop's advice to designers was practical and direct: 'Don't size your heat pump based on the old boiler. Reduce your flow temperatures to maximise COP [coefficient of performance] and always look at the building holistically – understand how it's operated, where the problems are and how users interact with the system.

'The heat pump gets blamed far too often for poor performance, when it's really a design or installation issue.'

She urged practitioners to embrace a wider range of technologies. 'There are so many resources available; don't just default to what you know.'

When asked why retrofit uptake in commercial buildings remains slow, Bishop was frank: 'It's money. We've worked on projects where local authorities receive grant funding for

"Every building can support a heat pump... but we need to understand what makes it tricky and plan accordingly"

heat pumps, but once the building is occupied, only one system is actually running, and that's down to cost. Until we crack this, the market will stay limited.'

She highlighted the ongoing issue of energy pricing and the 'spark gap' between gas and electricity: 'Gas is still far cheaper than electricity and that's driving some people back to fossil fuel boilers.'

Bishop urged project teams to plan for electrical impacts early. 'Upgrading an electricity supply can trigger unexpected costs,' she warned. 'Bring the client on that journey from the start, so there are no surprises. Understand the DNO [distribution network operator] upgrade implications, include all costs in your financial model and shop around for tariffs. Thermal storage and time-of-use pricing can also make a difference.'

Tackling tricky buildings

Bird explored the challenge of heat pumps in 'tricky' commercial buildings, which often have high temperature demands, limited electrical capacity, or space and noise constraints. He described the pitfalls of 'sledgehammer' sizing: 'Too often, we see systems sized to match the original boiler output. You need granular data to understand the building's true heating demand – only then can you size the system correctly.'

Despite these challenges, he remains optimistic: 'Every building can support a heat pump if properly assessed. We just need to understand what makes it tricky and plan accordingly.'

Many existing systems are vastly oversized, Bird added: 'Historically, when you were installing a boiler it was easy to oversize; there was little penalty. Now, with heat pumps, oversizing can be expensive and inefficient.'

On practical solutions, Bird shared examples of creative retrofits that can be easy and low intervention. 'If you are looking at offices with undersized fan coil units, you don't have to rip everything out and replace it, and displace the occupants while you do so. You can "hack" the building, optimise controls, use different operational strategies, and work within constraints.'

When the debate turned to controls, Bird and Bishop were aligned. 'Performance specs don't cut it,' said Bird. 'Designers should specify down to every nut and bolt, otherwise you'll have kit that doesn't work well together.'

Bishop agreed: 'When you write a control philosophy document, it forces you to question and understand how the system operates. That's what leads to good, functional design.'

The briefing ended on a note of cautious optimism. Retrofitting commercial heat pumps is not simple, but with better data, training and design, it's achievable.

As Hitchin concluded: 'We're learning fast. The tools and guidance are coming, and the market will mature. The key is getting the fundamentals right – design, performance and understanding how buildings really work.' ●

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Could waste heat hold the key to decarbonisation?

Seven heat networks based around waste-heat sources could supply up to 6% of London's heat needs, according to a Waste Heat Study for the GLA by Buro Happold. **Bill Wilson** reports

London is looking to become net zero in 2030, under ambitious plans from the Mayor, Sir Sadiq Khan. Around two-thirds of the city's carbon emissions can be attributed to heating and powering its buildings, but London offers a range of recoverable waste-heat sources that could support the supply of clean heat to homes and businesses – although these vary considerably by volume and temperature.

Consider energy-recovery plants, sewage-treatment works and data centres, which all emit large amounts of recoverable heat daily. Just one mid-sized data centre emits the equivalent amount of waste heat annually to heat around 100,000 homes.

Our work for the Greater London Authority (GLA), through the London Energy Accelerator funding programme, shows how waste heat could unlock the carbon conundrum. We identified and implemented improvements to the London Heat Map, to include data around available waste-heat sources – helping build awareness and identifying opportunities for developing low carbon heat offtake.

Our analysis considered the location and size of waste-heat sources across the city. By mapping this data, we highlighted a significant amount of waste heat already available in London. The largest existing sources contain enough energy to supply up to 12% of London's heat – the equivalent of heating more than 600,000 homes.

The subsequent London Waste Heat Study[1] examined the capital's largest, most strategic waste-heat sources and modelled the opportunity for multi-borough heat networks development.

At a high-level feasibility stage, seven strategic heat network areas were identified by running analysis based on clusters of heat demand with size and proximity to these strategic waste-heat sources. If these potentially 'viable' heat networks were built, these seven areas could potentially supply up to 6% of the city's heating needs after necessary development work. They also have expansion potential (Figure 1).

Multi-borough solution

If recovered (and 'connected' to heat pumps to lift temperatures where required), this waste heat could be used to distribute low carbon heat via district heat networks across multiple adjoining London boroughs simultaneously. This would successfully address one of the major challenges to delivering strategic-scale district heat networks – that is, the scale and complexity of providing a multi-borough solution.

To achieve this, considerable investment would be needed – specifically, the installation of around 487km of pipework. The cost would be around £2.3bn in capital expenditure for constructing the primary network in each heat cluster. Yet this investment in local energy provides considerable socio-economic opportunity and social value through associated local growth and jobs.

These seven strategic heat networks would also provide multi-borough solutions. To date, decarbonisation has mainly been considered borough by borough, as large-scale change and establishing the necessary delivery partnerships are challenging and time-consuming.

A strategic heat network programme aligned to waste-heat sources and the government's zoning policy could enable the GLA to lead the way in demonstrating how the best of the public and private sectors is brought together. This could further unlock multi-borough zonal-scale heat network opportunities for cities globally.

The UK is looking at a new heat network zoning policy aimed at de-risking network development. The above-mentioned approach could offer greater confidence in securing heat network connections. Other large heat users – such as hospitals, universities and social housing providers – could also consider these heat networks to help decarbonise their estates.

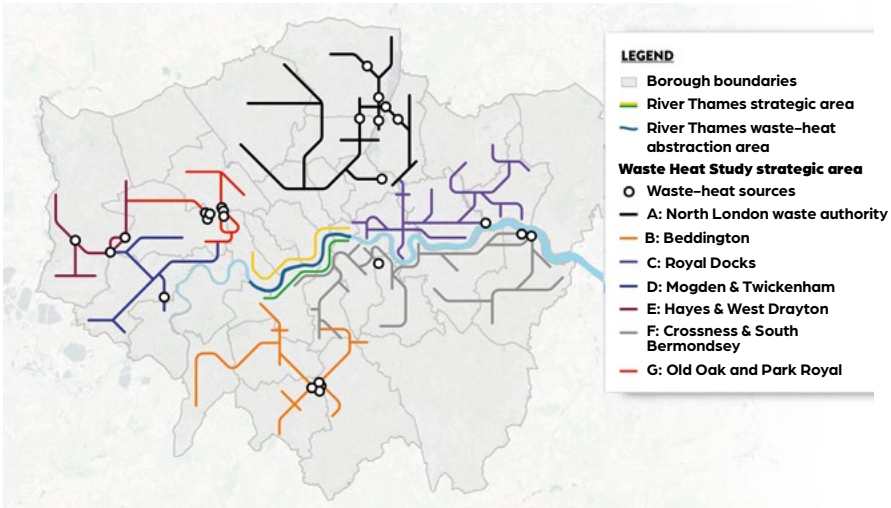

Figure 1: Heat network areas based around large waste heat sources identified by Waste Heat Study

The investment looks considerable, but this infrastructure has a lifespan of more than 60 years. Plus, waste heat is often available at lower cost than alternative low carbon sources. This makes heat networks more viable than ever for investors, giving customers more attractive tariffs and simpler technical solutions to decarbonising heat compared with other technologies. There is also the added value of improved air quality, energy security and significant emissions reductions.

Next stage

More needs to be done to realise these opportunities. At a high level, each of the seven strategic multi-borough heat networks identified were potentially commercially viable and deserving of further development work. The next stage involves looking at the findings in greater detail to better understand the technical and economic opportunities and business case. If these proceeded to commercialisation and construction, investment would be needed. This would probably be sought in partnership with the private sector – for example, the UK's National Wealth Fund or the GLA's Green Finance Fund.

None of this can be achieved in isolation. We will need to work with the GLA, London councils and boroughs, heat network developers and waste-heat sources, as well as several other stakeholders to unlock this opportunity fully. ●

● **Bill Wilson, associate director, Buro Happold**

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Potential of heat networks based on waste heat

- **Networks would cover 25 of the 32 London boroughs and the Corporation of London**
- **More than 7,900GWh per year of rejected waste heat, meeting up to 3,700GWh per year of heat demands, could be recovered, with potential for further recovery through infill and/or expansion**
- **Networks would save more than 40 million tCO_2e over the next 40 years**

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Making the grade

Filter selection can have a large impact on a building's energy use and indoor air quality, so it's essential that designers use the latest guidance when specifying ventilation systems, says ARM Environments' **Adam Taylor**

Providing the outdoor air to ventilate buildings requires large amounts of energy and a significant amount of space. Failing to heat or cool this supply air will quickly result in complaints, but if the air being supplied to the building is polluted to the point that it would negatively affect people's health, it is unlikely occupants would notice immediately.

Air filters are a critical part of a ventilation system, and basic, low-grade filters can protect the internal components of that system. With an increasing focus on health and wellbeing in buildings, however, filters are increasingly being selected according to the level of outdoor pollution at the building's location, not via rule of thumb selections from the air handling unit manufacturer. Fortunately, enough standardisation and guidance has been released in the past few years to make it easier for designers and building operators to select appropriate filters.

In 2016, *ISO 16890-1 Air filters for general ventilation* introduced a new global standard for testing and classifying air filters based on particulate matter (PM) size (PM1, PM2.5 and PM10). It outlines 49 new classifications, replacing the EN779:2012 standard and its nine grades, such as F7 and G4. ISO 16890 is used worldwide, except in the US, where MERV (minimum efficiency reporting values) are employed.

In 2018, the European industry association Eurovent produced the guidance document *4/23 Selection of EN ISO 16890-rated air filter classes for general ventilation applications* (**bit.ly/CJEV423**). This advises on appropriate levels of filtration based on outdoor pollution and the use of the building.

These two documents provide a comprehensive methodology for selecting particulate filters to try to meet the 2021 World Health Organization (WHO) limits for PM2.5 and PM10.

Another key development in recent years has been around the energy rating of filters. Resistance to airflow and the subsequent impact on specific fan powers is an often overlooked aspect of a building's energy consumption. HVAC systems typically account for 38% of a building's energy consumption[1], and 16% of energy usage is typically attributable to the resistance of filters[2].

"The cleaning performance and energy efficiency of filters has often been overlooked by designers and building operators"

Eurovent 4/21 *Energy efficiency evaluation of air filters for general ventilation purposes* (**bit.ly/CJEV421**), published in 2019, gives ratings for energy consumption of particulate filters. Filters are graded from A+ (top 5% most efficient) to E (bottom 50% for efficiency). While a filter with basic construction may meet the required filtration efficiency, if it has a low dust-holding capacity and quickly increases in resistance as it loads, it will be penalised by this testing methodology.

More sophisticated low-energy filters are more expensive than basic ones, but prioritising low capital expenditure will significantly increase operating expenditure. Eurovent 4/21 has made filter energy consumption transparent, allowing for easier whole life cost calculations and supporting sustainability focused decision-making. As there can be a vast difference in energy performance for a similar particulate filtration efficiency, this should be a focus of sustainability engineers. Low-energy filters should be a key component of an M&E design.

ISO 10121-3 Test methods for assessing the performance of gas-phase air cleaning media and devices for general ventilation was released in 2022. Until this point, there was little guidance around the effective use of gas-phase or molecular filters, often referred to as carbon filters.

ISO10121-3 rates the filters' single-pass efficiency at removing a range of

'challenge gasses': ozone (O_3), nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and toluene. The first three are common outdoor pollutants, while toluene is a representative volatile organic compound (VOC). VOCs can be found in outdoor air, particularly in cities, but are more often considered an indoor pollutant, as they are readily released by solvents, paints and building materials.

Molecular filters require a contact time between pollutants and the filter media. If air passes through the adsorbent media too quickly, it will not be effective. This is related to the velocity of the air and the thickness of the media. The physical structure of the media also plays a significant part in the finished filter's effectiveness.

Just as the efficiency of gaseous pollutant removal is graded, so is the effective lifespan of ISO 10121-3-rated filters. Combined filters with a tiny amount of impregnated carbon have been marketed as an effective solution for removing gaseous pollutants for as long as the particulate filters last (6–12 months). The tiny amount of carbon in these filters could become saturated – and therefore ineffective – within a few weeks in certain environments with high gaseous pollutant levels.

To address this, ISO 10121-3 categorises molecular filters as heavy duty (HD), medium duty (MD), light duty (LD) and very light duty (vLD). There is a large difference between these ratings (see Figure 1). For example, if a HD molecular filter has an effective lifespan of 80 months, an MD filter – for the same pollutant load – would last eight weeks, and an LD filter just two weeks. A vLD categorisation denotes that the filter performed below the 50% effectiveness required to meet the LD classification.

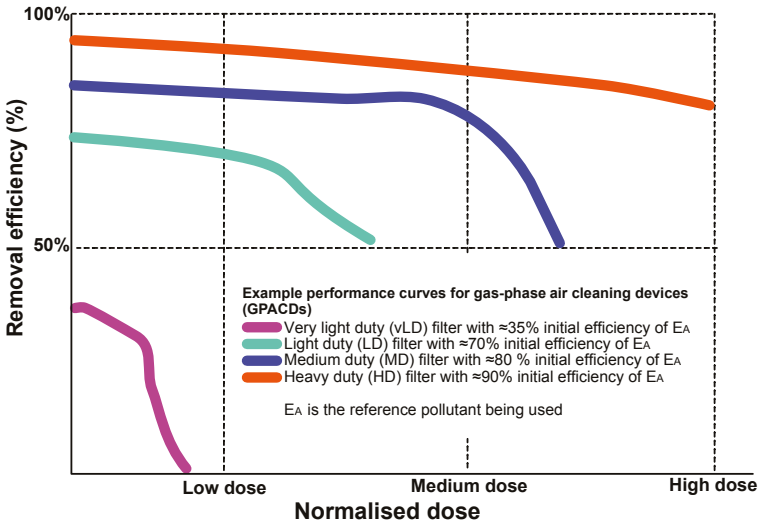

Figure 1: Lifetime of different molecular filters: removal efficiency vs gas dose

A filter may have different performance characteristics according to the challenge gas used in the test. For example, a filter could be HD 70 for toluene and LD 55 for SO_2.

In January 2025, *Eurovent 4/26 Selection of molecular filters for supply air for general ventilation rated according to ISO 10121-3* was released (**bit.ly/CJEV426**). In a similar vein to Eurovent 4/23, this aims to guide specifiers and facilities management teams in the selection of appropriate filters according to building usage and local outdoor air pollution levels.

Eurovent 4/26 advises how to select filters to comply with 2021 WHO guidelines (AQG) according to the outdoor air categories (ODA) and supply air categories (SUP) in EN 16798-3. It includes selection tables recommending appropriate efficiencies for specific ODA and SUP requirements.

The cleaning performance and energy efficiency of filters has often been overlooked by designers and building operators. There is now enough standardisation and guidance available to enable decisions to be made that reduce energy consumption and, more importantly, protect the health of building occupants. ●

Adam Taylor MCIBSE is CEO at ARM Environments and chair of the BESA IAQ Group

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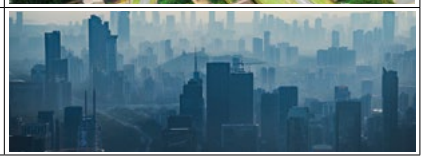
Category	Description	Typical environment
ODA 1 (G)	Applies where the 2021 WHO AQG are fulfilled: NO_2 mean* ≤10 µg·m^{-3} SO_2 mean* ≤ 40 µg·m^{-3} O_3 mean* ≤ 60 µg·m^{-3}	
ODA 1 (G)	Applies where concentrations exceed the 2021 WHO AQG by a factor of up to 1.5: NO_2 mean* ≤ 15 µg·m^{-3} SO_2 mean* ≤ 60 µg·m^{-3} O_3 mean* ≤ 90 µg·m^{-3}	
ODA 1 (G)	Applies where concentrations exceed the 2021 WHO AQG by a factor of greater than 1.5: NO_2 mean* ≤ 15 µg·m^{-3} SO_2 mean* ≤ 60 µg·m^{-3} O_3 mean* ≤ 90 µg·m^{-3}	

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Modern methods of construction

Shaping modern methods of construction in building services

This module explores the role of PAS 8700:2025 in defining the processes that underpin modern methods of construction, including the role of prefabricated building services systems

Off-site manufacture has evolved from an experimental delivery route into a key enabler of consistent, high-quality and low-risk construction. Within building services engineering, prefabricated and packaged systems now underpin many modern methods of construction (MMC). This CPD article examines how PAS 8700:2025[1] defines the processes that underpin MMC. It explores the role of prefabricated building services systems, platform design and digital coordination in delivering safer, higher-quality and lower-carbon construction outcomes.

Prefabrication is often most visible in high-profile projects, yet the same approach delivers significant value in smaller scale or repeated developments where space, labour and programme constraints make site assembly less practical. By transferring fabrication to controlled factory conditions, assemblies such as plant skids, prefabricated risers and packaged plantrooms can be completed before arrival on site. The factory setting enables systematic testing, consistent welding and wiring, and assurance of workmanship independent of site weather or phasing pressures.

The UK Government established a seven-category definition framework[2] for MMC, providing regularised terminology to describe the full range of modern construction methods used in homebuilding. This framework covers pre-manufacturing, site-based materials and process innovation, with categories ranging from 3D primary structural systems (volumetric construction) through to additive manufacturing. The final categories encompass site-based improvements associated with products and processes.

Significantly, an additional Category 0 has evolved in various MMC strategies to capture the foundation activities that make prefabrication effective. It measures the degree of standardisation, stakeholder engagement and digital enablement established before physical manufacture begins. High Category 0 performance reflects early agreement on repeatable designs, information management and BIM coordination, creating the conditions under which later manufacturing categories can deliver value. Without this groundwork, the benefits of off-site assembly risk being lost to late redesign and interface errors.

The strategic importance of MMC is amplified by current regulatory reform. The principles that govern this approach are consolidated within PAS 8700:2025, *Modern methods of construction for new-build residential properties*, which provides a UK-wide specification for how design, manufacture and assembly should be managed to ensure quality, safety and long-term performance. PAS 8700 emphasises early coordination, competence and traceability across the whole MMC process. It aligns with the duties established under the Building Safety Act 2022[3] and the Construction (Design and Management) Regulations 2015.[4] The specification requires that key dutyholder roles – including client, principal designer, manufacturer and principal contractor – demonstrate appropriate skills, knowledge, experience and behaviours (SKEB). For building services teams, this means confirming that the engineers responsible for mechanical and electrical design, control integration and commissioning are engaged from the earliest design stages and are competent to deliver systems that will remain accessible, maintainable and verifiable throughout the building life.

Early design coordination is central to the PAS approach. The specification uses the Royal Institute of British Architects (RIBA) Plan of Work as a reference framework, and identifies the importance of a design freeze – typically at Stage 3 or early Stage 4 – after which manufacture can proceed without late design changes. So, for example, for plantroom prefabrication this means that hydraulic, electrical and control interfaces must be fixed and documented before the module enters production. Late changes to valve configurations, control wiring or access routes can negate the efficiency benefits and create warranty or certification issues. PAS 8700 recommends that responsibilities are recorded in a matrix so that each connection, inspection point and testing obligation is clearly assigned to a named dutyholder. MMC projects do not necessarily follow a linear process and stages can be streamlined or overlap and, as such, the PAS is not restricted to being applied to RIBA-staged projects.

The specification also calls for a formal risk register to be created from project inception, identifying hazards such as fire spread, transport limits, structural interfaces and maintenance access. For prefabricated MEP modules, risk items may include lifting and cranage, temporary protection of factory finishes or the integrity of joints and fire barriers when modules are connected on site. Each risk is to be rated for likelihood and consequence, with mitigation measures recorded and reviewed at each stage. This structured approach turns qualitative claims about

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'reduced risk' into a documented process that satisfies regulators and insurers.

Design for manufacture and assembly (DfMA) underpins the PAS methodology. It encourages designers to consider how each element will be fabricated, transported, lifted, installed and maintained before construction begins. In the context of building services, this typically includes grouping main plant items with pipework, pumps, pressurisation units, expansion vessels, filters and control panels into assemblies that can be fully wired and hydraulically tested in the factory. Each assembly forms part of a standardised 'kit of parts' that can be adapted to different projects with minimal redesign. PAS 8700 links this approach to the Construction Product Quality Planning (CPQP) framework and to the 'golden-thread' principle of maintaining a permanent digital record of each component and test certificate.

The benefits of MMC and DfMA extend directly to building-services design and delivery. For heating, ventilation and air conditioning (HVAC) and other mechanical, electrical and plumbing (MEP) systems, factory fabrication and digital integration can improve safety, quality and whole-life performance, while accelerating installation and reducing waste. The summary in Table 1 outlines how these outcomes translate specifically to building services applications.

Interfaces between factory-built plant and site systems must be coordinated digitally, typically through a federated building information modelling (BIM) model, and validated physically during installation. PAS 8700 requires that tolerances, movement allowances and sealing arrangements are defined before manufacture. In building services applications, this includes confirming that pipework penetrations, fire stopping and acoustic seals can be completed without dismantling protected elements. These details are often minor in appearance but critical to achieving compliance and avoiding future claims.

Factory acceptance testing is required for all assemblies that can be safely powered or pressurised before shipment. Pressure tests, electrical continuity checks, and control verification must be documented, witnessed where appropriate, and recorded as part of the quality file. On site, systems are to be commissioned in accordance with established codes such as CIBSE Commissioning Code M for management,[5] BESA DW 144[6] for sheet-metal ductwork, DW 143[7] for leakage testing, DW 154[8] for plastics ductwork, BS 7593[9] for the preparation and maintenance of heating and cooling water systems, and BS 7671[10] for electrical installations. By citing these standards, PAS 8700 anchors factory prefabrication within the same compliance framework as traditional installations.

Category	Relevance to building services
Land and planning	Compact packaged plantrooms and riser modules make small or constrained sites viable and simplify service coordination.
Programme and cost	Factory-built modules shorten site installation time, give earlier cost certainty and reduce commissioning delays.
Labour and safety	Off-site assembly cuts hot works and working at height; fewer on-site trades reduce congestion and improve safety compliance.
Quality and performance	Controlled factory conditions improve jointing, wiring, insulation and testing quality; ensures reliable system performance and compliance with design intent.
User and community outcomes	Consistent thermal comfort, indoor air quality (IAQ) and noise performance through standardised assemblies; improved safety and accessibility in occupied spaces.
Environmental impact	Modular systems support low carbon technologies, optimise material use, reduce waste and embodied carbon, and enable future disassembly or recycling.
Life-cycle and value	Standardised, maintainable plant reduces life-cycle energy use, simplifies servicing, and provides digital records for asset management.
Collaboration and management	Integrated design and building information modelling (BIM) coordination improve spatial planning, interface control and performance validation across building services disciplines.

Table 1: Outline of benefits of MMC and DfMA to building services design and delivery

Clause 8.7 of PAS 8700 deals specifically with building services. It requires that systems are designed for manufacture and assembly, that distribution routes maintain airtightness and insulation continuity, and that service penetrations do not compromise fire or acoustic performance. Services must be accessible for maintenance and replacement without removing safety-critical structural or fire-resisting components. Thermal and acoustic performance, airtightness and indoor air quality (IAQ) are treated as measurable outcomes. These provisions align directly with CIBSE Guide B and with Part L of the Building Regulations, ensuring that off-site construction supports rather than bypasses regulatory expectations.

PAS 8700 defines the need for a factory production control system with inspection points agreed with the building control body and warranty provider. Components must be labelled, traceable and protected during transport. Deliveries must be accompanied by documentation identifying lifting points, weight, centre of gravity, and handling methods. On site, inspection records, photographic evidence and certificates form part of the quality and compliance record handed over at completion. These expectations are consistent with the requirements of insurers and mortgage lenders, one of the key motivations for developing PAS 8700 in the first place.

Integrating DfMA with BIM allows early clash detection, performance optimisation and collaboration across disciplines. Digital coordination also enables interoperability between platform components, reducing the need for bespoke design, and helping to maintain design integrity through manufacture and assembly.

Design teams are required to establish sustainability targets, including operational and embodied carbon, and to consider repair, replacement, adaptation and end-of-life recycling from the outset. For building services assemblies, this means selecting materials that can be disassembled, avoiding unnecessary use of composites that prevent recycling, and providing clear information on component weight, service life and replacement procedure. PAS 8700 thereby complements CIBSE TM65[11] and TM66[12] on embodied carbon and circular economy principles. Increasingly, attention is also turning to whole-life cost and whole-life carbon metrics, moving project evaluation beyond capital expenditure. For public projects in particular, there is growing recognition of the social cost of carbon as part of investment decision-making.

Although PAS 8700 is formally limited to residential projects, many of its provisions are equally applicable to other sectors. Clause 6.2, which covers design life and replacement, and Clause 9.4, which addresses operational testing, both establish a discipline that benefits commercial and public buildings. The

processes of early stakeholder engagement, design freeze, risk management and traceable testing can equally support, for example, prefabricated plant rooms, energy centres and district-heating substations in non-residential developments.

An illustrative example of factory assembly is given in Figure 1. The hybrid heating plant configuration combines cascade-controlled boilers and heat pumps serving multiple heating zones through a low-loss header and buffer vessel. Within the green dashed boundary, the entire skid-mounted assembly – which includes pumps, headers, valves, pipework, controls and temperature sensors – is prefabricated, wired and hydraulically tested in the factory. Each component is connected to the building management system (BMS) for coordinated control and monitoring. The completed module is delivered to site as a pre-tested unit, craned into position, and connected to the distribution pipework and electrical supplies. This approach reduces on-site installation time, ensures consistent quality, and simplifies commissioning, with all test and inspection records forming part of the project's digital quality file. It demonstrates how factory-built building services assemblies can satisfy the traceability, integration and competence requirements set out in PAS 8700.

A clear example of these techniques in non-residential projects is found in the NHS England Modern Methods of Construction Assessment Tool,[13] published in 2025 to guide the design and delivery of healthcare buildings. The tool forms part of the NHS approach to embedding MMC, DfMA and platform construction within new and refurbished hospitals and clinics. It measures the pre-manufactured value of each project, identifying where factory-built components such as plantrooms, riser modules and service corridors can replace traditional on-site assembly. The process links directly to NHS net zero and digital-build strategies, ensuring that prefabrication contributes to reduced embodied carbon, improved quality and faster programme delivery. Under the ProCure23 framework,[14] teams use the assessment collaboratively to set measurable MMC targets and verify outcomes post-occupancy, providing a strong public sector example of how structured prefabrication and pre-manufactured value metrics are being used to deliver complex, safety-critical infrastructure within a regulated environment.

The earlier UK initiative known as platform design for manufacture and assembly (P-DfMA) sought to standardise repeatable building components so they could be configured across different project types. Its principles are now embedded within PAS 8700 and the wider MMC framework,

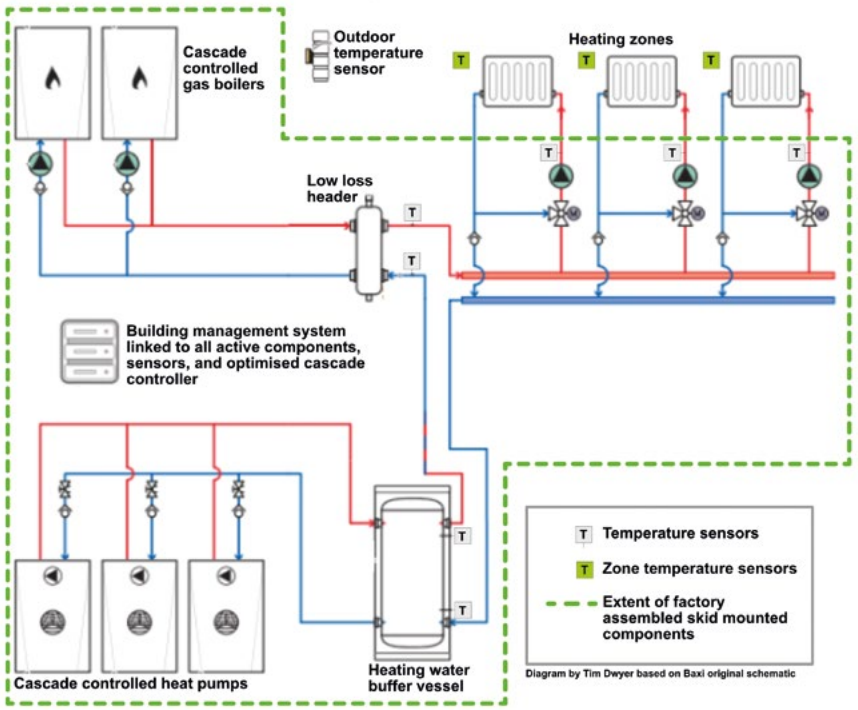

Figure 1: Example of a hybrid heating plant incorporating cascade-controlled boilers and heat pumps, with factory-assembled skid-mounted components, sensors and controls forming an integrated module ready for site connection and commissioning (Source: Baxi)

promoting platform-based design and shared manufacturing supply chains. The Construction Innovation Hub's Product Platform Rulebook,[15] developed with the Infrastructure and Projects Authority, expands this approach by providing practical guidance on creating repeatable building platforms with standardised structural grids, service interfaces and digital component libraries. While not mandatory, it is shaping government procurement policy and informs both the Construction Playbook[16] and PAS 8700, making it a key reference for engineers applying platform-based MMC solutions.

The Construction Playbook, last updated in 2022 and still current as government guidance under the 'comply or explain' principle, remains a key policy document promoting value-based procurement, whole-life performance, and the adoption of MMC across public-sector projects. The Procurement Act 2023[17] updates the legal framework for public-sector contracting, but this not expected to replace the Construction Playbook. Instead, the Playbook's principles of transparency, whole-life value and MMC will continue to guide how those statutory procurement duties are applied in practice.

The philosophy of factory-assembled construction is not unique to the UK. Hong Kong has advanced it through modular integrated construction (MiC) and modular integrated MEP (MiMEP) programmes[18] led by the Construction Industry Council, while Singapore's PPVC and similar frameworks in Europe and North America share the same DfMA principles.

Addressing the traditional bottleneck created by lengthy MEP installation remains one of the main motivations for modularisation. Applying DfMA to building services enables large portions of this work to move off-site, reducing programme risk and improving safety while maintaining assured performance through factory testing and standardised interfaces.

The benefits of factory assembly are realised not by moving the same work indoors but by transforming the process into one that is traceable, standardised and continuously improved. PAS 8700:2025 provides the UK's formal specification for achieving these outcomes within the context of MMC, and offers a timely and authoritative framework that emphasises early integration, competence, quality assurance and life-cycle responsibility. It formalises many of the practices already adopted in advanced prefabrication projects. For the building services community, the specification reinforces the case for modular and off-site manufacture as part of a disciplined, verifiable engineering process that supports the UK's drive toward safer, lower-carbon and more productive buildings. When combined with the established guides and commissioning codes, it offers a structured route from design intent to assured performance – turning prefabrication from a convenient option into an accountable modern standard .●

Module 255

November 2025

1. Why is 'Category 0' considered particularly important in MMC strategies?

- ☐ A It covers foundation design and site-based enabling works
- ☐ B It defines the acoustic performance of modular buildings
- ☐ C It establishes early digital coordination, standardisation and stakeholder engagement
- ☐ D It sets out minimum space requirements for factory layouts
- ☐ E It specifies carbon-reduction targets for manufacturing plants

2. What does design for manufacture and assembly (DfMA) encourage building services engineers to do?

- ☐ A Consider fabrication, transport, lifting, installation and maintenance during design
- ☐ B Defer equipment selection until construction is complete
- ☐ C Focus on aesthetic layout of visible MEP components
- ☐ D Outsource mechanical and electrical design to third-party consultants
- ☐ E Simplify system documentation by excluding commissioning data

3. How does integrating DfMA with building information modelling (BIM) support successful prefabrication?

- ☐ A By allowing design teams to bypass traditional approval stages
- ☐ B By enabling clash detection, design optimisation and improved interdisciplinary coordination
- ☐ C By ensuring identical geometry across all manufacturers' models
- ☐ D By removing the need for on-site supervision
- ☐ E By replacing factory testing with digital simulations

4. In the illustrated example, which of the following are not likely to be included in the factory-mounted components?

- ☐ A Boilers
- ☐ B Buffer vessels
- ☐ C Heat pumps
- ☐ D Pumps
- ☐ E Zone heat emitters

5. What is the main advantage of applying off-site prefabrication to building services installations?

- ☐ A It allows all system testing to be carried out on site
- ☐ B It avoids the need for digital records or traceability
- ☐ C It eliminates the need for post-installation inspections
- ☐ D It ensures equipment can be reused without re-certification
- ☐ E It provides factory-controlled quality, reduced on-site labour and shorter programmes

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MVHR set to play a key role in meeting Building Regulations and tackling damp

With the introduction of new regulations such as Awaab's Law, which requires landlords to act swiftly to address issues of damp and mould, the spotlight on effective ventilation systems has never been stronger. Recognising this growing need, Elta has launched its new HAVA MVHR range, designed to deliver compliance, energy efficiency and improved indoor air quality in one comprehensive solution.

David Millward, product manager at Elta Group, explains: 'With modern homes being built to ever-tighter energy standards, airtightness has increased dramatically. Without effective ventilation, this can lead to a build-up of stale air, condensation and mould, posing serious risks to both the building fabric and occupant health.'

Traditional ventilation methods – such as extract fans and trickle vents – while technically compliant, are increasingly viewed as inadequate for today's homes. They can struggle to maintain consistent air quality and heat efficiency, particularly in new, highly insulated properties.

By contrast, mechanical ventilation with heat recovery (MVHR) systems are already commonplace in parts of Europe, including Sweden and the Netherlands, where they are standard in new housing. MVHR units continuously extract stale air while supplying fresh, filtered air, recovering up to 92% of the heat from the outgoing air. This makes them a key solution for meeting modern energy and health standards.

The upcoming implementation of Awaab's Law adds urgency to the need for robust, high-performing ventilation systems.

The legislation will enforce stricter timelines for landlords and housing providers to remedy damp and mould problems, placing greater responsibility on effective ventilation to help prevent these issues before they occur.

Engineered specifically for UK residential applications, the Elta HAVA MVHR range includes six models.

● **Visit www.eltatrade.co.uk**

Vent-Axia showcases Lo-Carbon ventilation at elementalLONDON

Vent-Axia will present its latest energy-efficient ventilation solutions for housebuilders and social housing providers at the inaugural elementalLONDON exhibition, Excel London, on 19–20 November 2025.

Visitors to stand D46 can explore the Lo-Carbon Sentinel Econiq range of MVHR systems, designed to support net zero housing and tackle overheating challenges. Vent-Axia experts will offer tailored advice on meeting Building Regulations and achieving sustainable indoor air quality.

● **Visit www.vent-axia.com**

Heritage meets efficiency at Corpus Christi College

A new heating and hot-water system at Corpus Christi College, Cambridge, combines modern efficiency with heritage preservation. Installed within a Grade I-listed building, the project features Hamworthy Heating's Modumax mk3 condensing boilers and Powerstock calorifiers, chosen for their compact, modular design.

Using 3D digital design tools and offsite prefabrication, installation was completed in a day, delivering a future-proof, low-emission solution that respects the college's historic fabric.

● **Visit www.hamworthy-heating.com**

Cooling partnership delivers energy savings

A collaboration between Weatherite and Condair has produced the AdTec-D direct cooling system, a refrigerant-free solution now used by major telecoms and data centre clients. Incorporating Condair's adiabatic cooling technology, the system achieves up to 80% power savings compared with traditional units and maintains performance even in extreme temperatures.

Offering 15–80kW of cooling with an EER above 15, AdTec-D provides an efficient, sustainable alternative for retrofit and new installations.

● **Visit www.condair.co.uk**

Hamworthy updates Varmax Mk2 boiler range

Hamworthy Heating has introduced updates to its Varmax Mk2 floor-standing condensing boiler range, enhancing flexibility, performance and ease of maintenance. The range now features a touchscreen interface, improved casing for component access, and durable stainless steel heat exchangers with a five-year warranty.

Available in six models with outputs up to 450kW, the boilers can be cascaded for larger projects, offering energy-efficient heating for schools, offices and healthcare facilities, while reducing installation time and costs.

● **Visit www.hamworthy-heating.com**

Diffusion's Highline 275 wins HVR Award

Diffusion has won Air Conditioning Product of the Year at the HVR Awards 2025 for its Modular Highline 275 fan coil range. Offering airflows up to 514l/s, low sound levels and energy-efficient performance, the range is ideal for hotels, offices and large-scale spaces.

Its modular, configurable design allows more than 300,000 possible layouts, including side-access fans for easy maintenance. The built-in Lifetime 'Eco' filter reduces waste, combining high performance with sustainability.

● **Visit www.diffusion-group.com**

Details matter when specifying pumps

Selecting the right pump involves more than just flow and head. Factors such as wastewater type, debris, duty/standby configuration, high-level alarms and BMS connections are all critical.

Pump Technology, the UK's authorised Jung Pumpen supplier, can quickly specify the correct equipment when provided with layout drawings or application details.

Based in Berkshire, the company holds extensive stock for next-day delivery, ensuring rapid and reliable solutions for all projects.

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

Sentinel Apex earns fresh certification

Vent-Axia's award-winning Sentinel Apex commercial MVHR range has achieved Passivhaus certification, confirming its suitability for low carbon buildings.

With thermal efficiency up to 93% and an industry-leading performance number of ≥11.5, the Sentinel Apex combines impressive air quality and low noise with minimal energy use.

The models offer reliable, high-performance ventilation for sustainable commercial projects.

● **Visit www.vent-axia.com**

Panasonic heat pumps adopted in new homes

Harron Homes is using Panasonic Aquarea J Series Monobloc air-to-water heat pumps at its Nevison's Fold development in Barnsley, to meet the Future Homes Standard 2025. Installed across 50 homes, with 277 more planned, the system provides high-efficiency, renewable heating.

Delivered in partnership with Secon Renewables, UK Cylinders, Honeywell Home and local installers, the project combines onsite training and support to ensure optimal performance and sustainable homes.

● **Visit www.aircon.panasonic.eu**

Directory

Your guide to building services suppliers

Q&A

The chair of YEN Republic of Ireland brings nearly a decade of diverse engineering experience to his role, driving connections and growth within the Irish building services community

Dylan Ryan chairs the Young Engineers Network (YEN) in the Republic of Ireland and has worked in the building services industry for three years. He is now a technical and specification sales representative at Euro Gas.

With nearly nine years of diverse engineering experience, Ryan brings technical insight and a passion for collaboration to his role as YEN chair, supporting young engineers across the network.

Q How did you become involved in YEN?

A I became aware of CIBSE during my time at Euro Gas. My colleague James Porter, who sits on the CIBSE Committee, introduced me to the Young Engineers Network. Ryan Loney, who had been the YEN Ireland chair for the previous nine years, kindly put me forward to be the new chair.

Q What are the benefits of joining YEN?

A There are numerous benefits. It offers a fantastic opportunity to expand your professional network and connect with individuals from all areas of the building services industry. Membership also gives you a deeper understanding of how CIBSE develops its regulations and standards. Through that connection, you gain valuable access to insights and knowledge.

Q Briefly describe your career to date.

A I studied electrical engineering at the National University of Ireland, Galway (now University of Galway), graduating in 2016. I have since gained experience across multiple disciplines, including manufacturing and process engineering in Ireland, substation design in New Zealand, and food processing engineering in Australia. After returning to Ireland, I pursued

a Master's in business administration at the University of Limerick, graduating in 2024. I now work in the HVAC industry with Euro Gas.

Q What project have you been most proud of?

A Rather than a single project, I would lean into my experiences working alongside consultant engineers and installers to develop effective design solutions for existing plants and new facilities through Euro Gas. When the project is completed, you get to reflect and say to yourself 'I, alongside the design consultancies and installers, have been able to make a significant impact on this project and the building or facility as a whole '. Being able to see your ideas and contributions manifest into something real is a great feeling.

"My main focus is to establish anchor events that strengthen relationships across the network"

Q Where has YEN Ireland had the biggest impact in the past year?

A We have made significant progress by increasing the number of events hosted, in both technical and social aspects, strengthening and structuring the committee, and establishing data-collection methods to assess how we operate, to make it easier to identify areas where we can improve.

Q What are the current priorities for YEN Ireland? Have you any personal objectives?

A My main focus as chair is to build on the momentum of previous years and establish new anchor events that strengthen relationships across the network. My overarching theme is relationships – initiating, enhancing and growing connections on all sides of YEN. Key priorities include:

- Strengthening relationships between current YEN professionals, CIBSE and sponsors
- Connecting college students entering the industry with working professionals in YEN, to help them grow their networks early
- Encouraging greater collaboration throughout all facets of CIBSE in the Republic of Ireland
- Developing mentorship opportunities that connect CIBSE and YEN alumni with newer members
- Organising enjoyable, inclusive events that bring people together.

Q CIBSE President Vince Arnold's theme is 'paying it forward'. Who has inspired you?

A If I were to 'pay it forward', I wouldn't single out one mentor or role model. Instead, I would pay it forward to my committee. They work tirelessly behind the scenes, often without recognition, and their dedication is what makes YEN successful. It's important to me that they get the credit they deserve.

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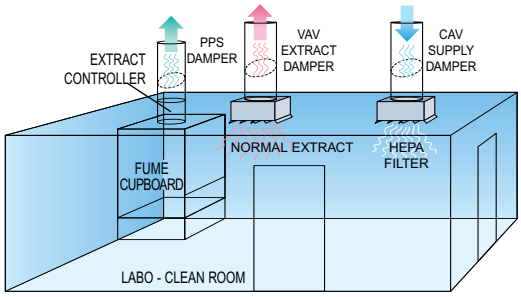

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