

**EXTRACTING HEATING AND  
COOLING FROM MINEWATER**

**TRIALLING THE USE OF  
MATERIALS PASSPORTS**

**PREVENTING HEAT PUMP  
NOISE AND VIBRATION**

# CIBSE JOURNAL

**#Build2Perform**

November 2023

[www.cibsejournal.com](http://www.cibsejournal.com)

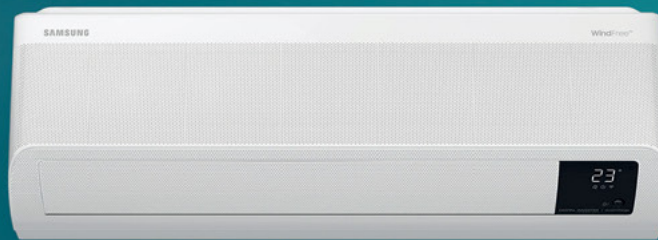


## **TAKING THE LEAD**

**Graduate of the Year Francesca James  
on how engineering benefits society**

**CPD  
Special**

SAMSUNG



Cool. WindFree™  
everywhere.  
No cold drafts.

Offer clients the latest in climate innovation with Samsung WindFree™: the first air conditioner that uses micro-perforation technology to cool any home or business without cold drafts\*. And, with intelligent AI that learns their user's preferences\*\*, anyone can set their temperature to perfect.

[samsung.com/windfree-range](https://samsung.com/windfree-range)

\*ASHRAE (the American Society of Heating, Refrigerating, and Air-Conditioning Engineers) defines "Still Air" as air currents moving at speeds below 0.15 m/s, with no cold drafts.

\*\* WindFree™ Wall-Mount with AI Auto Comfort can analyse your room conditions and usage patterns and then automatically adjusts the temperature. Wi-Fi connection and SmartThings application account are required.



## Editorial

**Editor:** Alex Smith

**Tel:** 01223 378034

**Email:** [asmith@cibsejournal.com](mailto:asmith@cibsejournal.com)

**Tel:** 01223 378048

**Technical editor:** Tim Dwyer

**Reporter:** Molly Tooher-Rudd

**Designer:** James Baldwin

*CIBSE Journal* is written and produced by CPL One

Tel: +44 (0)1223 378000.

[www.cplone.co.uk](http://www.cplone.co.uk)

1 Cambridge Technopark, Newmarket Road,  
Cambridge CB5 8PB.

**Editorial copy deadline:** First day of the month  
preceding the publication month

## Advertisement sales

**Display and sponsorship** Jim Folley

[jim.folley@redactive.co.uk](mailto:jim.folley@redactive.co.uk)

**Tel:** +44 (0) 20 7324 2786

**Products & services** Daniel Goodwin

[daniel.goodwin@redactive.co.uk](mailto:daniel.goodwin@redactive.co.uk)

**Tel:** +44 (0) 20 7880 6217

**Recruitment advertising**

[cibsejournaljobs@redactive.co.uk](mailto:cibsejournaljobs@redactive.co.uk)

**Tel:** +44 (0) 20 7880 6215

**Advertising production** Jane Easterman

[jane.easterman@redactive.co.uk](mailto:jane.easterman@redactive.co.uk)

**Tel:** +44 (0) 20 7880 6248

The opinions expressed in editorial material do not necessarily represent the views of the Chartered Institution of Building Services Engineers (CIBSE). Unless specifically stated, goods or services mentioned in editorial or advertisements are not formally endorsed by CIBSE, which does not guarantee or endorse or accept any liability for any goods and/or services featured in this publication.

We remind all readers that it is their responsibility to verify advertisers' products claims.

# Making a difference



The Young Engineers Awards felt grander and more relevant than ever this year, with a larger venue – the Royal College of Physicians in Regent's Park – and a record number of entries. For the CIBSE ASHRAE Graduate of the Year Award there were 58 entries alone, and the quality of these was evident in the high standard of presentations from the finalists.

The deserved winner was Francesca James, graduate engineer at FairHeat and University of Cambridge graduate with a Master's in chemical engineering.

The judges asked the finalists to present on the theme of attracting more young people to the building services engineering industry. James eloquently

explained that a huge motivation for young people today was to make positive, long-term impacts on society and the environment.

She said building services engineers were in a perfect position to provide that sense of purpose for young engineers, and she offered personal evidence to back up her claim. In her first year as a graduate engineer, she calculated that she had saved 500,000kg of CO<sub>2</sub> through her work improving heat networks – the equivalent of six people's lifetime consumption of CO<sub>2</sub> in the UK (page 18).

James is already attracting new talent to the industry with this positive message: she told the audience that at one university careers event in Cambridge she was so persuasive that three undergraduates who heard her ended up joining FairHeat.

I had the privilege of attending the President's Awards dinner last month where CIBSE Members and volunteers were rewarded for their tireless work for the Institution and wider industry (see page 10). I was honoured to receive a President's Commendation, and extremely humbled to be alongside the true industry stalwarts who had given up so much of their time for the benefit of others.

Last month also saw new building safety regulations come into force, which CIBSE marked with a 'golden thread' safety conference. The Building Safety Regulator's Andrew Moore was a speaker and he caused consternation when he said design and build (D&B) procurement would not work for higher-risk buildings (HRBs) under the new building regime. With more than half of UK contracts currently D&B, this led to a lively Q&A session.

David McCulloch, compliance manager at Balfour Beatty, who also spoke at the event, said D&B would still be viable as long as the design was brought forward and carried out with more rigour using specialists to achieve the optimal result. He gave the audience some sage advice: if you are using D&B for HRBs you must 'make sure your design is compliant before you put your spade in the ground'.

**ALEX SMITH, EDITOR** [asmith@cibsejournal.com](mailto:asmith@cibsejournal.com)

## CONTRIBUTORS



### Hywel Davies

The information that has to be provided as part of the 'golden thread' of information for higher-risk buildings



### Ken Gordon

The project lead of *TMS1 Ground Source Heat Pumps* on major changes to the upcoming heating guidance



### Sasha Krstanovic

Keeping the art world comfortable at the Frieze Art Fairs in London and Los Angeles



### David McCulloch

Balfour Beatty's compliance manager on preparing for the new safety regime

# The **GREENEST** solution for Heating Commercial Buildings without Natural Gas.

Air to Water

**R290** Refrigerants with a GWP of only 3... R32 is at 675 and R410A at 2088.

COP's at up to 6 to 1 plus DHW at over 65 °C.

55,000kW heating capacity from air and ground source heat pumps manufactured and installed in the UK.

Simultaneous 4 Pipe Heating and Cooling Option.

Air to Air

Water to Water

**excool**  
GROUP OF COMPANIES

**EcoAir Box**

European HQ | Bromsgrove, Worcestershire, UK | +44 (0)1527 492770 | info@excool.com



BRITISH DESIGNED ENGINEERED AND MANUFACTURED IN THE UK.

ecoairbox.com





## SOCIAL MEDIA



@CIBSEJournal



CIBSE LinkedIn



CIBSE Journal newsletter



www.cibse.org

## FOR CIBSE

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

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

©CIBSE Services Ltd. ISSN 1759-846X

## SUBSCRIPTION ENQUIRIES

If you are not a CIBSE member but would like to receive *CIBSE Journal*, subscribe now! Costs are £80 (UK) and £100 (international). For subscription enquiries, and any change of address information, please contact Nicola Hurley at [nhurley@cibse.org](mailto:nhurley@cibse.org) or telephone +44 (0)208 772 3697. Individual copies are also available at a cost of £7 per copy, plus postage.

*CIBSE Journal*, ISSN 1759-846X (USPS 4070) is published monthly by CPL One, 1 Cambridge Technopark, Newmarket Road, Cambridge CB5 8PB, UK.

Subscription records are maintained at CIBSE, 222 Balham High Road, London, SW12 9BS, UK.  
ISSN 1759-846X (print)  
ISSN 2756-1895 (online)

## CREDITS

P07 Credit / Jim Stephenson / iStock.com / Nirian  
P08 iStock.com / Sturti  
P09 iStock.com / Highwaystarz-Photography  
P31 iStock.com / Pheelings Media  
P34 iStock.com / Michael Boeckling  
P36 iStock.com / Dave Couldwell  
P54 iStock.com / Photoman  
P66 iStock.com / Intpro



ABC audited circulation:  
18,724 January to December 2021  
Printed by: Warners Midlands PLC

# CONTENTS

17

## News

6 News

10 CIBSE news

## Voices

14 Defining the golden thread

Hywel Davies explains what the 'accountable person' role will entail

65 Q&A: Heat pumps from the ground up

Ken Gordon on the key changes to the revised TM51

## Features

18 How young people can make a difference

Graduate of the Year winner Francesca James on attracting young talent into the industry

20 Get ready for Build2Perform Live

Highlights to expect at the two-day event in December

22 Design & build will have to change

Molly Tooher-Rudd looks at how D&B will have to evolve to comply with new safety regulations

24 Material assets

Waterman's Mark Terndrup and Anastasia Stella on the all-electric Edenica building

## Technical

Industrial and commercial heating, cooling and ventilation

34 Digging for deep heat

Eshagh Goudarzi gives an overview of how abandoned mines play a crucial role in the transition to net zero

38 Hanging with the cool set

Molly Tooher-Rudd talks to mstep's Sasha Krstanovic about the thermal comfort strategy at the Frieze art show

43 The balance of power

Mitsubishi Electric's Chris Newman explains how using a boiler alongside a heat pump can save CO<sub>2</sub> and costs

47 Sound advice

KP Acoustics Group's Kyriakos Papanagiotou and Mason UK's Adam Fox on CIBSE's guide B4

51 Sizing up the benefits

FairHeat's Jake Adamson on the benefits of oversized thermal stores

54 Lifting the lid

How infection spread can be limited in toilets at large-scale events

## Classified

61 Products

## Events & Training

66 Looking ahead



Read our  
CPD Directory Special

with this issue or online at [www.cibsejournal.com](http://www.cibsejournal.com)

## Waterman to launch materials passports framework

Consulting engineer Waterman is to launch a materials passports framework with the aim of providing a standardised approach to overseeing materials throughout their life-cycle.

The framework, due out this month, aims to establish an overall strategy for all components and systems. Although it doesn't detail the properties that need to be recorded for each component, it indicates that details such as performance, manufacturer information, certificates, and CO<sub>2</sub> performance should be captured.

Waterman, which is piloting materials passports at the Edenica office scheme (page 24), said they align with the CIBSE TM65 approach to calculating embodied carbon.

'We aim to drive material circularity and kick-start the circular economy throughout the construction industry with a robust process any scheme can follow,' said Mark Terndrup, managing director of Building Services (South) at Waterman Group.

## 'Design and Build must change for HRBs' – BSR

### BSR's Andrew Moore says current form of D&B not viable in new safety regime

Design and Build (D&B) procurement practices will have to change if they are to be used for higher-risk buildings (HRBs) under the new building safety regime, according to a senior official at the Building Safety Regulator (BSR).

Andrew Moore, head of operations, building control, at the BSR, said: 'I don't see the current D&B process working in the new BSR regime for HRBs, because design occurring at the same time as construction will not be viable. D&B will have to change.'

He told the audience at the CIBSE Golden Thread building safety conference that D&B contracts do not suit the new safety regime for HRBs. The new regulations require that major changes made to the design during construction have to be approved by the BSR, which could lead to costly project delays.

Also speaking at the event was Balfour Beatty's compliance manager, David McCulloch, who said D&B could still be used if designs were much more upfront in the process. He said: 'Minimising, if not completely eliminating, change was essential, as formalised change approval would be expensive and entail time implications.'

David Stevens FCIBSE, director of estates, facilities & capital development at East London NHS Foundation Trust, said: 'Poor aspects of D&B, where construction may have started prior to finalisation of designs, will no longer occur.'

He added that D&B contracts offer potential for much better management of the Golden Thread, especially as contractors will hold ultimate accountability for delivery of the design, construction and handover.

For more on D&B in the new safety regime for higher-risk buildings, see page 22.

# COMPLETE

ENERGY EFFICIENT SOLUTIONS FOR ANY VALVE REQUIREMENT

**CRANE** FLUID SYSTEMS

For more than a century we have designed market leading solutions. Our variable flow valves, with outstanding hysteresis performance, can help reduce energy consumption by up to 27% based on a 10% improvement in the controlled flow rate. So, why not take comfort in our efficiencies.

Find out more at [Cranefs.com/solutions](https://www.cranefs.com/solutions)





## WINNING BY ASSOCIATION

A day care centre designed to encourage social connection and movement has been awarded this year's RIBA Stirling Prize for Britain's best new building. As well as a medical centre and consultation rooms, the John Morden Centre in south-east London houses a café, events space, and wellbeing facilities. The redesign of the centre, by architects Mæ, aims to combat social isolation among the elderly residents. Boom was the environmental and M&E engineer on the project.



# Rule out hydrogen for heating homes, says NIC

**National Infrastructure Commission wants more support for heat pumps**

Hydrogen should be 'ruled out' for home heating and support for heat pump installations increased, the National Infrastructure Commission (NIC) has urged.

In its five-yearly National Infrastructure Assessment (NIA), published last month, the NIC concluded that there is 'no public policy case' for hydrogen to be used to heat individual buildings. Ruling it out as a home heating option would enable an 'exclusive focus' on switching to electrified heat. It said the government should: 'Take a clear decision that electrification is the only viable option for decarbonising buildings at scale.'

The NIC said hydrogen heating will not be available in time to make a 'material contribution' to the Sixth Carbon Budget emissions-reduction target, which covers the mid-2030s. Converting the gas networks that serve properties to hydrogen will also require a time-consuming programme of area-by-area switching.

The NIC identifies production capacity as another 'critical barrier' to the mass use of hydrogen ahead of the mid-2030s. The volume of 'green' hydrogen produced via electrolysis will be limited by competing demands for the electricity available. Hydrogen is also 'not necessary' for home heating, stated the NIC, because alternatives exist for 'all buildings'.

According to analysis it has carried out,

a heating system with hydrogen will be 1.2 times more expensive than one without – and it takes five to six times more electricity to produce hydrogen than using it directly in heat pumps.

To encourage greater uptake of heat pumps, at which the UK is lagging behind other European countries, the NIC called for them to be installed for free in social housing and other low-income households. The other two-thirds of UK households should be offered grants, worth £7,000 initially, to install heat pumps or connect to heat networks, plus access to government-backed 0% financing to cover additional costs. The government has recently increased heat pump grants to £7,500 through its Boiler Upgrade Scheme, but capped the budget.

At the NIA's launch, NIC commissioner Nick Winser said 'Green electricity is going to be gold dust in the [energy] transition and we need to use it efficiently: heat pumps are best placed to do that.'



The NIC called for heat pumps to be installed in social housing for free

## Global grid capacity must double by 2040

The world must add or replace as much electricity grid as currently exists across the globe by 2040 to meet growing demand, according to a new report by the International Energy Agency (IEA).

Published on 17 October, *Electricity grids and secure energy transitions* estimates that more than 80 million kilometres of grids will need to be added or refurbished – the equivalent of the entire existing global grid.

The increase in grid capacity is required to accommodate the rapid growth in electricity demand consistent with reducing emissions to net zero by 2050.

To achieve countries' national energy and climate goals, the world's electricity use needs to grow 20% faster in the next decade than it did in the previous one.

However, the report – which the IEA says offers a first-of-its-kind stocktake of grids worldwide – states that rollout of the networks is not keeping pace with the rapid growth in key clean energy technologies, such as solar, wind, electric cars and heat pumps.

## Call for new ratings for smart buildings

The government has been urged to introduce a new 'Smart Building Rating' (SBR), to encourage greater uptake of measures that enable households to use energy more flexibly.

A new report, published by the Centre for Net Zero and Energy Systems Catapult, outlines proposals for the SBR.

The new digital tool would complement a reformed energy performance certificate (EPC), which the report says is 'poorly designed' to incentivise carbon emission reductions because, for example, replacing a gas boiler with a heat pump can worsen a building's rating, rather than improve it.

The report proposes that the SBR would only cover assets attached to the building or premises. These could include heating systems and controls, heat storage capacity, electric vehicle chargers, solar panels, home batteries, and meters. It would not include items such as 'white goods', which can be moved from one property to another.

The SBR's methodology is an estimate of a building's capacity for flexibility, unlike the EPC, which is based on assumed energy running costs.

The report's proposals have been backed by Chris Skidmore MP, chair of the government's independent net zero review, and a cross-industry coalition of organisations.

## IN BRIEF

### Damp and mould issues for 55% of UK homeowners

A new survey shows that more than half (55%) of UK homeowners have experienced serious problems with indoor air quality and poor ventilation, leading to condensation, mould and damp. The poll, carried out by builders' merchants Jewson, also reveals that 44% of homeowners have reported health-related side effects, including allergies, respiratory infections, poor sleep, low mood, and difficulty concentrating. Publication of the survey comes as the Building Engineering Services Association and Mitsubishi Electric launch a new guide to tackling damp and mould in existing UK homes.

### Building firms should do more to hit net zero targets

Half of construction project managers believe their company is not doing enough to support the UK's 2050 net zero targets, according to a new survey. The survey, by the Association for Project Management, shows that 50% feel their company is doing 'too little' to support the government's 2050 greenhouse gas emissions reduction target. Another 23% said their company was doing 'enough' and 26% said their firm was doing 'too much'. In addition, 74% of construction project managers said their company incorporates net zero carbon emissions planning into their projects.



Energy efficiency projects are one of the few areas of growth

# Watchdog investigates hydrogen boiler claims

## CMA looks into marketing practices of boiler maker Worcester Bosch

The Competition and Markets Authority (CMA) is investigating whether Worcester Bosch has misled shoppers with 'confusing or inaccurate' claims in the advertising and labelling of its boiler products.

The consumer watchdog's probe will look at several marketing practices, including the use of labels or text stating that Worcester Bosch's boilers can run on a blend of 20% hydrogen and natural gas. This may give the impression that this is a special feature, despite all boilers in the UK being legally required to operate in this way since the mid-1990s.

The CMA will also look at information and messaging on the use of hydrogen for home heating in the UK, even though its introduction is, potentially, years away and dependent on

future government decisions. Descriptions and information about the environmental benefits of 'hydrogen-blend ready' boilers will also be investigated.

The CMA has written to 12 other businesses that sell 'hydrogen-blend' boilers after reviewing their marketing, to warn them that they could be breaching consumer protection law and to remind them of their legal obligations.

George Lusty, senior director, consumer protection, at the CMA, said: 'We set out our concerns earlier this year about businesses marketing boilers as "hydrogen-blend". We will now scrutinise green claims from Worcester Bosch to see if they mislead shoppers.'

Last month, Sky News broadcast an investigation that accused boiler companies of making confusing and potentially misleading marketing claims about the hydrogen compatibility of their products.

## Construction output likely to fall 6.8%

The Construction Product Association's (CPA's) autumn forecasts predict construction output in 2023 will be down by 6.8%. A further fall of 0.3% is expected in 2024, down from a 0.7% growth forecast predicted in its summer publication.

The CPA also expects the UK economy to 'flatline' in 2024 because of high interest rates. Mortgage rate increases have led to housebuilders reporting a 30-40% fall in demand, and this has remained weak throughout summer and early autumn, it added. Completions are expected to fall 19% this year and be flat in 2024, while private housing repair, maintenance and improvement is forecast to fall 11% this year.

Energy efficiency projects remain strong, but there are questions for the delivery of government programmes such as ECO4, the Great British Insulation Scheme, and the Boiler Upgrade Scheme, said the CPA. It added that infrastructure growth would be flat for the next two years.

## Helping Heat Networks deliver their promise

EnergiRaven | SAV<sub>6</sub>

Accountability through design, commissioning and verification, handover and ongoing use.

[www.energiraven.com](http://www.energiraven.com)





Britain's draughty homes need urgent upgrades, says the *Mission Retrofit* report

## Calls for national retrofit body to oversee building upgrades

**Mission Retrofit** report says new independent body should lead scheme

A new national retrofit delivery agency should be set up to oversee upgrades and making buildings net zero, according to a new report.

*Mission Retrofit* says the new independent body would lead on a national retrofit plan and build on the work of the existing non-profit group National Retrofit Hub.

The report also proposes a National Retrofit Bill to reform standards, including Energy performance certificates (EPCs), to increase trust in the retrofit industry.

*Mission Retrofit* was co-authored by chair of the government's Review of Net Zero Chris Skidmore MP and UK Green Building Council deputy chief executive Simon McWhirter, who said it 'shines a spotlight' on 'critical policy gaps and challenges', including the urgent need for a national retrofit strategy to upgrade

Britain's mostly cold and draughty buildings.

Publication of the report followed Prime Minister Rishi Sunak's decision to drop plans to make private landlords upgrade the energy efficiency of their properties to EPC C by 2028.

CIBSE is a member of the Buildings Mission Zero Network, and collaborated with other building sector organisations to develop the report.

In its contribution, CIBSE said: 'If we accept that retrofitted buildings also improve health and comfort, then we must also accept that delaying retrofit will have social costs, as occupants continue to live and work in poor-quality indoor environments.'

The report forms part of the Review of Net Zero, the largest engagement exercise on net zero. It has had more than 1,800 written submissions and is speaking to more than 1,000 companies and businesses directly.

### IN BRIEF

#### Trust wants minimum technical standards for heat networks

There should be minimum technical standards for new and existing heat networks, according to the Heat Trust. Responding to a joint consultation by Ofgem and the Department for Energy Security and Net Zero on their proposed consumer protection regime for heat networks, the trust called for 'informed, timely and targeted' enforcement action where these standards aren't met. The heat network consumer champion also wants people to have access to independent dispute resolution at the Energy Ombudsman. Where penalties or compensation are payable for service failures, it says heat suppliers cannot simply recover these costs from consumers. The trust also wants the most expensive and inefficient heat networks to be targeted for accelerated remediation.

#### 55th edition of Spon's M&E price book

BSRIA has launched its latest set of Spon's price books. The guides provide comprehensive and up-to-date pricing information and guidance across various disciplines within the construction industry, for project management and cost estimation. The set includes the Spon's Mechanical and Electrical Services Price Book, which is currently in its 55th edition. The price books, which are sponsored by Aecom, are available from the BSRIA bookshop.

#### KPMG fined £21m for Carillion failures

KPMG has been handed a £21m fine over 'exceptional' failures in its accounting work for Carillion. The Financial Reporting Council (FRC), which regulates accountants, ruled that the audit giant had 'failed to adopt a rigorous and robust approach', accepting the presentation of financial information that suited the management at the construction giant, which went into liquidation in early 2018 owing more than £1.5bn. The FRC found 'significant and serious breaches' in each of the audits it investigated, many of which related to the audit work performed in respect of Carillion's contracts.

## London plan urges Stamp Duty rebate for energy efficiency improvements

Homeowners should be offered a stamp duty rebate if they carry out energy efficiency improvements to their homes, according to a new 10-point retrofit action plan for London.

Launched on 20 October by the umbrella body BusinessLDN, the plan is designed to meet London mayor Sadiq Khan's target for all of the capital's homes to meet an energy performance certificate (EPC) B rating by 2030. It includes backing for a Stamp Duty rebate, which would be triggered by energy efficiency upgrades - carried out within two years of a home purchase - that improve the property's EPC rating.

The plan also includes a proposal for 'building passports' for homes, setting out information on their building performance. This data could then be collated in a pan-London green housing registry. In addition, it recommends making it easier for homeowners to navigate the grant process by streamlining programmes and bringing together existing pots, so that the level of available funding is determined by the home's actual energy usage.

Other recommendations include the establishment of accredited retrofit 'one-stop shops', to make it easier for homeowners to seek expert guidance during the retrofitting process.

## CIBSE Certification recognised for quality management

CIBSE Certification has been named National Quality Management, Compliance and Training Company of the Year at the Energy Efficiency Awards 2023. The category was open to organisations that have carried out quality management and compliance services related to energy efficiency measures. CIBSE Certification had to demonstrate clear knowledge of energy efficiency best practice.

The judges said: 'By operating across a wide range of certification schemes, CIBSE has demonstrated industry leadership in the field of regulatory compliance, training and quality management. Its robust processes and high standards are an industry benchmark.'

The National Energy Efficiency Awards, which were held in Birmingham in September, recognise best practice within the industry, and are open to anyone involved in the energy saving and efficiency sector.

CIBSE Certification is a wholly owned subsidiary of CIBSE. It operates the certification of personnel schemes within the UK that cover low carbon consultants, low carbon energy assessors for non-domestic Energy Performance Certificates, Display Energy Certificates, air conditioning inspectors, ESOS lead assessors, heat networks consultants, and Section 63 advisers for Scotland. CIBSE Certification holds UKAS accreditation for several of these personnel schemes.

It also certifies organisations to management systems ISO 9001 Quality Management, ISO 14001 Environmental Management, ISO 50001 Energy Management and ISO 45001 Occupational Health and Safety, and holds UKAS accreditation for quality, environmental and energy management certification.

See [www.cibsecertification.co.uk](http://www.cibsecertification.co.uk)

## CIBSE Careers Fair

The 2023 CIBSE Careers Fair took place on 12 October, at the International Students House in London.

Attracting students, employers and industry leaders, the event – organised by the CIBSE Young Engineers Network – gave attendees practical tips and insights about careers in building services engineering. Students travelled from far and wide to attend the fair, and there were delegates from Hong Kong representing the Asian Institute of Built Environment.

To close the event, CIBSE President Adrian Catchpole hosted a panel discussion on his presidential theme, Taking a Lead, to explore how engineers can collaborate to overcome the challenges the industry is facing.

Special thanks to the event sponsors: BCIA, Crown House, Trend, Waterman Group, and WSP.

# Aecom triumphs at CIBSE Employer of the Year Awards

## Whitecode Consulting and PM Group are the other winners

Aecom was named Employer of the Year at the CIBSE Young Engineers Awards, in recognition of its comprehensive training, mentoring and development schemes for early-career employees.

The consulting firm, which also won in the large company category, stood out for its established culture of training and development, which includes residential sessions, Aecom University, and annual compulsory training on topics such as sustainability, net zero, unconscious bias, and ethical behaviour.

It also has an Early Years Rotation Scheme, giving young engineers the chance to gain experience of project management, cost management, and project programming in placements across various business units and locations, in Europe and India.

In addition, Aecom demonstrated to the award judges how it is encouraging those who are not yet in the industry, with its national Stem programme, which has reached more than 28,000 students in the past 12 months.

Mary-Ann Clarke FCIBSE, director at Aecom, said: 'We are honoured to receive this recognition. Supporting

individuals as they enter the industry is not just a responsibility, but also a privilege. Nurturing and guiding emerging talent strengthens our organisation and enriches the entire building services industry.

'At the heart of our success lies a dedicated team of mentors and training and development staff, who give their time and expertise to help shape the careers of the engineers of the future – and thanks go to them. Investing in the growth and development of graduates and apprentices brings fresh perspectives, innovation and energy to our workplace.'

Whitecode Consulting was named Employer of the Year in the small company category, impressing the judges with its ongoing commitment to investing in training and development.

Claiming the medium company category was PM Group, with its provision of ongoing training throughout its graduate scheme. The company also provides soft skills training and a mentoring programme, while encouraging its young engineers to engage with local schools and colleges to promote the industry and Stem careers.

- To read more about the Young Engineers Awards see page 17.



The overall Employer of the Year Award went to Aecom





Frank Mills (second left) receives a silver medal from CIBSE President Adrian Catchpole. His citation was read by Steve Clifford, to his left, alongside CIBSE CEO Ruth Carter



Steve Vaughan is awarded a silver medal, alongside Mike Burton, who read his citation

# Celebrating dedication and commitment to the building services industry

## Gold, Silver and Bronze medals presented at President's Awards Dinner

One Gold, five Silver and six Bronze medals have been presented to CIBSE members for their outstanding contribution to the Institution and the building services industry.

They were among the accolades handed out at the 2023 President's Awards Dinner, which was held at the Waldorf Hilton hotel, London, last month. CIBSE members, authors, education establishments and *CIBSE Journal* editor Alex Smith were all in attendance.

Adrian Catchpole, CIBSE President, said: 'The awards showcase the remarkable talent, innovation, and dedication that is embodied within the CIBSE community.'

Stuart MacPherson received a Gold medal, CIBSE's highest accolade, for his long-standing service. He has had a number of integral roles on the Board of Trustees, including President and honorary treasurer.

Silver medals were awarded to Vince Arnold, Lynne Jack, Pat Lehane, Frank Mills, and Steve Vaughan.

Arnold, the current honorary treasurer, has been on the CIBSE Board since 2020, and chair of the Membership and Registration Panel for 12 years. Since the Grenfell Tower tragedy, he has served on a number of committees and strategy groups, and has been a key participant in CIBSE's work to develop competence criteria for building services for the new contextualised register.

Mills entered the industry as a Haden Young trainee - working on the new St George's Hospital, Tooting, in 1968 - and became a CIBSE member in 1971. He was chair of the North West Region Committee, and instrumental in establishing the CIBSE Healthcare Group.

Vaughan, a chartered engineer and technical director at Aecom, leads a 19-person

public health and fire protection team.

He has been a member of the Society of Public Health Engineers (SoPHE) for more than 25 years, and was chair in 2015, helping to grow the membership and relaunching the *SoPHE Journal*.

MacPherson, a past president of CIBSE and SoPHE, and Lehane, a former CIBSE Ireland regional committee member, were unable to attend the dinner and will receive their medals at a later date.

In recognition of service to their Regions, Bronze medals were awarded to: Malcolm Atherton, Eric Benton, Jeremy Cockroft, David Frank, Chia Huay Lau, and Martin Trentham.

*CIBSE Journal* editor Alex Smith also received recognition, with a President's Commendation for the pivotal role he plays in shaping CIBSE's presence on the international stage.

Ibrahim Qadir received the 2023 Ken Dale Bursary, and the Happold Brilliant Award - which recognises excellence in the teaching of building services engineering - was presented to the Hong Kong Polytechnic Institute.



Vince Arnold receives a silver medal, alongside David Hughes who read his citation

## IN BRIEF

### Renew your membership for 2024

Members of CIBSE can now download their invoices via MyCIBSE and renew their membership for 2024, to stay connected to a global community of 20,000+ members.

Once you have logged in to MyCIBSE, you will find your outstanding invoices in the 'Make a Payment' section, on the left-hand side menu. Click on the invoice number to download it as a PDF, or select it and click 'Pay Now'.

Renew your membership today, stay up to date with the latest technical updates, and get the opportunity to influence the industry's future. Find out more at:

[www.cibse.org/renew](http://www.cibse.org/renew)

### REHVA student competition

Recently finished your BSc/BEng or MEng/MSc major project? Then enter now to become CIBSE's nominee for REHVA's Student Competition in Istanbul, 2024.

As a member of REHVA, CIBSE nominates one student from a CIBSE accredited course. To enter, send a six-page summary of your work (that meets competition requirements) by 6pm on 12 December, 2023.

The selected finalist will be able to claim a travel bursary of up to £500 towards the cost of travel and accommodation. Visit: [www.cibse.org/REHVA-Competition](http://www.cibse.org/REHVA-Competition)

### CIBSE backs *Mission Retrofit* report

The publication of *Mission Retrofit*, which focuses on the imperative to retrofit the 85% of existing buildings that will still be standing in 2050 to meet net zero targets, has been welcomed by CIBSE.

It is the first report from the Buildings Mission Zero Network, convened by Chris Skidmore MP, of which CIBSE is a member.

The report highlights the need for a clear strategy for the retrofitting of existing building stock. It also defines a National Retrofit Mission.

A further report, titled *Building the Future*, will focus on new buildings.

# CIBSE Financial Briefing

The summary of CIBSE's account was presented on 22 August 2023 as a hybrid event

As announced at the CIBSE AGM on 13 June, the Briefing was held as soon as possible once the delayed CIBSE accounts had been fully audited and signed off. Adrian Catchpole, CIBSE's President, welcomed those attending, and Vince Arnold, CIBSE Honorary Treasurer, then summarised the accounts:

- 2022 had seen a strong performance: Group income rose from £6.9m to £8.4m; Group expenditure rose by £809k; operational surplus was £767k (£279k in 2021); investment performance reflected economic trends at £494k loss; final surplus was therefore £273k (£442k in 2021).
- There had been no major changes to the figures presented at the AGM and reported in the August issue of *CIBSE Journal*. £116k reallocated from debtors had resulted in slight changes to the balance sheet, but the net assets remained unaffected.
- The related parties note in the Statutory Accounts (page 78) had been amended in relation to Trustee and Subsidiaries transactions.

Julia Poulter, from auditors Crowe UK LLP, then confirmed that the audit had

concluded and that the statutory accounts of CIBSE, CIBSE Services Ltd and CIBSE Certification Ltd had been approved by the Board, and signed by the Trustees and herself on behalf of Crowe UK.

Questions from Members, were then addressed, including:

Stephen Lisk requested clarification on the resources challenge that had caused the accounts and audit to be delayed. Ruth Carter CIBSE CEO, confirmed that it had proved very difficult to recruit the number and capability of staff required.

A subsequent internal audit had established the resources needed to ensure this issue wasn't encountered again, and the Trustees had accepted these actions.

In addition, David Cooper, vice-president responsible for governance, is carrying out an internal review to ensure the Trustees are fully satisfied that all recommendations have been addressed and learnings adopted.

Chris Jones questioned whether there is a need for a more strategic approach to financial stability, including the ongoing deficit funding of the Defined Benefit Pension Scheme. Vince Arnold advised that the Board acknowledges that financial stability was recognised as a key risk and that it is actively managed by regular review of available funds to settle debts as they fall due, regular liaison with the bank, and active management of trade debtors and creditors balances.

In regards to the Pension Scheme, investments are performing better in 2023 and the triennial review may even show a surplus. It is not, at present, a major concern, but is closely monitored as a potential risk.

A further question asked why it had been necessary for a Trustee to be paid to lecture on the Building Safety Act, rather than a staff member? In response, it was highlighted that CIBSE Services uses a pool of up to 100 trainers to deliver training courses, as do other professional engineering institutions (PEIs). It is not financially viable to have sufficient salaried staff to meet the requirements to deliver training.

In conclusion, Adrian Catchpole thanked all those attending the Briefing, as well as Crowe UK and CIBSE staff for all their hard work on the 2022 accounts and audit.

- The full Annual Report and Financial Statements are available to view online.

## CIBSE awards medals for best *BSER&T* papers

Low energy and carbon façades, use of smart controls for air purifiers and openable windows, ambient loop heat networks with interseasonal storage, and fault detection and diagnostics for air handling units are the topics addressed by this year's award-winning technical papers, as featured in *Building Services Engineering Research & Technology (BSER&T)*, the research journal of the Institution.

The Dufton Silver and Napier Shaw Bronze Medals are awarded for papers relating to fundamental research. The Barker Silver and Carter Bronze Medals are awarded for papers on application of research in practice. The winning papers are selected based on international interest and significance.

With façade performance in mind, the **Dufton Silver Medal** for research was awarded to **Michalis Michael** and **Mauro Overend**, of the University of Cambridge, for their paper 'Closed cavity façade, an innovative energy-saving façade'.



The **Napier Shaw Bronze Medal** for research was awarded to **Akos Revesz**, **Phil Jones**, **Chris Dunham**, **Anthony Riddle**, **Norman Gatensby**, and **Graeme Maidment**, of London South Bank University, for their paper 'Ambient loop district heating and cooling networks with integrated mobility, power and interseasonal storage'.

The **Barker Silver Medal** for application and development was awarded to the paper 'Improving indoor air quality and occupant health through smart control of windows and portable air purifiers in residential buildings', by **Yan Wang**, **Elizabeth Cooper**, **Farhang Tahmasebi**, **Jonathon Taylor**, **Samuel Stamp**, **Phil Symonds**, **Esfandiar Burman** and **Dejan Mumovic**, of University College London.

**Narges Torabi**, **Huseyin Burak Gunay**, **William O'Brien** and **Ricardo Moromisato**, of Carleton University in Ottawa, Canada, were awarded the **Carter Bronze Medal** for application and development for 'A holistic sequential fault detection and diagnostics framework for multiple zone variable air volume air handling unit systems'.

The accolades were presented at the CIBSE President's Awards Dinner in October.

- CIBSE members can read the *BSER&T* and *LR&T* journals for free at [www.cibse.org/knowledge](http://www.cibse.org/knowledge)



## New members, fellows and associates

### FELLOWS

**Bowen, Colin John**  
Felixstowe, United Kingdom

**Capel, Christine Elise**  
Oxford, United Kingdom

**Daffin, Neil James**  
London, United Kingdom

**Giles, Ian Frank**  
Colchester, United Kingdom

**Lear, Stephen**  
Urmston, United Kingdom

**Metcalf, Peter Arthur**  
Cheadle, United Kingdom

### MEMBER

**Abadir, Amgad**  
London, United Kingdom

**Fong, Siu Kwan**  
Tseung Kwan O, Hong Kong

**Galligan, Craig**  
Shankill, Ireland

**Kwong, So Yin**  
Yuen Long, Hong Kong

**Loudon, Keir**  
London, United Kingdom

**Mostafa Mohamed Ahmed, Ahmed**  
Dubai, United Arab Emirates

**Pangilinan, Arnold**  
Al Nahda 2, United Arab Emirates

**So, Chun Kit**  
Tai Po, Hong Kong

**Spencer, Richard**  
Leeds, United Kingdom

**Tam, Chi Wah**  
Kowloon, Hong Kong

**Tsang, Chung Man**  
Hung Hom, Hong Kong

**Wilson, Stephen**  
Essex, United Kingdom

**Wong, Kwan**  
Hong Kong, Hong Kong

**Yang, Chun Kui**  
Wong Tai Sin, Hong Kong

**Yip, Man Ki**  
Hong Kong, Hong Kong

### ASSOCIATE

**Aslam, Hassan**  
Cardiff, United Kingdom

**Chehab, Dana**  
London, United Kingdom

**Coad, Luke**  
Durham, United Kingdom

**Devlin, James**  
Banbridge, United Kingdom

**Heyes, Mark Edward**  
Leeds, United Kingdom

**Hobbs, Adam**  
Paignton, United Kingdom

**Mould, Darren**  
London, United Kingdom

**Nutt, Dylan**  
Braintree, United Kingdom

**Pervez, Iqra**  
Birmingham, United Kingdom

**Smith, Adam**  
West Wicken, United Kingdom

**Taylor, Ellis**  
Hessle, United Kingdom

**Worman, William**  
Whitehill, United Kingdom

**Wright, Gavin**  
Exeter, United Kingdom

**Yam, Ho Yin**  
Hong Kong, Hong Kong

### LICENTIATE

**Ashworth, Andrew**  
Leeds, United Kingdom

**Bailey, Daniel**  
Bingham, United Kingdom

**Ballance, Frank**  
Leeds, United Kingdom

**Cruz, Efren**  
Surbiton, United Kingdom

**Davis, Edward**  
Solihull, United Kingdom

**Dervey, Dillon**  
Hull, United Kingdom

**Feve, Zak**  
Hessle, United Kingdom

**Finnemore, Jack**  
Worcester, United Kingdom

**Haigh, Sam**  
Ossett, United Kingdom

**Hanson, Stephen**  
London, United Kingdom

**Hendricks, Charlie**  
Tonbridge, United Kingdom

**Hussain, Syed Thakhar**  
London, United Kingdom

**Kilmartin, Mason**  
Leeds, United Kingdom

**Kirkbright, Liam**  
Wakefield, United Kingdom

**Lathan, Nyle**  
Nottingham, United Kingdom

**Mole, Dominic**  
Peterlee, United Kingdom

**Nash, Andrew**  
Hitchin, United Kingdom

**Oliver, Michael**  
Dronfield, United Kingdom

**OSullivan, Jack**  
Birmingham, United Kingdom

**Rose, Harry**  
Leeds, United Kingdom

**Scott, Luke**  
Dunnington, United Kingdom

**Sousa, Paulo Diogo Fernandes**  
London, United Kingdom

**Veale, Joe**  
Leeds, United Kingdom

**Waghela, Rimal**  
London, United Kingdom

**Withey, Grace**  
Newark, United Kingdom

**Zhao, Haibo**  
London, United Kingdom

**This valve was developed by world class engineers. Just like all our others.**

Complete valve solutions take engineering prowess, rigorous testing and operational excellence, oh yes, and an exhaustive selection of valves. So, when you need the complete valve solution none of the others will do.

Find out more at [hattersley.com/justlike](https://hattersley.com/justlike)



Trevor, Senior Design Engineer

# Defining the golden thread

The Higher-Risk Buildings (Keeping and Provision of Information etc.) (England) Regulations 2023 set out the requirements for providing 'golden thread' information about a higher-risk building to other parties. Hywel Davies explains what any accountable person needs to do now

The Higher-Risk Buildings (Keeping and Provision of Information etc.) (England) Regulations 2023 are the final set of regulations implementing Part 4 of the Building Safety Act, which covers the occupation of higher-risk buildings (HRBs). They deliver on Dame Judith Hackitt's call, in 2018, for a digital standard of record-keeping for HRBs, and prescribe what information and documents the principal accountable person (PAP) and any other accountable person (AP) responsible for a HRB must keep in relation to the building.



For those reasons, many in the sector have been working towards this for several years. They have been busy identifying and bringing together the information they already hold, and updating information where that was needed. There has been a particular focus on the requirement for this information to be held 'electronically', for it to be readily available to those who need it, and for it to be exchangeable, especially if management contracts or providers change, or HRBs change ownership.

An AP is a dutyholder who is responsible for the safety of an occupied HRB under Part 4 of the Building Safety Act. If there is only one AP, they are the principal AP (PAP). Where there is more than one AP, the PAP is the AP responsible for the structure and exterior of the HRB.

Those who are accountable for a HRB have a duty to have, and to maintain, accurate, up-to-date and secure information about the building, so they can discharge their duty to manage that building safely. If they already have up-to-date information and a full safety management plan, there will not be a huge amount to do.

These regulations identify what information the PAP must provide to the regulator, other APs, residents and the fire and rescue authority. There is significant detail, both in the regulations and in Schedule 1, on the information prescribed for the golden thread under section 88(1) of the Building Safety Act.

These 'golden thread' regulations should certainly not surprise anyone responsible for a HRB. It is more than five years since Dame Judith made her recommendations, and four and a half years since the government accepted them in full. This train has been coming for a while now.

The key building information submitted will help the accountable person to assess the building's safety risks

**DR HYWEL DAVIES**  
HonFCIBSE is chief technical officer at CIBSE. He chaired the BRAC Golden Thread working group.

## Unrivaled Accuracy in Airflow & Pressure Differential Measurement



- Accurate and stable measurement down to still air for HVAC
- No onsite calibration is required
- Thermal dispersion technology
- Premier specified airflow measurement device

**EBTRON**  
a measurable difference!



**CooperWard**

cooperward.co.uk

+44 118 971 4971

enquiries@cooperward.co.uk



when developing the safety case for the building. It will also help the Building Safety Regulator to determine which HRBs to prioritise when calling in safety case reports to consider granting Building Assessment Certificates. This process is due to begin in earnest in April 2024.

These new regulations build on the foundations laid by the HRB regulations, published earlier this year. They set out, in detail, what information must be held in the golden thread and the requirements relating to how that information is held, made available, and kept up to date.

The required information covers fire safety management of the building, including assessment of the major fire safety risks and the measures in place to manage those risks, including physical location of equipment or elements of the fabric – such as a fire door – within the building.

## “These ‘golden thread’ regulations should not surprise anyone responsible for a HRB. This train has been coming for a while now”

It also covers the evacuation strategy for the building, including details of the precautions to be taken by building occupants to reduce the risk of needing to evacuate the building at all.

The golden thread information includes details of all structural safety measures in the building, relevant reports, and details of the design codes applied to the building when constructed, as well as plans of the building. It will include the assessment of building safety risks as defined in the Building Safety Act, which relate to fire and structural safety, and management of maintenance and repair of the HRB.

The provision of this information is not unreasonable. Those APs who find these requirements unduly onerous might want to consider whether they have been providing an appropriate standard of management until now. It might not be wise to make too much fuss about the new requirements, as it might only serve to draw attention to previous management standards.

CIBSE is working with the Construction Leadership Council to provide further industry guidance on the regulations and on how APs can meet the new obligations in a safe, reasonable and proportionate manner. It is another step on the road to rebuilding trust in the construction and operation of our higher-rise building stock, and to building a safer future.

Read more articles on the regulations at [bit.ly/CJSafety](https://bit.ly/CJSafety)

### ■ Evacuation strategies

Further information on evacuation strategies was recently updated by the government at [bit.ly/CJreg9FS](https://bit.ly/CJreg9FS)

# Firefighting and smoke control systems

In response to the ongoing discussion around firefighter intervention in smoke control systems, **Ian Doncaster**, of the SCA, examines manual override switches

Smoke control systems are required in many buildings, and protect escape routes from smoke, allowing occupant escape, safe access for fire crews, and the exhaust of heat and smoke.

The complexity of a smoke control system may vary from a single vent to a multi-core multi-compartment system in a complex building. The guidance for smoke control systems are covered in Approved Document B and British Standards BS 9999 and BS9991. Controls should be intuitive and clearly marked, to allow attending fire crews to interact easily with the system, and the controls should do what they say.

There has been much debate between the smoke control industry, fire authorities, the National Fire Chiefs Council (NFCC) and building control bodies about producing guidance that can be applied across all fire services in the UK, as the relevant standards do not offer clear guidance about manual intervention.

The smoke control requirements for a building will be specific to the fire strategy for that building and should be agreed at the start of the project. The recommended approach for this is a ‘qualitative design review’, known as a QDR, which involves all the relevant parties.

It is important to note that most smoke control systems are designed as one-shot systems that are set to an operating state when a fire incident is detected – they are not expected to change during a fire.

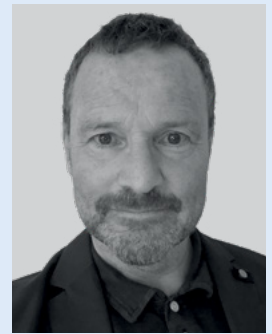
If full control of a system is required during a fire, the system must be designed to be more durable, and all elements need to operate while exposed to, or having been exposed to, fire heat and smoke.

Focusing on residential and high-rise residential buildings, it is commonly agreed that the smoke control system should, ideally, be automatic in operation, requiring no intervention from the attending fire crew. However, what does this mean in practice?

If a fire crew attends before enough smoke has leaked into the common area, the smoke control system might not be activated. In this situation, crews may want to activate the system manually before entering the fire compartment.

Look out for an upcoming SCA document on this topic which will include input from fire and rescue services and the NFCC.

● **IAN DONCASTER** is managing director at Fire and Smoke Solutions



# Sign up and get closer to the lighting industry with



## This is T-Word.

Made for you, this NEW resource hub gives you access to relevant industry news and updates regarding the built environment. From technical and legislation, to energy and sustainability solutions in lighting. Subscribe to our blog to stay on top!

#letstalkaboutlight

Subscribe now!





Undergraduate of the Year  
Ruairi Devlin

Apprentice of the Year: Level 5-7:  
Jess Sargent

Apprentice of the Year: Level 5-7:  
Sidney Hargreaves

CIBSE President  
Adrian Catchpole and  
Graduate of the Year  
Francesca James

# A FORCE FOR GOOD

The Young Engineers Awards showcased the best new talent in the industry and featured nine inspirational presentations from graduates willing to lead by example

**T**he 2023 CIBSE Young Engineers Awards received a record 58 entries for the CIBSE ASHRAE Graduate of the Year competition, which was won by FairHeat's Francesca James last month, for her inspired presentation on attracting young talent to the industry, see p18.

James said that the key to attracting people into the sector was to tell them how an individual could have a positive impact on the planet by becoming a building services engineer. She told a packed auditorium at the Royal College of Physicians that, in one year's work as a graduate engineer, she had saved 500,000 Kg of CO<sub>2</sub> emissions.

James said that relaying this message to just one undergraduate careers fair had resulted in her recruiting three Cambridge University graduates to her company. 'We make such a positive impact on communities and the environment, and we need to get this message across,' she added.

Nine graduate finalists were asked to answer the question, 'What practical actions would excite teenagers to join the world of building services?' The awards aim to empower young

engineers to put forward their ideas and arguments. From mentoring to real-world engagement and the importance of a sense of purpose, each finalist offered diverse approaches, with unique perspectives on how to excite and engage young minds in building services.

The live presentations followed an introduction by CIBSE President Adrian Catchpole, who commended the young engineers for taking the opportunity to lead by example, which was the theme of his Presidential address earlier this year.

'The finalists exemplify the ethos of taking a lead and steering the trajectory of building services to new heights,' Catchpole said.

The Young Engineers Awards were held on 12 October, and were staged at the Royal College of Physicians for the first time. They included the CIBSE Undergraduate of the Year and Apprentice of the Year Awards (see panel, below), as well as the Employer of the Year Awards (see page 10).

The Graduate of the Year Award is supported by ASHRAE and CIBSE, and ASHRAE President Ginger Scoggins addressed the audience. She emphasised the exciting, yet challenging times, that lay ahead, and focused on climate change and improving indoor air quality.

'The awards recognise the outstanding contributions of young engineers; we need each and every one of you if we are to create a better future,' she said. **C**

## AWARD WINNERS

### CIBSE ASHRAE Graduate of the Year

- 1st Francesca James, FairHeat and University of Cambridge - prize of a trip to the 2024 ASHRAE Winter Conference
- 2nd Lewis Turner, Arup and Leeds Beckett - £600, provided by Patrons
- 3rd Hiba Talmoust, Waterman Group and Queen Mary - £300, provided by Manly Trust

### CIBSE Undergraduate of the Year

- 1 Ruairi Devlin, University of Nottingham £500
- 2 Fraser Nicoll, Glasgow Caledonian University - £100
- 3 Erin Cullen, Heriot-Watt University - £100

### Apprentice of the Year: Level 3-4

- 1st Sidney Hargreaves, HDR - £500
- 2nd Ryan Beary, CPW - £300
- 3rd Sean John, University of Warwick - £200

### Apprentice of the Year: Level 5-7

- 1st Jess Sargent, Atkins - £500
- 2nd James McLarnon, SCC MEP - £300
- 3rd Finley Bowdidge, Venables Associates - £200

# ‘Let’s show young people how they can make a difference’

Focusing on the individual impact a person will have in building services is a sure-fire way of attracting young people to the industry, according to Graduate of the Year Francesca James, whose winning presentation was one of the highlights of the 2023 Young Engineers Awards



**G**raduates at this year’s Young Engineers Awards were asked to do a presentation on the following question. How can building services attract more young people to the ‘surprisingly wonderful, disparate world of building services engineering’?

To answer this question, we need to understand what the younger generation wants from a career and how we can give that to them – and, importantly, we need to make sure they understand that we can give them what they want. So, what do they want?

This generation of teenagers, college students and university graduates want to feel a sense of purpose through their work: to make positive, long-term impacts on community, wider society, and the environment. I’m a graduate engineer working in heat networks, and it’s this sense of purpose that drew me to building services.

A 2022 Gallup survey of 5,800 adults found that 72% of 18 to 29-year-olds feel it is extremely important that their company has a focus on long-term benefits to society instead of short-term profits, a significant increase compared with other age groups.

In 2021, another Gallup survey found that 33% of Generation Z (those born between the mid-1990s and early 2010s) feel it is very important that their job allows them to work for a greater cause, compared with 27% of millennials (those born between the early 1980s and mid-1990s).

A Deloitte survey in 2019 found that around half of Gen Z and millennials want to make positive impacts on society.

I want to focus on those phrases ‘long-term benefit to society’, ‘work for a greater cause’, and ‘positive impact on community’. This is what teenagers, college students and university graduates want – to feel this sense of purpose. Fortunately, we work in an industry where we don’t have to bend over backwards or pull clever tricks to give the appearance that our work aligns with these goals, because it directly aligns with them.

An obvious example of a long-term benefit to society is the work we do in reducing the carbon emissions from buildings. We work for a greater cause by helping to reduce energy bills during the cost-of-living crisis. We make a positive impact on the

community by improving people’s standard of living and comfort in their workspaces and homes. We know this, but teenagers, college students and university graduates don’t.

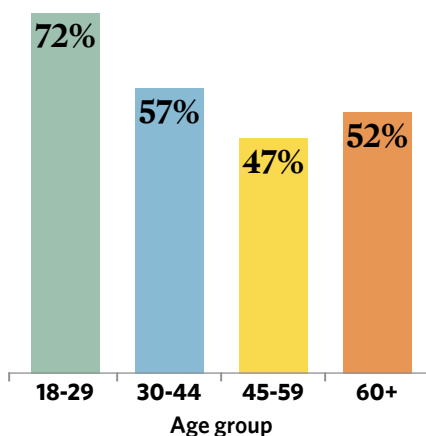
So, we know what the incoming workforce wants, and we know how the building services industry can give this to them – but how do we get this message across?

We need to focus on the individual impact that a person will have if they join the industry, because this is how the sense of purpose is fulfilled.

I know that we all attend careers fairs already, and give careers talks at schools and at universities; we post job adverts on job boards and on our websites; we run internship programmes for teenagers through to graduates; we’re involved in great programmes such as the Stem Ambassadors, where engineers volunteer to run sessions for schoolchildren, teachers and parents – and, obviously, we need to keep doing all of this.

But to really excite the young people we’re talking to, we need to not only highlight the positive impact that the industry has as a whole, but also, critically, we need to highlight the impact that an individual young person can have.

Last year, I gave a careers talk at my university, and I calculated and presented the reduction in carbon emissions that could be attributed to my work during the graduate scheme. This number, to my huge surprise when I actually worked it out, was half a



% of adults who find it ‘extremely important’ that their employer focuses on **long-term benefits to society** instead of short-term profits

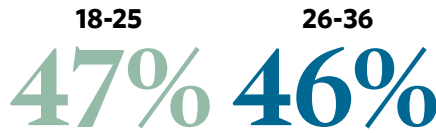


The presentation by Francesca James, CIBSE Graduate of the Year, was one of the highlights of the 2023 Young Engineers Awards

“We need to focus on the individual impact that a person will have if they join the industry, because this is how the sense of purpose is fulfilled”

million kg of CO<sub>2</sub>. I also gave a case study of a residential development where the retrofit work I designed had reduced residents’ heating bills and improved comfort through reduction in overheating. I was presenting the positive impact that my work had had on real people’s lives in only a year.

After the talk, we saw a huge number of applicants for our summer internship and graduate programmes, and three



have ambitions to have a **positive impact on community**



It’s very important that my job allows me to **work for a greater cause**

students who attended the talk went on to be employed by FairHeat. So, practically, in our careers talks, we should be emphasising the reduction in embodied carbon that can be attributed to the work of materials engineers during their graduate scheme.

In our job adverts, we should be giving case studies of sites where residents’ utility bills have been reduced because of efficient lighting design carried out by electrical engineers in perhaps their first year of work.

And, during our internship programmes, we should be demonstrating the positive impact on the comfort of real people of ventilation design carried out by graduate mechanical engineers.

Young people want to feel this sense of purpose. We work in an industry that directly correlates to these aims, so we can give them what they want.

Practically, we need to emphasise this relationship in our outreach and recruitment by highlighting the individual impact a person will have – because this, I believe, will excite young people to join this wonderful industry. **CI**



**Don’t go bigger. Go smarter with Jaga heat pump radiators.**

Designed for maximum heating performance at low flow temperatures, our heat pump radiators are smaller, lighter and faster. They cool too...

- ✓ High heat output
- ✓ Light cooling function
- ✓ Dynamic 3-speed fan control
- ✓ Whisper quiet operation
- ✓ Simple push button control or BMS
- ✓ Wide range of models and colours

Visit [jaga.co.uk](http://jaga.co.uk) to see the full range



# GET READY FOR BUILD2PERFORM LIVE 2023

The building services industry's premier event includes, for the first time, the Light2Perform symposium and CABE's Building Environment Live. Alex Smith picks out some highlights from the packed two days of discussions and learning



A packed theatre at last year's CIBSE Build2Perform Live

**T**he eighth CIBSE Build2Perform Live will return to ExCeL London on 5-6 December 2023, with 125 speakers, 100-plus exhibitors, and more than 70 hours of presentations and debates, covering every facet of the building services industry.

For the first time, the event will incorporate Light2Perform, with an extensive programme curated by the Society of Light and Lighting (SLL) and the Lighting Industry Association. Also co-locating with Build2Perform Live is the Chartered Association of Building Engineers' (CABE's) Built Environment LIVE, which has themes of performance, compliance and safety.

A CIBSE-accredited CPD programme will run alongside Build2Perform. Curated by CIBSE Divisions and Special Interest Groups, and the Build2Perform Live advisory

committee, it will feature invited specialist speakers from across the built environment.

Build2Perform's key themes this year are heating for net zero, climate adaptation, electrical services, smart technology, building safety, and health and wellbeing.

### Net zero, safety and overheating

The keynote session on day one will discuss how the UK Net Zero Carbon Buildings Standard will impact environmental design. This will be followed by a session on virtual, augmented and virtual realities, which will delve into artificial intelligence and discuss the benefits and pitfalls of handing building control to the machines.

Representatives of the government and the Building Safety Regulator (BSR) will explain how the Building Safety Act is revolutionising the way buildings are procured, designed and maintained. Building safety is also the

theme of a session organised by the Society of Façade Engineering.

Thermal comfort is key to health and wellbeing, and Build2Perform will feature a session on the latest research and industry developments in assessing overheating in buildings. Speakers include Kevin Lomas, Susie Diamond and Becci Taylor.

On day two, the keynote will cover CIBSE's *TM65: Embodied energy in building services*, and look at TM65 guides specifically for Middle Eastern and North American regions.

Winners of the annual Society of Digital Engineering Awards will also be announced at Build2Perform.

The CIBSE Resilient Cities Group is hosting a seminar on advances in urban digital planning and modelling for climate-resilient and healthy cities, and other sessions will look at indoor air quality and guidance on avoiding mould and damp.

## The perfect combination..... P-Sensor and the CMR Velogrid



VELOGRID

Velocity Averaging Sensor



P-Sensor

CMR are the inventors and manufacturers of both the P-Sensor and the Velogrid. The Velogrids are made to measure to fit any ductsize up to 3m x 3m and the P-Sensor has a keyboard to easily enter : duct height - width - density - magnification factor and the scaling in m/s - m<sup>3</sup>/s - m<sup>3</sup>/h - l/s. It can even work out the Air Change rate. And the BMS gets three linear volume signal outputs of 0..10V 4..20mA and an addressable Modbus rtu bus.

CMR CONTROLS Ltd

22 Repton Court Repton Close  
Basildon Essex SS13 1LN GB  
www.cmr-controls.com

Tel +44 (0) 1268 287222  
Fax +44 (0) 1268 287099  
sales@cmr-controls.com







In the CPD theatre, the CIBSE Lifts Group, with Adam Scott, will present on the whole life carbon of lifts, while Nick Mellor, of the Lift and Escalator Industry Association, will discuss building safety and the evacuation and use of lifts by firefighters.

### Light2Perform

Key themes of Light2Perform include emergency lighting, external lighting, dark skies light pollution, decarbonisation, health and wellbeing, regulation, and sustainability.

The conference will feature the launch of *LG7 Lighting for offices* and *LG14 Control of electric lighting*, and the Young Lighter of the Year competition will be announced.

Light2Perform's technical programme will cover ever-tighter eco-design requirements and the challenge of reducing embodied carbon, and has been organised by leading lighters Bob Bohannon, Sophie Parry and current SLL president Helen Loomes.

The BSR's deputy chief inspector of buildings, Chris Griffin-McTiernan, will give a keynote at Build2Perform Live, and there will be sessions on fire safety, new-build housing quality, building retrofits, and zero carbon building performance.

The event is a fantastic opportunity to network and be on top of all the huge changes happening in building services as we strive for net zero and building safety. The *Journal* hopes to see you there. **CJ**

■ For the full programme and to register for your free place visit [www.build2perform.co.uk](http://www.build2perform.co.uk)

## FEATURED EXHIBITORS

### HAMWORTHY HEATING STAND NUMBER 258

Hamworthy Heating is a trusted British commercial heating manufacturer that provides low carbon heating and hot-water products to suit a wide range of requirements and heat loads.

Founded in 1914 in Poole, Dorset, where its main offices remain today, Hamworthy Heating's range offers low carbon solutions that deliver on comfort, cost, and sustainability.

As well as bringing heat pumps and hydrogen-ready products to market, the Hamworthy Heating range includes more than 90 wall-hung and floor-standing condensing boilers, such as the popular Wessex Modumax model. Also available are more than 40 hot-water products, such as the new Dorchester DR-SG stainless steel condensing water heater range.

The impressive knowledge of its service engineers and sales managers can make a real difference. From help with sizing hot water products to replacing commercial boilers, Hamworthy's team offer a friendly and knowledgeable service.

**Contact:**

**Website:** [hamworthy-heating.com](http://hamworthy-heating.com)

**Email:** [sales@hamworthy-heating.com](mailto:sales@hamworthy-heating.com)

**Telephone:** 01202 662500



### ARMSTRONG FLUID TECHNOLOGY STAND NUMBER 106

Armstrong Fluid Technology is a leading global player in HVAC solutions, designing and manufacturing innovative fluid flow equipment and high-efficiency solutions for a broad range and scale of applications (including, but not limited to, district energy schemes, data centres, fire systems, commercial buildings, hospitals, hotels, retail, and education facilities).

Our expertise is in the integration of fluid dynamics, heat transfer, variable speed, and demand-based controls, integrating mechanical equipment and digital controls in a way that no other company can match. The foundation of our core competencies are demand-based control, digitalisation, fluid flow, and heat transfer, where we are uniquely positioned to combine high-quality hardware, controls intelligence, and related services into fully integrated building energy solutions. These offer optimum lifetime building performance through maximum design, build and operating flexibility, lowest project and operating risks, and lowest installed and life cost.

**Contact:**

**Website:** [www.armstrongfluidtechnology.com](http://www.armstrongfluidtechnology.com)

**Email:** [UKhvacsales@armstrongfluidtechnology.com](mailto:UKhvacsales@armstrongfluidtechnology.com)

**Telephone:** 0161 223 2223



### IDEAL HEATING COMMERCIAL AND ACV STAND NUMBER 206

Working closely together, Ideal Heating Commercial and ACV UK provide total plantroom solutions.

Ideal Heating Commercial is the UK's leading manufacturer of high-efficiency commercial heating solutions. Operating from Hull since 1906, it is one of the few true British manufacturers left in the heating industry. Established in 1922, ACV is a leading specialist in the design, manufacture and distribution of hot-water products. Its products range from water heaters and cylinders to condensing and electric boilers, for commercial and residential heating applications.

Ideal Heating has developed low carbon heating solutions for commercial properties, from hydrogen-ready condensing boilers and commercial heat pumps to heat interface units. ACV specialises in stainless steel and is the home of the Tank-in-Tank concept. It provides a range of electric boilers that includes wall-hung electric boilers, floor-standing heat-only and combination boilers, and a mobile electric boiler for heating and screed drying.

**Contact:**

**Website:** [idealcommercialboilers.com/contact-us](http://idealcommercialboilers.com/contact-us)

**Website:** [www.acv.com/gb/contact](http://www.acv.com/gb/contact)



### BUILD2PERFORM KEY THEMES

- Delivering net zero and adapting to climate
- Hydrogen, heating and heat pumps for net zero
- Electrical services for a zero carbon environment
- Adopting digital tools and smart and secure technologies
- Implementing the building safety reform programme
- Health and wellbeing

# 'DESIGN AND BUILD WILL HAVE TO CHANGE'

The Building Safety Regulator tells CIBSE's golden thread event that design and build contracts in their current state cannot be used for higher-risk buildings. Molly Tooher-Rudd looks at how the procurement route will have to evolve to comply with new regulations

**T**here was an audible sharp intake of breath when Andrew Moore, head of operations for building control, at the UK's new Building Safety Regulator (BSR), addressed CIBSE's recent golden thread building safety conference.

He told delegates that current design and build (D&B) procurement methods for higher-risk buildings (HRBs) in the UK would not be possible under new building safety regulations. 'Design occurring at the same time as construction will not be viable,' he said. 'D&B will have to change.'

The reason for the audience's collective shock is that this form of procurement makes up 58% of contracts in the UK.

The golden thread event was held at The Royal Society, London, shortly before major safety regulations came into force on 1 October (see panel, 'The new building safety regulations'). Among the changes that Moore says will force the industry to rethink the use of D&B is the requirement for a 'dutyholder' to be responsible for overseeing all aspects of building work through a statutory change control process. The dutyholder could be the client, principal contractor, principle designer, or any other designers or contractors.

Under the new rules for HRBs, any design changes must be documented and managed after the building design has been approved for construction by the BSR, at what is known as Gateway 2. (Gateway 1 is the planning application stage, while Gateway 3 is when the BSR approves the building after construction.) Major changes after Gateway 2 need approval by the BSR before they can be made, which

could lead to project delays. Smaller changes deemed 'notifiable' can be carried out, but must be flagged with the BSR.

The process doesn't lend itself to D&B, said Moore: 'Under the new regime, you have to design it and then build it. D&B for HRBs doesn't fit in with the methodology.'

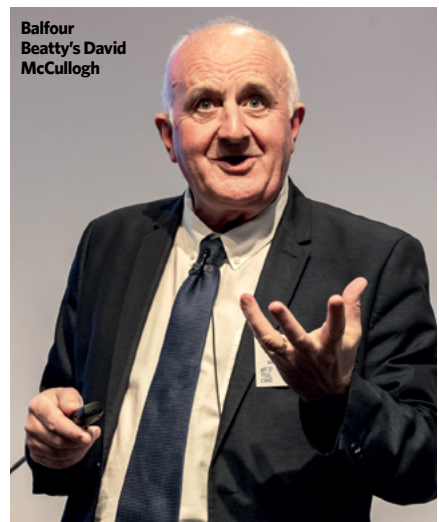
David McCulloch, compliance manager at Balfour Beatty, closely studied the Building Safety Act to ensure his company takes the necessary steps to comply with the new regulations. Speaking at the golden thread event, he said he believed D&B procurement for HRBs is possible under the new building safety regime, but that processes would have to change significantly for contractors to comply.

## Regulatory impact

Before the new regulations came into force on 1 October, a principal designer working on a D&B contract could incorporate additional design information, and the contractor would update the construction plan submitted to building control as required. There was no need for further statutory approval from building control if changes were made.

In her independent review, *Building a safer future*, Dame Judith Hackitt noted that there was 'no over-arching statutory requirements to report or record changes to previously agreed plans, even where they will have a substantial impact on building safety (or wider Building Regulations requirements)'. She said the lack of oversight meant D&B contracts can often result in 'uncontrolled, undocumented, and poorly designed changes being made to the original design intent'.

Dame Judith added that building



Balfour Beatty's David McCulloch

**"Design, design, design: those are my top three priorities, and it's at the heart of this new regime"**  
 – David McCulloch,  
 Balfour Beatty

control bodies were overly reliant on the need to ensure positive, open and ongoing relationships with contractors (or sophisticated interventions at the completion stage). Under the new regime for HRBs, there is no longer the flexibility to make significant changes without having to go back to the BSR for approval.

McCulloch said it was clear that the





Andrew Moore, head of operations for building control, at the BSR

regulatory changes recommended by Dame Judith do not preclude any particular methods of construction. However, they do place an imperative on clients to tighten up processes to ensure a good understanding of how the project is delivered. 'It was the thoroughness of design finalisation and timing that she commented on, not the concept itself,' he added.

McCulloch started his presentation by highlighting the advantages of D&B contracts. 'D&B has become a very attractive method of procurement for clients because it removes the risk of extra costs associated with design errors from the client and places these with the contractor,' he said, adding that contractors like it because it allows buildability to be incorporated into the design solutions – for example, synchronicity of design with their supply chains.

David Stevens FCIBSE, director of estates, facilities and capital development at East London NHS Foundation Trust, agreed, saying: 'D&B makes cost and budget control much clearer, a key factor for public sector or higher education clients.'

### Making D&B work for HRBs

For D&B procurement to be viable for HRBs under the safety regime change, McCulloch said 'minimising, if not completely eliminating, change was essential, as formalised change approval would be expensive and entail time implications'.

'If D&B is to continue to be feasible, all design will need to be done in a timely way, and be much more upfront at Gateway 2,' he

added. 'It is perfectly permissible in the new regulations to have the Gateway 2 information submitted in a phased way, but it is clear that D&B will have to be done in the way it was intended, and not – as has often happened – with work being carried out without design being completed, never mind approved, often dubbed "build and design".'

McCulloch explained that contractors will have to assemble a capable team, ensuring that every member is competent and has a good understanding of their individual responsibility. 'Timely, holistic design approaches should replace isolated, siloed practices,' he said.

Construction should be approached in a similar way, especially where compliance is dependent on several mutually dependent trades, such as drylining, service penetrations and firestopping, added McCulloch. 'Project managers need to shift their focus to manage compliance, not just cost,' he said.

'Poor aspects of D&B, where construction may have started prior to finalisation of designs, will no longer occur,' said Stevens. He believes that the use of two-stage tendering – where a contractor is brought in much earlier – is likely to increase. 'Under the new act, the design for a new HRB must be complete before construction can commence, but mandatory HRB change control procedures are likely to be lengthy and costly. This means getting it right first time is arguably more achievable with a properly procured and early appointed contractor on board,' he said.

Because a D&B team works under a single contract with the project owner, Stevens argued that there is the potential for much better management of the golden thread,



David Stevens, East London NHS Foundation Trust

especially as contractors are ultimately accountable for delivery of the design, construction and handover. 'The less moving parts, the better,' he said.

McCulloch warned that the BSR will be much stricter about design being signed off before building occurs. 'Make sure your design is compliant before you put your spade in the ground. Design, design, design: those are my top three priorities, and it's really at the heart of this new regime.' [C](#)

■ CIBSE's one-day training course on the Building Safety Act provides a comprehensive introduction to the act and the changes it is bringing to working practices. It can be attended remotely or face-to-face, and is worth six CPD hours. [www.cibse.org/training](http://www.cibse.org/training)

### References:

- 1 *Getting closer to your supply chain*, Procurement Trends Survey, Rider Levett Bucknall, March 2023, [bit.ly/CJPTR23](https://bit.ly/CJPTR23)

## REGULATIONS APPLYING TO HIGHER-RISK BUILDINGS

By Hywel Davies HonFCIBSE, technical officer at CIBSE

There are three significant sets of regulations placing new duties on accountable persons for HRBs.

**The Higher-Risk Buildings (Descriptions and Supplementary Provisions) Regulations 2023** determine which buildings will be subject to the new, more stringent, safety regime for HRBs. They do this by completing the definitions of 'higher-risk building' at section 120D of the Building Act 1984 (which is inserted into the 1984 Act by section 31 of the 2022 Act) and in section 65 of the 2022 Act. Following these changes, the 1984 Act now covers design and construction work carried out in respect of an HRB.

**The Building Safety (Registration of Higher-Risk Buildings and Review of Decisions) (England) Regulations 2023** set out the detailed requirements to register HRBs with the Building Safety Regulator. Anyone who is an accountable person for an HRB had until the end of September to register the building.

Once a building is registered, accountable persons must provide key building information for it. **The Higher-Risk Buildings (Key Building Information etc.) (England) Regulations 2023** prescribe the information required.

**Higher-Risk Buildings (Keeping and Provision of Information etc.) (England) Regulations 2023** make provision for what information and documents the principal accountable person and any other accountable person must keep in relation to that HRB. See [bit.ly/CJSafety](https://bit.ly/CJSafety)





A mixed-mode air conditioning strategy will help to minimise operational energy use

# MATERIAL ASSETS

Edenica's new all-electric office building in London is a pilot for the use of material passports. Waterman Building Services' **Mark Terndrup** and **Anastasia Stella** give details of how the scheme has been designed

**T**he ambitious brief for the new Edenica office building was 'to push the boundaries of sustainability'. The design for the 13,000m<sup>2</sup> scheme, located in Fetter Lane in the City of London, has done just that, with a progressive approach to pioneering new sustainability standards for speculative office developments in the capital.

Waterman Building Services – the scheme's building services, structural and sustainability engineers – produced a design for developers BauMont Real Estate Capital and YardNine that minimises operational and embedded carbon. It also promotes the re-use of materials in its construction by pioneering the adoption of material passports.

Designed to be all-electric, Edenica is predicted to use half the operational energy of a Building Regulations minimum-compliant building. It is Bream Outstanding, WiredScore Platinum (see boxout, 'WiredScore certification'), UK

Green Building Council net zero compliant for construction, and is set to be Nabers-rated once occupied.

Waterman was able to push the sustainability boundaries so effectively because the consultant worked closely with Fletcher Priest Architects from the outset.

One of the early decisions was to design the envelope of the 12-storey building (plus basement) so it could accommodate a mixed-mode air conditioning strategy, to help minimise operational energy.

As such, the façade incorporates automated 'hopper' windows at high level on each of the 3.4m-high floor plates. 'When conditions are right, the high-level windows will open automatically, which is a clue to the occupants that the building is in natural vent mode,' says Mark Terndrup, managing director of Waterman Building Services South.

The façade also features mid-level, manually openable windows with an insulated spandrel panel at low-level to improve thermal performance.

Edenica's façade is assembled from precast concrete panels, made using recycled concrete





“An underfloor air distribution system has the least initial quantum of components and is easily adaptable”

‘There isn’t any useful daylight at low level,’ says Terndrup.

He says the decision to allow occupiers to open and close the windows will allow them to feel in control of their immediate environment, which will increase their tolerance of higher internal temperatures.

However, when outside temperatures get too high or too low for natural ventilation, an underfloor air conditioning system has been included to help maintain occupant comfort on the office floors. This was selected for its low whole life embodied carbon and ease of adaptability over the life of the office building, based on studies by Waterman’s sustainability team, which factored in embodied carbon associated with typical air conditioning system fit-out, maintenance and replacement.

‘Simplicity is key to unlocking the challenge of delivering low carbon strategies for M&E; an underfloor air distribution system has the least initial quantum of components and is easily adaptable without the need for extensive physical interventions,’ Terndrup explains. ‘This reduces equipment replacement over a building’s life-cycle.’

The system uses the raised floor void as a supply plenum to deliver a mix of fresh and recirculated air from mini air handling units (AHUs) located in the building’s core. The rate of fresh air is demand-controlled, supplied to the mini-AHUs, via variable air volume boxes, from AHUs hidden in the building’s basement.

A major benefit of the underfloor system is that it allows the thermal mass in the precast concrete planks that form the soffit to remain exposed on the office floors, further moderating temperatures. Retained heat is

**CASTING LIGHT ON WHOLE LIFE CARBON**

‘There is a tendency in the industry to over-specify office lighting, which can have a significant impact on whole life carbon,’ says Terndrup. ‘The CIBSE Lighting Guide LG7 says you only need 200-300 lux in an office where occupants are computer-based using back-lit screens; however, we found that lighting is commonly designed for paper-based tasks at 400-500 lux.’

If lighting is designed based on 200 lux general lighting, plus 100 lux task lighting, for an office that is purely used for screen-based work, the number of lights in an office can be reduced by more than 20%, Terndrup explains.

‘That means 20% fewer lamps to replace, 20% fewer fittings to find a home for in the future. So while a simple reduction in light fittings may have a relatively small initial impact on cutting a building’s embodied carbon, once the reduction in waste from office churn, reduced maintenance and lamp and lamp-fitting replacements are considered, the whole life carbon savings are far more significant.’



WIREScore  
CERTIFICATION

Developed in America in 2013, WiredScore certification assesses the quality and resilience of digital infrastructure in buildings across the globe. It provides landlords and developers with valuable guidance on how to design a best-in-class digitally connected and future-ready building, and how to promote it to prospective occupiers and residents.

Each level, from WiredScore Certified to WiredScore Platinum, proves that your asset goes above and beyond to meet modern expectations of digital connectivity.

WiredScore is a point-based system under which a building can earn up to 100 points, achieving levels from WiredScore Certified to WiredScore Platinum. For an existing building to reach WiredScore Platinum, it must earn at least 90 points.

Points can be earned in a variety of ways, and this is broken down into three main categories - connectivity, infrastructure and readiness.

» removed from the soffit at night by opening the high-level hopper windows.

On the lower floors, where the floor plates are deeper, the natural ventilation solution is less effective. The perimeter underfloor air supply units will turn off when the windows open, but the underfloor system will continue to serve the interior spaces in a solution that Terndrup describes as ‘part natural ventilation, part air conditioning’.

The façade is assembled from precast concrete panels, made using recycled

concrete to minimise embodied energy. It comprises deep window recesses, supplemented by elevation-specific brise soleil to minimise heat gains on the floor plates. Waterman modelled the scheme to assess the shading benefit provided by the adjacent buildings.

‘Often, engineers will say “we’re not going to allow for that because someone might knock the building down”, but our client took a pragmatic approach by not having shading where the building is already shaded.’

Four roof-mounted air source heat pumps provide heating, cooling and domestic hot water (DHW) to a variable flow system. Heating is at a temperature of 45°C flow/40°C return, while chilled water is at 7°C flow/13°C return to maximise heat pump efficiency. Heat pumps are four-pipe heat recovery units, selected to enable heat and coolth to be shared during shoulder seasons. A top-up water source heat pump in the basement elevates the hot water supply temperature to 65°C to heat the basement DHW calorifiers.

Passport to circularity

The building’s prefabricated concrete envelope contains less than half the carbon of a fully glazed or aluminium-clad solution. The architect estimates its design life as 120 years; nevertheless, its fixing system has been designed to enable it to be easily removed or replaced where necessary. »



The brise soleil on Edenica is elevation-specific



The building has high-level automated ‘hopper’ windows and mid-level manually openable windows



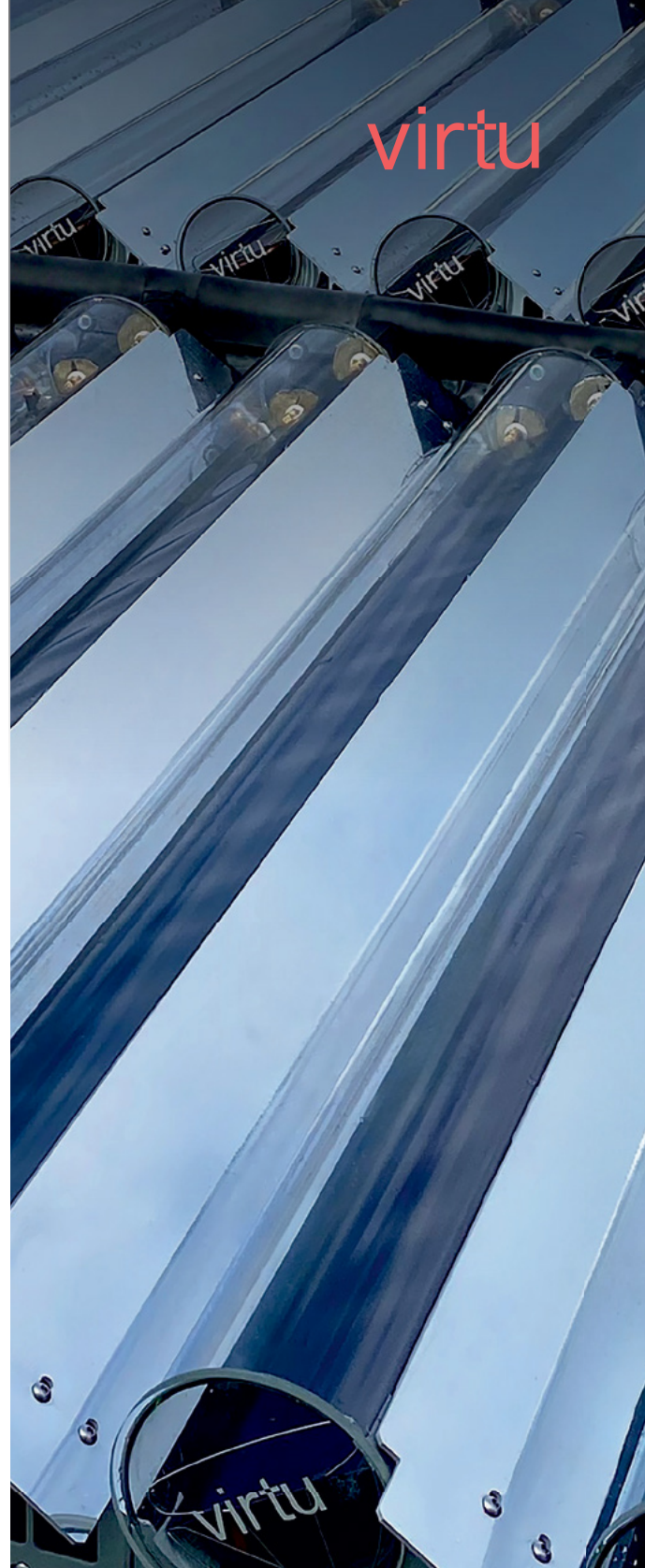
# Virtu is the world's highest energy density solar technology delivering zero carbon heat, affordably.

Virtu<sup>HOT</sup> is the next generation in solar thermal technology heating water from the power of the sun up to 120°C.

Virtu<sup>PVT</sup> is a hybrid solar technology combining solar photovoltaics and solar thermal technology. It performs at optimal efficiency by up to 75°C.

Installing Virtu during retrofit or in new buildings can halve energy bills while future-proofing building standards for low-carbon developments. Virtu works in parallel with heat pumps and other technologies, adding to the aesthetic value of the building.

- > 100% zero carbon energy
- > 4x carbon savings compared to solar PV
- > Energy independence from volatile fossil fuels
- > Increased financial returns
- > Reduce development and project costs
- > Improve building ratings
- > Strengthen brand value and enhance ESG performance



## More energy, less space.

If you want to learn more about how Virtu can help decarbonise heat demand for commercial and industrial businesses, get in touch at [commercial@nakedenergy.com](mailto:commercial@nakedenergy.com)

Naked Energy.

[nakedenergy.com](https://nakedenergy.com)



» The building's steel frame has also been designed for adaptability. The structural grid is based on beams positioned at 4.5m centres, as opposed to the normal 3m centres, which reduces the total mass of steel used, saving on embodied carbon.

An added benefit of this solution, says Terndrup, is that the beams' wider spacing enables additional internal stairs to be incorporated in the future without the need for major structural alterations. 'This might not be an office building in 40 years' time, so we have addressed longevity through incorporating flexibility,' he says. The environmental credentials of the steel frame are further enhanced by it being awarded a materials passport.

Materials passports are digital datasets that contain key information on materials and construction components to facilitate reuse at the end of the building's life. Their implementation is being piloted at Edenica.

Without a defined process to follow, Waterman's sustainability team had to pioneer the methodology for producing digital passports. On Edenica, information included in the passport is obtained from the construction contractors.

'We had to start from scratch, defining what should be included, how to organise the information to form a database, and how to use the passports and update them when changes occur over a building's life,' says Anastasia Stella, sustainability associate at Waterman.

On Edenica, material passports are being created for: the substructure, including piles,

retaining walls and basement floor slab; steel frame; precast concrete floor planks; in situ concrete topping to the planks; external precast concrete panels; and the raised access floor. The digital passport for each element contains details of its geometry and location in the building, along with information on all the materials used in its formation.

When asked whether any of the building services have materials passports Stella says: 'We haven't yet considered passports for the building services; this would be one of the last things we'd tackle because of their complexity.'

Waterman is using the knowledge gained from Edenica to create a protocol for producing and reporting materials passports across the UK. Its sustainability team has collaborated with EU circularity project CIRCuiT to standardise the passports, contents and process, details of which, Stella says, will be published this month and be freely available.

The next step, she adds, is to create a materials passport standard, which could then be linked to the net zero standard.

Over time, Stella says, the intention is to create a database and marketplace for used products and materials. Then, when refurbishment or demolition of a building is planned, the passported materials can be sourced by contractors looking to start work on a new project, reducing the amount of carbon spent manufacturing new materials.

The passport database will be available when the Edenica development is completed in autumn 2024. [C](#)

**"This might not be an office building in 40 years' time, so we have addressed longevity through incorporating flexibility"**



Introducing our electric range. Preparing for a carbon-free future.



### E-Tech W

Wall hung electric sealed system boiler

9-36kW



### E-Tech S

Floor standing electric combination boiler

160-240kW



### E-Tech P

Floor standing heat only electric boiler

57-259kW

Speak to a member of our expert team today to see how we can help with your next project

SCAN ME



[acv.com/gb](https://acv.com/gb)

**ideal**  
HEATING  
COMMERCIAL



# EXPERTS TOGETHER

LOW CARBON HYBRID HEATING SYSTEMS

## COMMERCIAL HEAT PUMPS

**ECOMOD RANGE**  
14kW – 70kW



[idealcommercialheating.com](https://idealcommercialheating.com)



## ELECTRIC BOILERS

**E-TECH RANGE**  
9kW – 259kW



[acv.com/gb](https://acv.com/gb)



Visit us  
at CIBSE  
Build2Perform,  
stand 235

# Our most powerful Exhaust Air Heat Pump yet S735 Exhaust Air Heat Pump



## INTEGRATED SOLUTION

Our compact indoor solution for the provision of heating, hot water, and ventilation.



## NATURAL REFRIGERANT

R290 refrigerant for reduced environmental impact.



## PERFORMANCE

Combining ventilation heat recovery with heat pump technology to deliver high seasonal performance and economic operation.



## SMART VENTILATION

Smart ventilation based on temperature, humidity and CO2 levels with myUplink smart home.



## EXCEPTIONALLY QUIET OPERATION

New design for low noise level, 49dB(A) nominal sound power level

Discover Exhaust Air Heat Pumps at [nibe.co.uk](https://nibe.co.uk)



@NIBEenergy



NIBE (GB)



nibeenergyuk



nibe-energy-systems-limited



**NIBE Pro**



## Heated debate on hydrogen and heat pumps expected at Build2Perform Live



**Event at ExCeL London will feature a wide range of seminars and CPDs**

The industry's foremost heating experts will debate key issues around decarbonisation of commercial HVAC at CIBSE Build2Perform Live on 5-6 December, at ExCeL London.

A session on heat pumps will provide a brief background and overview of the importance of the CIBSE heat pump programme, with an introduction to recently published guidance *AM16 Heat pump installations for multi-unit residential buildings*, and *AM17 Heat pump installations*

for large non-domestic buildings, alongside ongoing work.

Consultant Roger Hitchin will offer an insight into the latest research and policy developments around heat pumps, with a commentary on how this technology has gone from niche to mainstream. He will also discuss the importance of its application in the transition to net zero, and how to get best practice aligned.

In the same session, 'Heat pumps - leading the way from niche to mainstream', Ken Gordon, CEO of the Ground Source Heat Pump Association, will provide a summary of CIBSE *TM51 Ground source heat pumps* (see story below).

There will also be a presentation on hydrogen for home heating and some of the challenges it presents.

On day two, the keynote address will include a discussion on embodied carbon in commercial and logistics buildings, and will feature the CIBSE guidance *TM65: Embodied carbon in building services*.

Later, there will be a session on *TM67 Electrification of buildings for net zero*, which will offer more guidance on installing heat pumps in areas with a constrained electrical grid.

Visit [build2perform.co.uk](http://build2perform.co.uk) for more details about the free-to-attend event.

## Author to provide update on revision of TM51 guide

The lead author of the new version of *TM51 Ground source heat pumps* will be at Build2Perform Live to highlight the major updates to the guide.

Ken Gordon, chief executive officer at the Ground Source Heat Pump Association, will provide an update on the revision of *TM51*, which was last updated in 2013. The document has been completely rewritten, updated and expanded, to provide a holistic approach to the feasibility, design and application of the latest technology.

*TM51* lays out how ground and water source heat pump systems should be designed to achieve maximum efficiency, the lowest carbon emissions, and the optimum occupant comfort. It looks at systems that are centred on a single, large central heat pump, similar to traditional heat network designs, or on multiple, smaller heat pumps connected to a shared ground loop, which are often used in urban areas.

Gordon said: 'TM51 is intended to address the common barriers and misconceptions about heat pumps, providing educational material to make them more accessible and understood by a broader audience.' (See page 65 for a Q&A.)

*TM51* is due to be published in early 2024 and will be available at [CIBSE.com/knowledge](http://CIBSE.com/knowledge)

## Heating CPDs to highlight innovation and best practice

There will be a host of CPDs relating to heating, ventilation and cooling during the two days of CIBSE Build2Perform Live 2023.

Heating CPDs confirmed as *CIBSE Journal* went to press include: 'The role of balancing in efficient system design' by Altecnic; 'Incorporating heat pumps' by Modutherm; 'Low carbon systems: appliances and applications using heat pump technology' by Ideal Heating; 'Factors driving material selection for hot water storage products' by ACV; 'Introduction to heat pumps' by Swegon; and 'An introduction to air to water technology' by Panasonic.

There is also a CPD on the benefits of AHU refurbishment in healthcare facilities, by Daikin, as well as one on controls, including a presentation on internet of things sensors and actuators.

## CIBSE training courses aim to upskill mechanical engineers

CIBSE's training programme features a diverse range of courses, including a number on mechanical engineering that feature cooling, ventilation and heating.

They include: An introduction to mechanical and electrical building services; Heating systems design; Practical controls for HVAC systems; Ventilation design; Air conditioning and cooling systems; and Design for ductwork systems. Training can be face-to-face or online. For a full programme, visit: [www.cibse.org/training](http://www.cibse.org/training)

CIBSE is looking for trainers in all subjects across building services, but there is immediate demand in the following areas: energy assessor - specifically low carbon consultant building design and low carbon consultant building operations; electrical services; and mechanical services.

Trainers must be an expert in their field and be at least an Associate CIBSE member. Applications can be submitted at [bit.ly/CJMay23CN2](http://bit.ly/CJMay23CN2).



## Academies decarbonise with ASHPs

Air source heat pumps (ASHPs) have been installed at three academies in Lincoln, in a bid to reduce annual CO<sub>2</sub> emissions by 227.5 tonnes.

The Priory Federation of Academies Trust partnered with Oakes Energy Services, which commissioned and installed Rehema ASHPs. These will decarbonise the sports centres, which previously used gas boilers to heat their swimming pools. The Public Sector Decarbonisation Scheme, operated by Salix, funded the scheme.

At Witham and LSST academies, two ASHPs supply heat to underfloor heating, radiators, changing rooms, and swimming pool plants. In the first phase of the decarbonisation programme at Lincoln Academy, five ASHPs provide heat for calorifiers and the pool heat exchanger.

Rob Erwood, commercial sales and specification director at Baxi, said: 'The focus on low carbon design is now critical for all public sector buildings, in line with ambitious government decarbonisation targets.'

## Peak performance blended with cost-efficiency

A new ventilation system with heat recovery is aiming to provide superior performance and significant cost savings in the commercial sector. Gilberts Blackpool claims the MFS-HR hybrid ventilation product achieves a 75% heat recovery rate. It complies with industry standards such as BB101 and DFE Output Specification, prevents overheating (TM52 comfort compliant), and maintains a quiet environment (BB93 guidelines), says Gilberts.

MFS-HR operates as a standalone system, using natural air movement and a low energy fan to control temperature and indoor air quality. During colder months, it extracts heat from exhaust air and transfers it to incoming air through an exchanger. Separate chambers eliminate the risk of cross-contamination, ensuring Covid-safe ventilation.

MFS-HR provides both heating and cooling, with the option to integrate a low pressure hot water coil.

## Prefab solutions service launched by Elta Fans

Elta Fans' new prefabricated solutions service is suitable for commercial projects of any size, and is set to help cut installation costs and speed up building projects. Fans and ancillaries – such as acoustic equipment, mounts, panels, flexible connections, and fan controls – can be assembled off site and delivered as a compliant assembly, ready for crane lifting, for a quick, efficient installation.

# CIBSE to verify embodied carbon calculations

## Institution's third-party programme aims to boost trust in the data

CIBSE is to launch a third-party verification programme for embodied carbon calculations in building services components made using the CIBSE TM65 Digital Tool.

Carl Collins, head of digital at CIBSE, said the Institution will be a headquarters for third-party verifiers, who will verify the calculations to an agreed methodology.

'When we soft-launched the TM65 digital tool, many in the industry asked if there was a method to ensure people weren't gaming the system,' Collins said.

'At the same time we were approached by a third-party verification company, asking if we'd like to develop a verification system with them. I said "brilliant, we would love to".'

CIBSE will make sure the verifiers have done their work properly, added Collins, and will issue the verified data in a form that can't be edited.

The verification process will depend on the complexity of the product and the type of analysis that has been done.

In TM65, the analysis is defined as being basic or mid-level. If the manufacturer has done the mid-level analysis, the verifier will also look at the factory energy data and the parts-replacement strategy during the lifetime of the product.

If, for example, it's a fan coil unit that comes with filters that need replacing – and the supplier hasn't mentioned it – it will be questioned by the verifier.

If claims fall outside what is considered normal by the verifiers, CIBSE will ask for more documentation to support the claim.

'Once a product has been verified, a manufacturer can say CIBSE has looked at this, which means there will be more trust in the data,' said Collins.

'I think it's really important for the market, because a lot of people are distrustful of unverified data.'

The verification programme is expected to be launched in 2024.



## Operational and embodied carbon targeted in latest *Journal* podcast

The challenges of decarbonising cooling across the lifetime of a building was the subject of *CIBSE Journal's* latest podcast, sponsored by Daikin.

Four experts discussed the challenges, focusing on reducing operational and embodied carbon. They talked about the importance of training in handling different refrigerants, the need for third-party verification of embodied carbon calculations, and the role of digital twins in managing building data.

The discussion concluded that there was a need to consider occupant comfort and flexibility in building design to reduce the requirement for cooling.

Space cooling accounted for nearly 16% of the global building sector's electricity consumption in 2020, and is expected to triple by 2050.

The guests on the podcast were: Carl Collins, head of digital engineering at CIBSE; Matteo Dall'Ombra, product manager, commercial, at Daikin; Clara Bagenal George, associate, sustainability, at Introba; and Andy Mitchell, sustainability – operations director at Mace.

Listen to the *CIBSE Journal* podcast on Apple, Spotify and SoundCloud.



R290  
NATURAL  
REFRIGERANT

## Decarbonising for a greener future

Natural, sustainable  
and with high efficiency



A++

### ECOi-W AQUA-G BLUE R290 Air to Water Reversible Heat Pump

- R290 has a GWP of only 3
- Capacity range from 50 to 80kW
- Excellent energy efficiency
- Wide operating range
- DHW management
- Very quiet operation
- Multi-systems available with a cascade controller (up to 8 units)
- Perfect for multi-dwelling and commercial applications
- Max. 70°C leaving water temperature

New Aquarea  
L Generation heat pump



AQUAREA

A+++



### A revolution in design, efficiency, connectivity and sustainability

- Aquarea heat pumps provide heating, cooling and hot water for residential and commercial applications (cascade units to boost capacity).
- Engineered with natural refrigerant R290 with GWP 3
- Innovative hydraulic split heat pump, with 75°C water outlet down to -10°C outside, and operation down to -25°C.
- Compact design blends into indoor and outdoor spaces.
- The heat pump's quiet operation brings harmony between technology and the home.
- Smart control. Wi-Fi included for smart control, advanced monitoring and servicing.

For more information or to contact  
one of the team, please scan the  
relevant QR code

ECOi-W  
Information



Aquarea L  
Information



Contact





# DIGGING DEEP FOR HEAT

The integration of minewater into smart cooling and heat networks offers a sustainable energy solution. Researcher **Eshagh Goudarzi** provides an overview of how abandoned mines can play a crucial role in the transition to net zero

**M**inewater is an underused resource that holds significant potential as an energy source and storage solution, with a single mine potentially heating 1,800 buildings. This innovative approach harnesses abandoned mines, with a geothermal solution that can be integrated into smart cooling and heating networks.

Minewater stands ready to serve as a thermal storage powerhouse, accommodating inter-seasonal demand fluctuations. This year, my case study presentation was awarded the ‘Most significant contribution to the art and science of building services engineering’ at the annual CIBSE ASHRAE Technical Symposium. My research expands on a previous feasibility study conducted in Barnsley, Yorkshire, as part of the GreenSCIES project, which examined the integration of heat, power and mobility in a smart local energy system. This involved using waste heat from a glass factory.

During the Industrial Revolution, there was a surge in demand for coal, which reached its peak in 1913, when UK coal extraction reached nearly 290 million tonnes per year. As the years progressed, however, the mines became economically unviable and were subsequently closed. Now, we are left with abandoned mines that can be found below 25% of UK buildings. These have the potential to annually provide nearly 2,200TWh, while the annual demand for heat in the UK is 475TWh.

The worked coal seams within the mines still contain void spaces that have become flooded because of natural water flow. Over time, the water in these void spaces has been heated by the geothermal energy of the surrounding rock formations. As a result, the coal seams offer a sustainable geothermal resource that could be used primarily for heating and cooling buildings.

Figure 1 illustrates the heat recovery concept. The subsurface temperature is relatively constant and increases with depth. In heat recovery mode, high-temperature minewater would be pumped and circulated through a heat exchanger. The heat would then be upgraded by a heat pump to an appropriate temperature for distribution via district heating.

During storage mode, low-temperature water from shallow seams is extracted and circulated through a heat exchanger to absorb waste heat. This heat is then stored in a deeper seam with a higher temperature,



making it suitable for inter-seasonal usage. In this configuration, cold water can serve the purpose of an industrial cooling system.

A feasibility study considering Barnsley demonstrated that it is possible and financially viable to store up to 7MW of heat from glass manufacturing. This is achieved by using the old mine workings to store and recover heat. However continuously storing 7MW of waste heat requires a substantial flowrate and storage volume of water.

Flooded abandoned mines in the Barnsley area are relatively porous compared with untouched underground formations, which presents an excellent opportunity for a high pumping rate. Data from various sources, including maps, historical records and logs, have been analysed to build a subsurface model primarily focused on void-space assessment.

### Data gathering and methodology

To interpret the subsurface conditions, data was gathered from borehole records, historical maps, and archives. Additionally, scans of mine workings, shaft records, pumping records, and local reports were obtained. These records hold valuable information about the mine's history and play a crucial role in planning boreholes. Furthermore, some wells monitored by Barnsley Metropolitan Borough Council have recorded water levels, annual temperatures, and other observations. Reports from local authorities have also contributed to the understanding of interconnectivities and flow expectations.

Integrating all these datasets, using specialised software, allows the creation of a data-based model illustrating the

## “Flooded abandoned mines in the Barnsley area are relatively porous compared with untouched underground formations, which presents an excellent opportunity for a high pumping rate”

subsurface conditions. Initially, ‘BGS Groundhog’ was used to assess the potential of a larger area for the project.

For a more detailed numerical subsurface model and in-depth analysis, we turned to ‘Petrel,’ a widely recognised software application within the fields of petroleum geology and reservoir engineering. This model identifies the most suitable locations for abstraction/injection purposes and establishing quantitative limits on the available void volume for efficient heat storage and recovery.

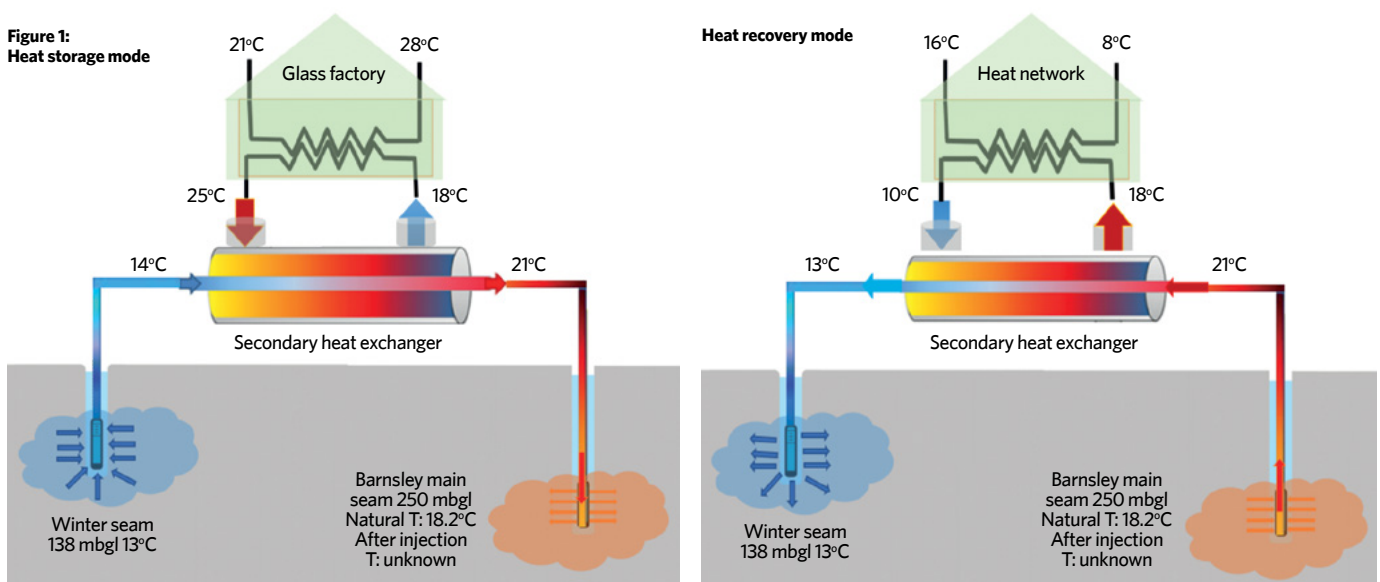
Figure 2 is an example of a borehole record, showing a typical stratigraphic description and summary log dated from 1896. This information was extracted and along with those for 46 other wells, based on a certain comparable standard, provided the data to visualise the subsurface structure and its properties.

The Barnsley heat storage resource has an average seam thickness of 2.5m and the temperature typically exceeds 18°C. The recorded water level has shown that the shallowest flooded seam beneath the area is the Winter seam, at a depth of 138m. The volumes of the mineworking panels in each seam have been calculated by

>>

### THE CHALLENGES ASSOCIATED WITH THE APPLICATION

Despite the abundance of opportunities for the project in Barnsley, several challenges related to data collection, licensing, and the condition of mineworkings must be addressed. Drilling to precise points for injection or abstraction in thin seams poses a considerable challenge. The Winter seam, a source of cold water situated close to the water table, presents a unique concern. The operation of submerged pumps can cause a rapid drop in the initial water level until it stabilises at the static water level. The difference between these levels is known as drawdown. In the case of the Winter seam, there is a risk of the mine drying up if water is abstracted too aggressively. While extracting water from the shallowest seam may, initially, provide a highly efficient abstraction because of the lower pumping cost, it might not be sustainable in the long term if it depletes the water source.



» integrating available data with knowledge of mining techniques, these values have been incorporated into a comprehensive 3D model. The estimated volume of the mined area in the Winter seam, which serves as the cold source, is approximately 13.1 million.m<sup>3</sup>, whereas the Barnsley seam has a significantly larger volume of 92.5 million.m<sup>3</sup>. In heat recovery mode, to achieve the extraction of 5°C of heat during circulation, it is necessary to store around 3.87M.m<sup>3</sup> of water in abandoned mines. So, the minimum void volume required to support a 7MW storage system is 3.87 million.

Estimating the exact void volume in Barnsley's abandoned mines is challenging. Mines worked after 1949 are anticipated to be collapsed because of high-rate excavation using the longwall

technique (where a long wall of coal is extracted in a single continuous operation), while older mines are only partially collapsed. Additionally, roadways and connections may be blocked at certain points. Figure 4 provides an estimate of the required mine volume for a range of likely parameters. It compares the Winter and Barnsley volumes with the required mine volume, ranging from the worst-case scenario to the most probable situation.

The Barnsley seam appears sufficiently large, with workings likely to be connected, and is a strong candidate for providing a warm water source and possible storage. The Winter seam, for balancing the scheme, requires additional volume, which may be met locally by the Beamshaw seam, which is hydraulically connected to the Winter seam, and so doubles the capacity.

A well into the deeper Beamshaw seam offers the advantage that gravity would help draw the water from the Winter to the Beamshaw seam while pumping. The overall system efficiency may drop because of higher pumping costs in deeper seams, but such a scheme could potentially heat 1,800 buildings.

The results obtained will undergo further analysis to quantify the uncertainty ranges associated with this project, significantly reducing the risk of costly test boreholes. Correlating the model results with temperature measurements and flow tests should allow the assessment of the commercial viability of this project and for similar endeavours in Barnsley and beyond.

This effort is important as it assists local authorities in accurately gauging uncertainties around future geothermal energy systems using minewater, a key resource that should be efficiently exploited as the UK transitions to a net zero economy. **CJ**

**ESHAGH GOUDARZI** is a PhD researcher at London South Bank University

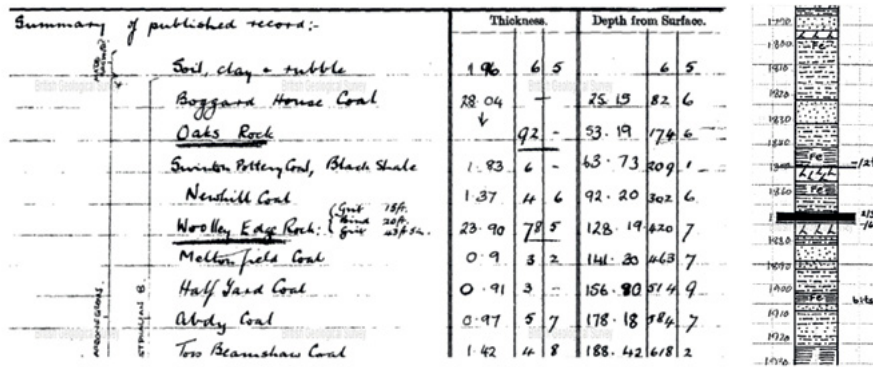


Figure 2: Example of borehole data recorded from 1896

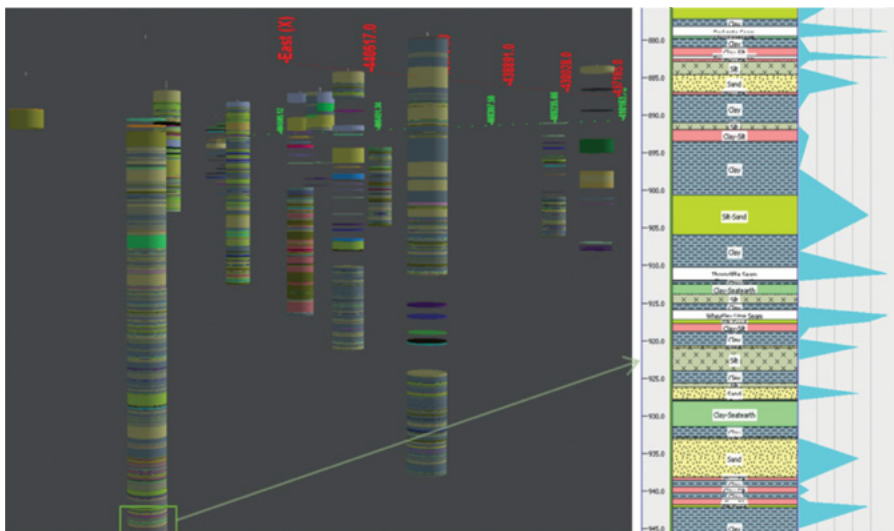


Figure 3: Digitised boreholes. Nature of strata vs depth vs transmissivity

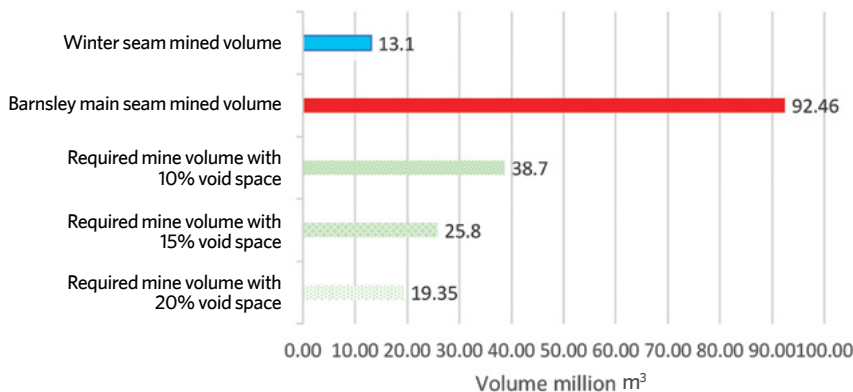


Figure 4: Modelling mine volume for Δθ=50°C

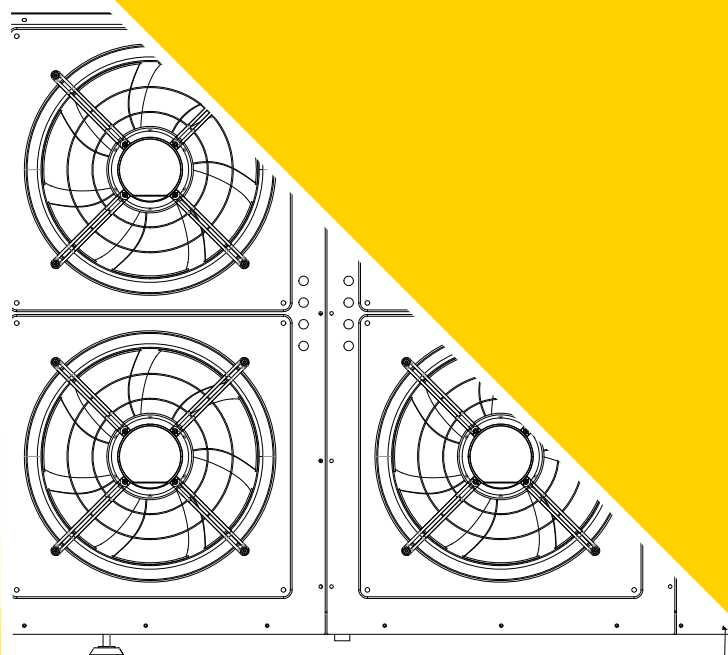


Abandoned mines can be found below 25% of the UK's buildings



# Low carbon solutions? Talk to us.

Optimise the  
energy efficiency  
of your heating  
system with our  
range of heat pumps



Start a conversation with us today  
[remeha.co.uk/morechoice](https://remeha.co.uk/morechoice)

**remeha**

# HANGING WITH THE COOL SET

Controlling the internal environment of the Frieze Los Angeles art fair is essential to ensure Hollywood's celebrity set are not distracted from the serious business of buying art. **Molly Tooher-Rudd** talks to mstep's Sasha Krstanovic about the comfort strategy at the five-day art event

**T**here is always a sense of trepidation on the first day of Frieze Los Angeles, the city's most prestigious art fair. Hundreds of dealers are hoping to persuade Hollywood's rich and famous to buy art from their collections, and day one is when the biggest deals take place.

A successful day selling to art-loving stars such as Jay-Z, Leonardo DiCaprio or Brad Pitt can make a gallery's year.

Keeping sellers and collectors comfortable as they negotiate million-dollar art sales is of paramount importance. Frieze Los Angeles is held in a series of temporary tented structures, so controlling the rarefied environment was a particularly demanding challenge for consulting engineer mstep.

'The galleries can be super-sensitive to environmental conditions,' says founder of mstep Aleksandra Sasha Krstanovic FCIBSE. 'Dealers are trading very expensive collections with delicate people. They don't want to be sitting around getting hot and flustered. We have to be aware of how the temperatures affect the clients and their business.'

To ensure every gallery at Frieze sits within a comfortable temperature band, Krstanovic has a small army of helpers, with handheld infrared thermometers, recording whether spaces are within an acceptable range.

Variations in temperature can be caused by the position of the sun, the proximity of doors and, in some cases, by the biggest celebrities on the planet. 'Last year, we had Beyoncé visit the show, and it was amazing to see the surge of heat move across the space as the crowds followed behind her,' remembers Krstanovic. 'We had to guess where she was going to go next and push the air con up to cool everything down.'

## The history of Frieze

Frieze is one of the contemporary art world's most influential trade fairs, attracting international galleries to exhibit and sell at exhibitions in London, Los Angeles, New York and Seoul. It was set up in London in 2003, before expanding to New York in 2012, Los Angeles in 2019, and Seoul last year.

While the New York and Seoul fairs are held in

permanent exhibition centres, the London and LA shows take place in tented structures. In LA, the tents are set up by temporary events specialist Production Glue. It takes four weeks to build the site, in an operation that, according to Krstanovic, 'requires a remarkable amount of coordination'.

Frieze first came across Krstanovic's desk while she was working at Aecom as the arts and culture lead, and she took the project with her when she founded mstep, an MEP engineering and environmental consultancy in London. 'For someone who has an interest in art, Frieze is just phenomenal,' she says.

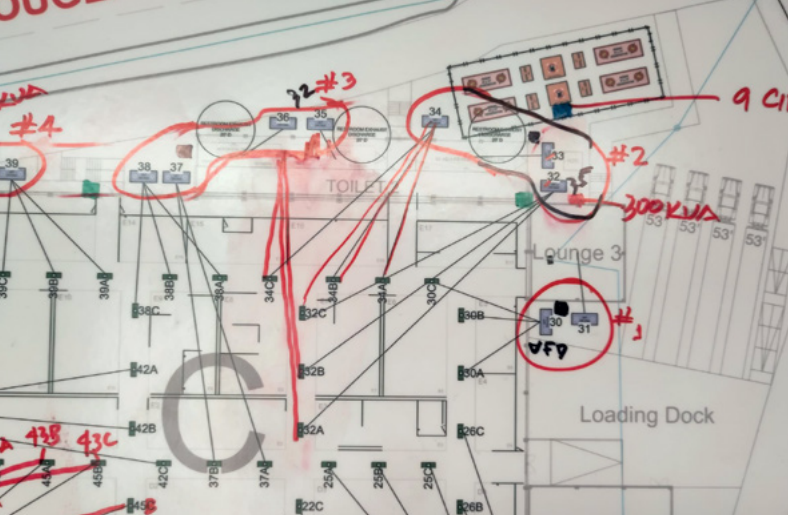
Before signing a contract, Krstanovic says a lot of technical design work was undertaken to remove any risk. 'The main thing was to agree a floating setpoint with Frieze, which we agreed would be 26°C when the external is not outside of its standard extremes – which, in LA, is 33°C. If it goes to 40°C, we are allowed to go higher,' she says.

The decision to allow for a slight temperature fluctuation makes significant savings in cooling loads. 'We don't need to maintain a

**"We don't need to maintain 24°C... the closer we try to control temperatures, the more energy intensive it gets"**







The AHUs each serve three benches eg 30C, 30B and 30A

temperature of 24°C at all times; if it rises to 26°C, let it go to 26°C. The closer we try to control temperatures, the more energy intensive it gets.'

The focus of the Frieze environment is on comfort for visitors, rather than the art. 'Art doesn't like big fluctuations or surprises; at a reasonably steady temperature in a tent for five days, it will be fine – art is not as sensitive as many people believe,' Krstanovic says.

Temperature control in many temporary events features a conventional overhead fabric duct system with air blown downwards. This is the system used at Frieze London, which took place last month. However, this method is not appropriate in more extreme climates, Krstanovic says, as the 12m height of the tents means a large area has to be heated or cooled before the system affects the 2m high space in which the people are located. In LA, the show takes place in the spring, which means conditions typically vary between 32°C during the day and 4°C in the evening.

To enable air to enter the tent at floor level, mstep made use of the



A Frieze bench, with its metal mesh sides, in situ at Frieze Los Angeles (before rectangular grilles were used)

elevated area under the tent structures and designed a system with a network of ducts connected to externally mounted direct expansion air handling units (AHUs) with electric heaters. The air enters the tent through holes cut into the structure's wooden floor, which are then covered by mesh cages that double as benches.

'When we saw the opportunity to use the space underneath to move air through ducts, that's when the idea of the Frieze bench was born,' says Krstanovic. 'We presented Frieze with the idea, and they asked how many we needed and said they'd sort it out.'

The benches are spaced at approximately 3m centres and the air enters at up to 800 litres per second at temperatures of between 13°C and 35°C. It travels upwards from the grille to the underside of the bench, where it is dispersed sideways through the metal mesh, which acts as support for the bench.

Each AHU is connected, via a duct, to three benches, which enables mstep to vary temperatures and airflows according to the requirements of each gallery.

'Temperature can vary across the tent, depending on the flow of the crowd, the position of the sun, and the proximity to the door,' says Krstanovic. 'The controllable zones enhance flexibility. While each AHU can only have one environmental regime, having many units means temperatures can be altered between galleries.'

Mstep has learned to protect galleries from cold draughts that are close to air outlets. 'If there is a gallery in front of the bench, it can be uncomfortable if there is a lot of cool air, and we can include dampers in the supply grilles to moderate flows,' says Krstanovic.

Since the first LA Frieze, the design of the bench has evolved aesthetically to complement the gallery spaces. Extra mesh in the design makes the seats appear

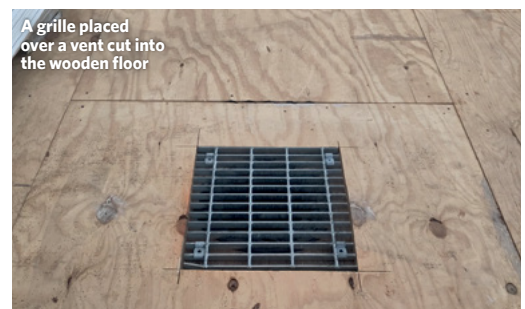


### IN THE FRAME

Originally at LA Frieze, the holes cut into the wooden floors to enable air to enter the tent were round, but these could not be fitted with standard grilles. This meant people had to stand guard over the openings while precious artwork was manoeuvred into position.

Thanks to a suggestion from Production Glue, square openings are now made, which can be fitted with metal grilles during construction, eliminating the need for human guard rails.

The carpet is laid after the artwork has moved into position, to prevent it from being damaged. The final task before the fair opens is to cut holes in the carpet to expose the grilles and then move the benches on top. 'It's a big operation,' says Krstanovic.



A grille placed over a vent cut into the wooden floor

» more transparent and congruous, and they are now collapsible, making them easier to store.

The team at mstep has also come up with a simple, yet incredibly effective, mechanism for regulating the temperature levels within the tent, as Krstanovic explains. 'We walk around the tent with £30 thermometer guns, taking readings. If temperatures are too high or low, we use WhatsApp groups to talk to the system operatives, who manually tweak the systems'.

The biggest swings in temperature are caused by the crowds – generated by mega celebrities or otherwise. 'At the start, people arrive at the same time, bringing in body temperature – that's when we really have to start playing around with the system,' says Krstanovic, who adds that they look at weather forecasts to predict how temperatures in the tent will change.

'It's incredible what you can do with manual predictive controls. Even in London, with this conventional single overhead duct system, it's really successful.

'We've discovered that between 20.5°C and 21.5°C is ideal in London. By measuring and communicating the temperature during the day, our teams keep the tent between this 1.5°C band. You don't need a super-sophisticated system to do it – just people power. Due to the temporary nature of the fairs, human monitoring and control is most effective,' she says. Frieze London also occasionally requires air conditioning – including last month as October was mild.

Teams of six or seven people are on rotation during the day, says Krstanovic. They don't have to be engineers, but they do need to be conscientious about what they are doing, she says. 'The tent's a bit like a sailboat – things go very wrong very quickly. Once temperatures start getting uncomfortable, it's really hard to bring them back. You can't let it go – it's relentless,' she adds.

Krstanovic believes continual monitoring and system optimising should be happening in all buildings. 'Around 90% of all buildings have sufficient hardware to do this. It's all easy, but we need building management assistance to help FM [facilities management] teams to operate the systems correctly,' she says.

'Operational carbon is what we building services



mstep has to be aware of rising temperatures when crowds gather

### FRIEZE LONDON

mstep has just completed working on Frieze London, which took place from 11-15 October. The heating and cooling strategy at the event in Regent's Park is relatively simple compared with the one for LA. The mild conditions in early autumn means a conventional overhead ducting system is used.

In London, the tent needs to be pre-heated before the event opens at 10am. Then, depending on the conditions, the heating is turned off, leaving only the ventilation running, unless cooling is required – which it was last month. When the sun starts to go down, the heating returns as the event continues until early evening.

engineers deal with – it's not glamorous, but that's where the major opportunities are. By monitoring and controlling buildings properly, we can cut energy consumption by 40%.

This will please green-minded celebrities such as DiCaprio and Jane Fonda, who have visited LA Frieze. The 2023 event was deemed a success, with dealers reporting a 'fruitful fair with a contagious energy'. A number of works sold for more than \$1m, with Mark Bradford's painting Shall Rest in Honor There topping the sales list at \$3.5m.

In London last month Damien Hirst sold all 12 of his paintings on show and Tracey Emin sold two paintings with a combined value of over £2m. While buyers snapped up the hottest artists, Krstanovic and her team ensured that everyone was able to appreciate the Frieze fair in optimal environmental conditions. [C](#)

■ **ALEKSANDRA SASHA KRSTANOVIC** FCIBSE is a Member of CIBSE Council





[www.jung-pumps.co.uk](http://www.jung-pumps.co.uk)

**0118 9821 555**





DrainMajor Wastewater Pumping System

Tank Construction Polyethylene

- Every time you specify a DrainMajor Tank, we will donate £5 to the Rainforest Trust.
- Email [davidj@pumptechnology.co.uk](mailto:davidj@pumptechnology.co.uk) so that we can donate on your behalf
- Specify pumping systems with recyclable tanks to support the environment!





# THE COMPLETE PLANT ROOM SOLUTION

Commercial boilers, hot water heaters and air source heat pumps

STRATTON  
MK3 WALL  
HUNG BOILER  
40kW - 150kW



WESSEX MODUMAX  
FLOOR STANDING BOILER  
97kW - 762kW



DORCHESTER DR-SG  
STAINLESS STEEL  
WATER HEATER  
20kW - 120kW



TYNEHAM MONOBLOC  
AIR SOURCE HEAT PUMP  
14kW - 50kW



SCAN  
ME



*There's a Hamworthy for that.*

Scan to speak to your  
expert Area Sales Manager



# Ask ME\*

about  
decarbonising  
heating

*\*Graham Jones,  
Customer Service  
Manager* →



*Ecodan CAHV-R*

As we near the end of gas, contractors are already installing renewable heating in buildings across the UK. With the heat pump market doubling year on year, more and more installers are helping make the switch from traditional gas boilers.

It's now time to join them. Improving energy efficiency and reducing carbon emissions, our heat pumps are at the forefront of this decarbonising transition.

The award-winning **Ecodan CAHV-R Air Source Heat Pump** is your ideal low carbon system for sanitary hot water and space heating. Find out more about the UK's widest range of commercial heat pumps at: [heatpumps.me.uk](https://heatpumps.me.uk)

← *Scan here*





# THE BALANCE OF POWER

Using a boiler to top up peak space heating in heat pump systems can save CO<sub>2</sub> and costs, says Mitsubishi Electric's Chris Newman, who gives examples of two configurations

**D**ecarbonising our existing building stock is both a huge challenge and a huge opportunity. When considering an existing gas-fired heating system that is operating with relatively high water flow temperatures of 70-80°C – compared with today's typical designs of ≤55°C – application of an electrically driven alternative to match those flow temperatures is fairly straightforward.

Managing the impact on operational costs and capital expenditure (capex) is much more complex, however, especially given the disproportionate cost per kWh of gas vs electricity currently, and the relatively high capex cost of technologies, such as heat pumps, compared with fossil-fuel alternatives.

This is where a bivalent approach can become attractive and possibly help bridge some of these gaps. Focusing on using heat pumps as part of this bivalent solution, we can consider two broad types of configuration: bivalent in parallel and bivalent changeover (see Figure 1).

It is typical in the UK for peak space heating capacity (100% load) to only be required for a small number of hours in the year and, therefore, this makes up a relatively small amount of the total kWh of heat energy delivered. This opens up the possibility of deliberately undersizing your heat pump, in comparison with peak load, and only operating it for certain parts of the year, allowing the gas boiler to provide the extra peak capacity or peak flow temperatures when needed. This approach can help reduce upfront costs and plant space requirements.

We know that operating a heat pump at the lowest possible flow temperature and the warmest source temperature will usually deliver the highest efficiency and lowest operating cost. But we must also consider how any heat generated is emitted into the building – this is where the infrastructure of the existing system begins to influence the design approach.

The existing heat emitters (fan coils, air handling unit coils, radiators, and so on) must be assessed to understand their deliverable output capacity at different mean temperatures. This will demonstrate what mean temperature is needed at certain ambient conditions to deliver the required capacity. This is a key piece of information needed to model bivalent parallel and bivalent changeover configurations.

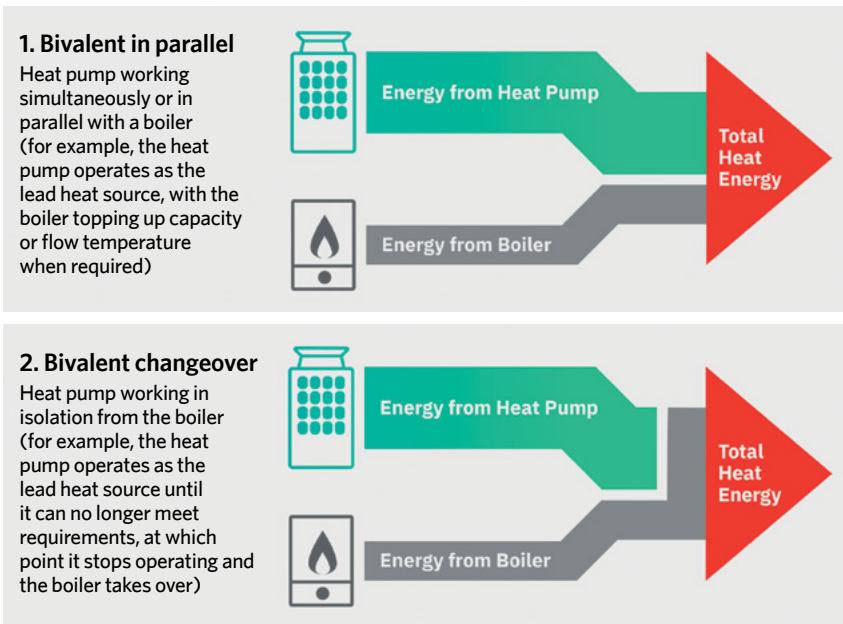


Figure 1: Two main configurations for bivalent heat pump systems

## Bivalent changeover configuration

In a bivalent changeover arrangement, the heat pump is deliberately designed not to deliver the peak flow temperature or capacity of the heating system. It will only operate up to a temperature and capacity chosen to match the heat-emitter capabilities and building load at that changeover point. As a result, the heat pump will operate in isolation from the boiler, providing heat to the existing heat emitters until its maximum flow temperature and capacity are reached. At this point, it will turn off and the boiler will take over, delivering the higher-temperature water and increased capacity required to meet the increasing building load.

This arrangement will deliver a lower proportion of annual space heating load from the heat pump compared with bivalent parallel. However, as the heat pump will not operate at peak design conditions, or be asked to deliver high flow temperatures, it will benefit from increased efficiency, resulting in a lower operating costs.

To maximise the ratio of kWh contribution from the capacity of heat pump provided, our research shows the optimum will be approximately 50-75% of the building peak load, with the maximum flow temperature being approximately 55°C. Depending on overall system design and existing heat-emitter capabilities, other combinations can also deliver good results. See Table 1 for an example >>

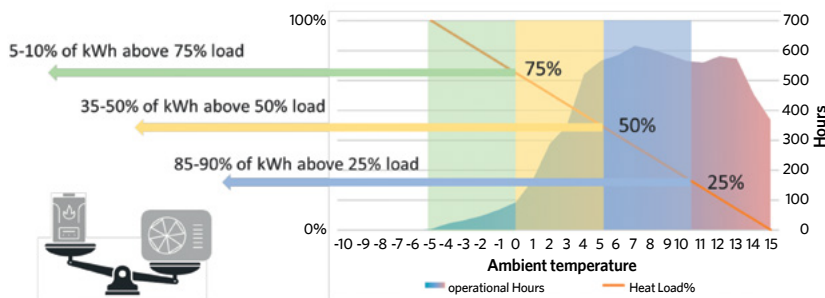


Figure 2: Estimated proportion of delivered kWh above specific load points

**“Special consideration must be given to the choice of heat pump, to ensure it delivers the necessary flow temperature and capacity”**

» of a bivalent changeover arrangement. Examples are modelled on the Mitsubishi CAHV-R450 YA-HPB.

**Bivalent parallel configuration**

This requires the heat pump to be capable of delivering the peak flow temperature of the system, allowing it to work side by side with the boiler at any time of the year. This means the heat pump can be sized to any capacity and, as Figure 4 shows, deliver heat energy on its own when it has the capacity, or in conjunction with the boiler when the load is greater than the heat pump capacity (the example shows a heat pump sized at 50% of peak load). Flow temperature can be fixed or weather-compensated, but the key design principle is that the heat pump is able to deliver the required flow temperature to meet peak heating demands via the existing heat emitters.

This arrangement will deliver a large proportion of annual space heating load from the heat pump, and probably result in the lowest overall carbon emissions. However, operating the heat pump at potentially high flow temperatures and low ambient conditions will reduce its efficiency, so this configuration will probably result in an increased operational cost compared with the gas boiler-only system.

Special consideration must also be given to the choice of heat pump, to ensure it delivers the necessary flow temperature and capacity in all operational conditions. A cascade arrangement or high-temperature natural refrigerant product may be needed to achieve the required flow temperature. The capacity of the heat pump can be freely selected to meet any site constraints of power supply or plant space, and consideration can be given to capital costs to achieve the optimum balance.

To maximise the ratio of kWh contribution from the capacity of heat pump provided, our research shows the optimum capacity in relation to the building peak load is likely to be approximately 25-50%. See Table 2 for an example of a bivalent parallel arrangement. Calculations shown are for comparison purposes only

**Conclusion**

As the two examples show, introducing even a relatively small heat pump into an existing heating system will lead to carbon reductions, but applying that same heat pump capacity in different ways can achieve different outcomes.

Choosing which configuration and capacity of bivalent system is best suited for a specific project depends on budget, existing infrastructure, desired outcome and, most importantly, how it is controlled. **CJ**

**CHRIS NEWMAN** is zero carbon design manager at Mitsubishi Electric

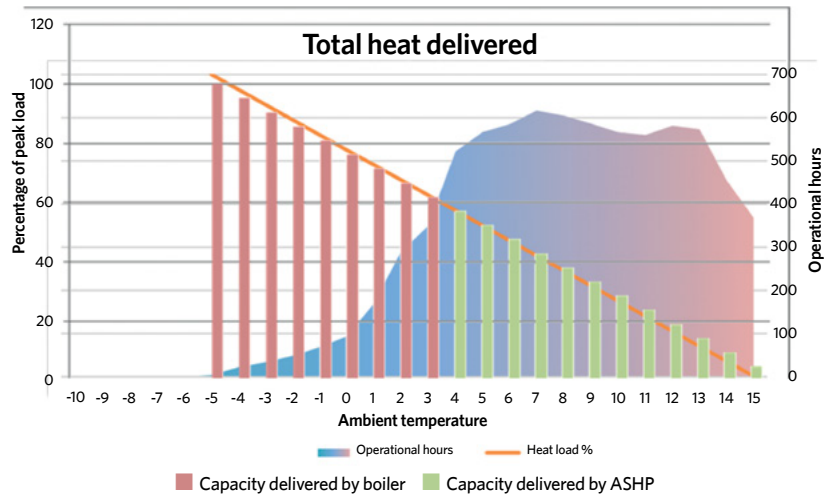


Figure 3: Boiler and air source heat pump (ASHP) operating hours in bivalent changeover configuration

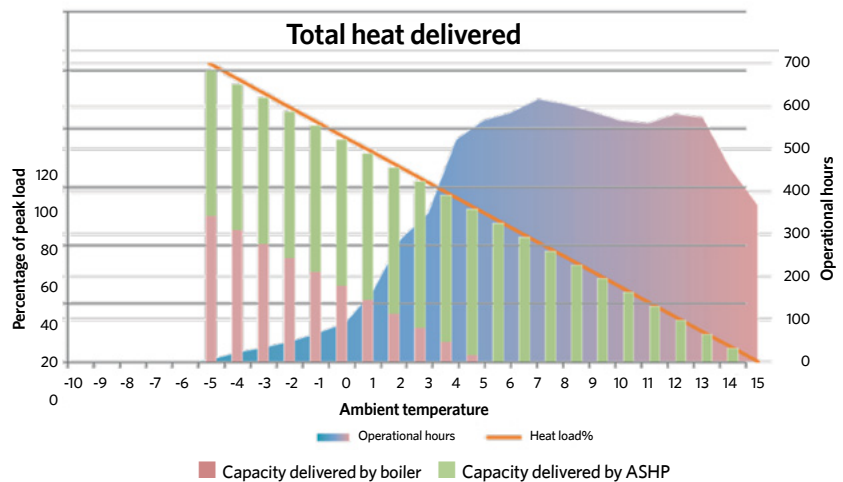


Figure 4: Boiler and ASHP operating hours in bivalent parallel configuration

Table 1: Example of bivalent changeover arrangement

Building peak load	1,000kW	Annual estimated operating cost of gas-only system	£336,487
Capacity of heat pump	500kW	Annual estimated operating cost of bivalent system	£334,445
Heat pump flow temp	55°C	Cost of difference	-£2,042
Gas boiler efficiency	85%	Annual estimated carbon emissions of gas-only system	706,624 kg/CO <sub>2</sub>
Carbon emissions factor (gas)	0.21g/CO <sub>2</sub> /kWh	Annual estimated carbon emissions of bivalent system	468,950 kg/CO <sub>2</sub>
Carbon emissions factor (elec)	0.233g/CO <sub>2</sub> /kWh	Carbon saved vs gas-only	34%
Cost/kWh gas	10p/kWh	Heat share of heat pump	53%
Cost/kWh electricity	30p/kWh		

Table 2: Example of bivalent parallel arrangement

Building peak load	1,000kW	Annual estimated operating cost of gas-only system	£336,487
Capacity of heat pump	500kW	Annual estimated operating cost of bivalent system	£409,787
Heat pump flow temp	*55°C or 70°C	Cost of difference	+£73,299
Gas boiler efficiency	85%	Annual estimated carbon emissions of gas-only system	706,624 kg/CO <sub>2</sub>
Carbon emissions factor (gas)	0.21g/CO <sub>2</sub> /kWh	Annual estimated carbon emissions of bivalent system	359,324 kg/CO <sub>2</sub>
Carbon emissions factor (elec)	0.233g/CO <sub>2</sub> /kWh	Carbon saved vs gas-only	49%
Cost/kWh gas	10p/kWh	Heat share of heat pump	91%
Cost/kWh electricity	30p/kWh		

\*Change to higher flow temp at 50% load point





**Extensive stock!**

**ACROSS OUR RANGE OF HEAT PUMPS  
WITH IMMEDIATE DISPATCH AVAILABLE**



**Check our  
current stocks**



**Need more information about a Lochinvar solution?  
Visit [lochinvar.ltd.uk](http://lochinvar.ltd.uk) or call us on 01295 269981**



[info@lochinvar.ltd.uk](mailto:info@lochinvar.ltd.uk)  
[lochinvar.ltd.uk](http://lochinvar.ltd.uk)

# UltraGas<sup>®</sup> 2

Highly efficient condensing boiler



Ready for 20% Hydrogen blend and will be certified for 100% Hydrogen

Cost-effective operation

Secure investment

Compact transport and installation dimensions

hoval.co.uk



**Hoval**

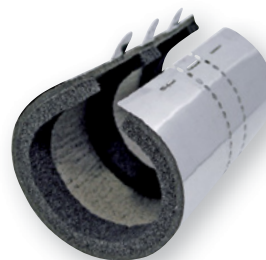
## 3 in 1 fire, smoke and noise barrier



### Walraven Pacifyre<sup>®</sup> MK II Fire Sleeve

Our unique single component fire sleeve provides an ETA certified fire and smoke seal for un-insulated plastic pipes. It comprises of a layer of intumescent, sound insulating foam strips and a metal outer cover. The benefits include:

- Only one required per aperture
- No fixings required, simply seal into place
- Certified noise insulation
- Allows the pipe to expand and contract
- ETA certified and CE marked



To find out more search fire sleeve on our website [walraven.com/en/](http://walraven.com/en/)

walraven.com

**walraven**





Service isolation depicted above must allow for thermal movement and structural response

# SOUND ADVICE

Noise and vibration from HVAC systems such as large heat pumps can have a huge impact on occupant comfort. KP Acoustics Group's Kyriakos Papanagiotou and Mason UK's Adam Fox say CIBSE's Guide B4, and early engagement with acoustic specialists, will give peace of mind

**A** staggering 450,000 complaints were made to councils across the UK in 2022<sup>1</sup> because of noise-related disturbances in residential and other settings – an increase of 155.5% from 2020.

Unlike our vision, which operates in a limited range, our hearing covers a broader spectrum of 10-octave bands, making us more vulnerable to unwanted noise.

With our brain's auditory responses effectively never switching off, it can become almost impossible for us to adapt to the hum of building services equipment, a noisy workplace, or the rumble of a passing freight train, for example.

Despite the glaring impacts of neglecting acoustic considerations in building design, noise and vibration control within the built environment are still all-too-commonly an afterthought. One example is the installation of large heat pumps for heat networks or individual buildings, often replacing existing gas-fired boilers or CHPs (see panel, on page 48). If noise and vibration is not controlled in these installations, there is a danger that areas close to the plantroom

could become unusable because of the disturbance to occupants.

CIBSE's Guide B4, published in 2016, provides an in-depth guide to noise and vibration control for building services systems. It includes information and best practice solutions for noise and vibration control ([bit.ly/CJB42016](https://bit.ly/CJB42016)), and complements other guides in the series (B0 to B3) that cover heating, ventilation and ductwork, air conditioning, and refrigeration. The B4 Guide also aims to counter external sources of noise.

## Consequences of excess noise and vibration

A lack of sufficient noise control of building services equipment can lead to disturbance to building occupants and neighbouring properties, and a lack of compliance with planning requirements – leading to health issues, work disturbance, complaints and, ultimately, enforcement actions against the project.

Limited vibration control can result in excessive levels of vibration being transferred into a building structure, which

is a major issue for sensitive manufacturing and scientific facilities. In extreme cases, this could be felt as tactile vibration, but, more commonly, the issue materialises as regenerated noise. Introducing noise and vibration control retrospectively is more difficult and expensive than incorporating it in the initial design.

To ensure that system designs are not blighted by noise or vibration, early engagement with acoustic consultancy following Guide B4's robust guidelines is recommended. It will help designers reduce costs by avoiding common pitfalls and mistakes that may result in expensive rectifications, and reduce future upgrades or repairs necessary to combat noise and vibration problems for the end user.

The emergence of multifunctional spaces and the need to decarbonise are creating more complexity in buildings, making an integrated approach to noise and vibration increasingly important.

There is a growing trend for structures to become more lightweight to reduce carbon and limit the cost of materials. The downside is that lightweight structures carry noise and vibration more effectively, increasing the need for considered acoustics, noise and vibration control.

From the incorporation of office spaces and gym facilities to cinemas and restaurants, multifunctional spaces in



“Introducing noise and vibration control retrospectively is more difficult and expensive than incorporating it in the initial design”

» residential and commercial developments are becoming ever more complex. Catering to the various needs of the end user requires careful acoustic planning in the early stages, to ensure optimal sound quality and minimal disturbances between distinct functions and building services. The increased focus on health and wellbeing in buildings is another reason noise and vibration should be considered at an early stage, alongside other environmental factors such as indoor air quality and temperature control. A good acoustic strategy will contribute to a better quality of life for the end users.

Acoustic consultancy is a unique, yet vital, part of the design process. Understanding how building materials and services equipment interact with each other and the surrounding environment is vital to the successful and sustainable functioning of the building. Early engagement with noise and vibration strategies using CIBSE’s B4 Guide will create better holistic building designs. **CJ**

**KYRIAKOS PAPANAGIOTOU** is founder and director of KP Acoustics Group, and **ADAM FOX** is director at Mason UK  
 ■ CIBSE Guide B4 is available on the Knowledge Portal [www.cibse.org/knowledge](http://www.cibse.org/knowledge)

**References:**

1 Noise complaint research, Churchill Insurance, 2022 [bit.ly/3Qoh1Em](https://bit.ly/3Qoh1Em)

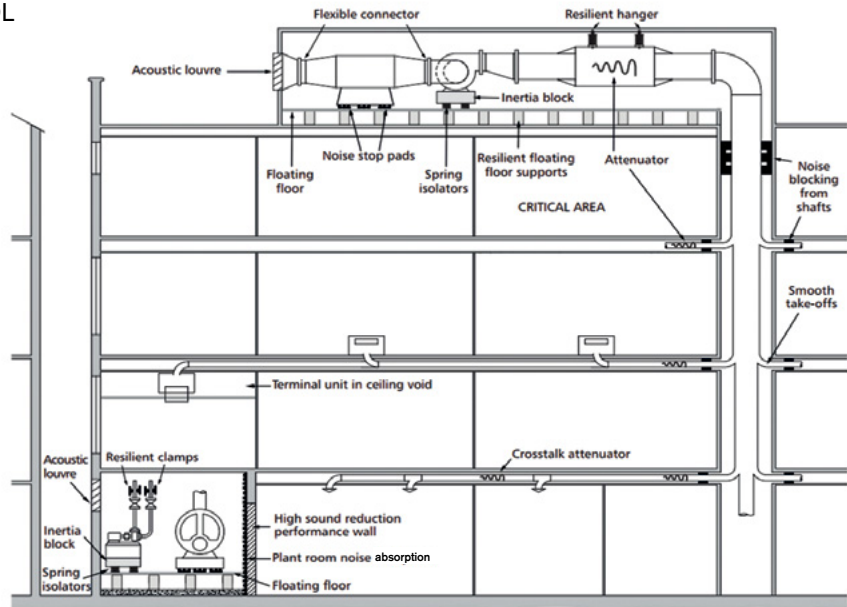
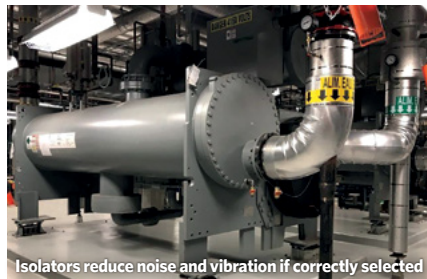
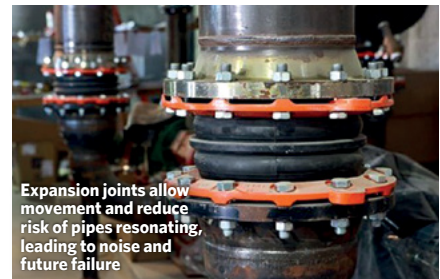


Figure 4.3 from the B4 guide shows typical noise transmission paths and treatment methods



Isolators reduce noise and vibration if correctly selected



Expansion joints allow movement and reduce risk of pipes resonating, leading to noise and future failure

**THE CONSEQUENCES OF NEGLECTING ACOUSTICS**

The neglect of acoustic considerations in building design can have severe consequences for building occupants. In one recent project, an appointed MEP contractor failed to recognise the need for any acoustic components within a building’s plantroom. It is unclear whether the contractor chose to omit acoustic measures despite the existence of an acoustic report, or whether a report was done at all because of a disregard or lack of knowledge of the indispensable CIBSE Guide B4.

Adding to the complexity, the heat pump supplier provided no guidance or ongoing support regarding potential noise and vibration, making the issue more difficult to rectify. The setting now finds itself unable to fully use vital spaces due to excessive noise and vibration. The quest to accommodate anti-vibration (AV) components, and the additional costs associated with retrofitting the heat pumps, only exacerbate the problem.

If AV mounts are not designed in at the start, then often the equipment is simply sitting on the floor or bolted straight to ceilings or walls. The project serves as a reminder of the issues that can result from not addressing acoustics in design. It spotlights the importance of educating peers on best-practice acoustic considerations and solutions to build a holistic approach to building design.

**Flexible and Efficient Nozzle Diffusers**



- Stable and defined air distribution through set nozzle patterns
- Maximum induction, utilising the Coanda effect
- Quick mixture enabling adaptation to changing room conditions
- Adaptable and renovation-friendly via nozzle adjustment



To learn more, visit [www.swegon.com/uk/nozzles](http://www.swegon.com/uk/nozzles)



# ecobat

## BATTERY



### Your ideal Residential BESS

Maximise the productivity of your solar panels, save money and work towards energy independence with Pylontech BESS.

Ecobat Battery can offer extensive stocks, technical support and a great service.

[VISIT US AT ECOBATBATTERY.COM](http://VISIT US AT ECOBATBATTERY.COM)



Scan to visit our site

Ecobat Battery, 36a Vanguard Way, Battlefield Enterprise Park, Shrewsbury, SY1 3TG, UK | T: +44 (0)1743 218500 | [is.info@ecobat.com](mailto:is.info@ecobat.com)

## THE START OF A NEW ERA.



For more than 150 years, innovations have been our driving force – and we are proving this once again with a completely new KSB Eta! The world's best-selling standardised water pump, fully updated and perfectly equipped for the future thanks to optimised planning certainty and maximum sustainability.

Find out more at [www.ksb.co.uk](http://www.ksb.co.uk) - 01509 231872 - [sales@ksb.com](mailto:sales@ksb.com)

► People. Passion. Performance.





# Renew Your Membership Now

Your membership fees are due on or before 1 January 2024

Thank you for being part of the CIBSE community this year and helping us shape the future of the industry. We look forward to welcoming you in 2024.



Pay online today at  
[CIBSE.ORG/MYCIBSE](https://CIBSE.ORG/MYCIBSE)  
or call +44(0)20 8772 3650



Sign in to your MYCIBSE account today and pay





# SIZING UP THE BENEFITS: OVERSIZED THERMAL STORAGE IN HEAT NETWORKS

Oversized thermal stores in heat networks could cut electric boiler capacity by up to 30%, says FairHeat's **Jake Adamson**, who looks at data from existing heat networks and the potential for thermal stores

**T**he UK has set ambitious – but necessary – carbon-reduction targets, and heat networks are one solution for achieving these goals. These networks are transitioning from gas-fired to electrically powered heat sources, which means using heat pumps and electric boilers as primary sources of heat in a hybrid generation arrangement.

But how do we make sure these networks deliver low carbon heat efficiently? My latest research, presented at the FairHeat Annual conference and selected to feature in the CIBSE Technical Symposium 2023, provides valuable insight into this very question.

A frequent topic in design meetings with clients was the large anticipated electrical capacities required on site, and the developer expenditure on upgrades to the local grid to accommodate this.

I saw this as an area to explore and see if we could start to cut these costs through reductions to the total electric capacity, while maintaining network performances.

The FairHeat Graduate Scheme gave me the resources and support I needed to conduct this research, which not only enhances FairHeat's knowledge base and practices, but is also shared with the wider industry for everyone's benefit.

In the past, we have ventured into predictive



A thermal storage system in a district heating energy centre

hourly models to select heat pump and thermal storage sizes. However, the purpose of the research was to use operational heat network data to assess how the size of thermal storage would have impacted the required boiler capacity during the peak months: typically November to March.

The findings showed that by increasing and oversizing the thermal storage volume, it is possible that marginal reductions in electric boiler capacity, in the region of 15-30%, could start to be considered. This could result in capital cost savings for developers – but it also poses a risk that must be mitigated.

To explain, heat pumps have relatively high capital costs, so it's optimal to maximise the thermal storage volume to minimise the required heat pump size for the majority of heat networks. This allows the heat pump to deliver a target annual heat fraction, with electric boilers used to meet peak demand.

Previously, it was acceptable to run the heat pumps to target 80% of the annual heat fraction when topped up by gas boilers. With the large running costs of electric boilers, however, supplying 20% of the heat fraction with these boilers is not achievable while maintaining a fair cost of heat. These days, we typically have to target a 95% heat fraction from the heat pump when topped up by electric boilers to maintain a fair cost to the end user.

The data from existing heat networks on residential schemes has provided a greater understanding of the heat-demand profile of the



» heating and hot water demands these networks serve. This data has previously been used to inform and optimise the sizing approach for the heat network distribution pipework and peaking plant, which, historically, was oversized significantly.

For example, in Figure 1, the morning peak demand is seen to last almost two hours, and remains with a moderate demand for the rest of the day. Historic designs have sized the thermal storage and allowed for far shorter peak demand durations.

Data was acquired from four operational heat networks to use throughout my assessment. In most cases, data from multiple years was available, which could allow us to assess the variation between demand profiles on a colder vs hotter year, and, ultimately, how large our electric boiler would have needed to be.

Initially, I analysed how big the boiler would need to be if all the thermal stores were allocated to the heat pump – that is, they fully empty before enabling the boilers. In reality, however, a sensible control strategy, allowing the boilers to enable before the thermal store fully discharged, would be applied. So, I used this control strategy as the main backbone of my research.

My analysis of operational heat meter data indicates that new residential developments installing a heat network with a hybrid-generation approach of a heat pump and electric boiler may be able to consider small reductions in the electric boiler capacity if an oversized thermal store is used. Figure 2 shows how significant the reductions could have been for the various datasets.

However, designers must approach any undersizing of peaking plant with caution. Take Site A, for example (Figure 2). The A1 dataset (2019-20) says we wouldn't have needed a boiler at all during that winter with a 22m<sup>3</sup> thermal store. However, the A2 dataset (2021-22) indicates that we would have still needed significant boiler capacity to meet the large demands. The year-on-year and site-on-site variation is highlighting the risks with undersizing electric boilers.

If future designs start to allow for oversized thermal stores, that provides us with additional benefits and opportunities. These include maximising generation hours during periods of low energy costs (subject to variable tariffs), or targeting our heat pump run hours when the coefficient of performance can be maximised, which, ultimately, allows for greater flexibility in the way we can operate energy centres.

Although the findings show a significant reduction in electric boiler capacity, there is still substantial variation within the data. Further assessments are required on a larger number of heat networks before any definitive

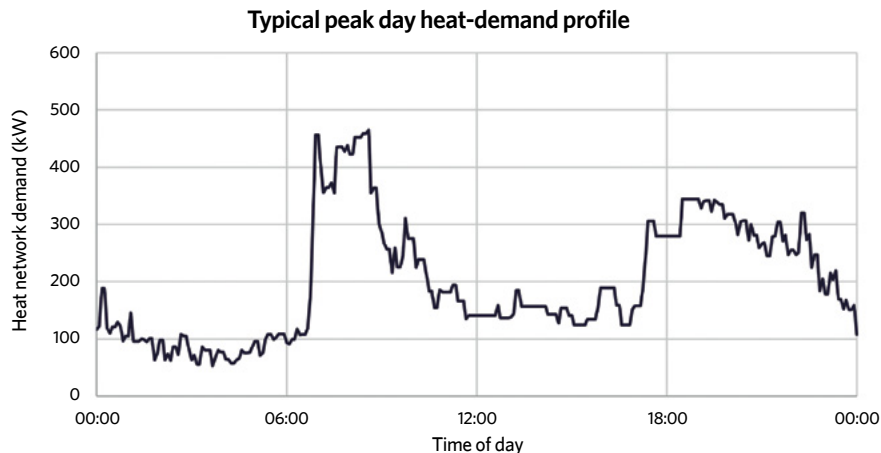


Figure 1: The morning peak heat demand lasts almost two hours, with moderate demand for the rest of the day

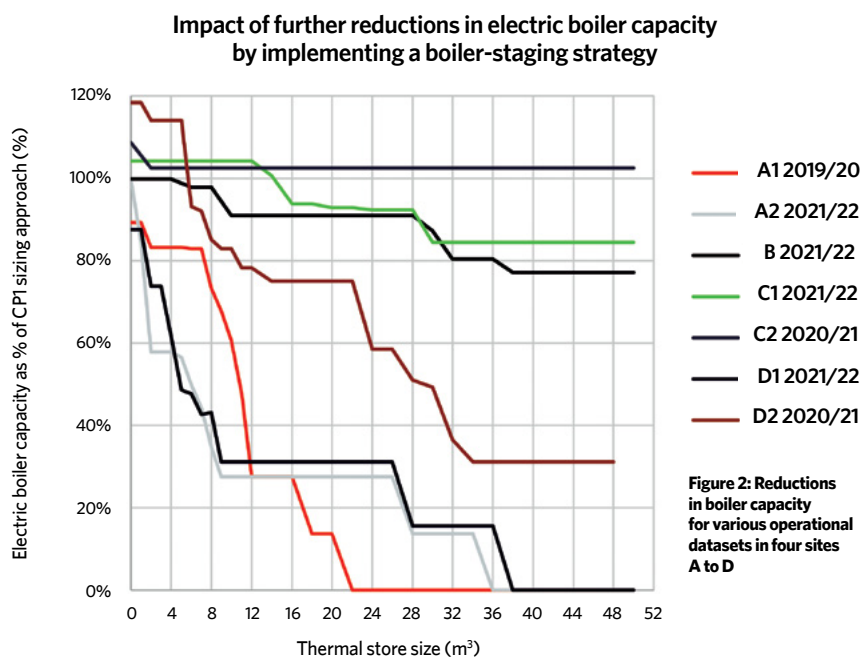


Figure 2: Reductions in boiler capacity for various operational datasets in four sites A to D

guidance could be provided regarding reducing the boiler size.

We may now be thinking about our run costs, and what happens to these if we prematurely enable the boilers, instead of emptying the thermal stores completely. Well, a case study on one of my datasets showed that the premature enabling, or 'staging', increased the annual energy consumption by around 1.05MWh. This may seem a lot. If we take the electricity price to be 40p/kWh, this equates to about £1.45 per dwelling every year. In my opinion, this seems worth it in the interest of heat-supply security, especially considering the significant capital cost reductions we could achieve in the beginning.

The transition to low carbon heat sources is an important step towards achieving the UK's carbon-reduction targets. By oversizing the thermal storage volume and using a hybrid-generation approach of heat pumps and electric boilers, it is possible to reduce the electric boiler capacity and deliver low carbon heat efficiently.

It's important to approach any reduction in boiler size with caution, however. I would like to see more collaboration with industry-wide groups – using developers' and operators' data – to inform future standards on suitable and optimal sizing, and issue a design guide for the use of data when considering boiler-capacity reductions. [CJ](#)

■ **JAKE ADAMSON** is a graduate engineer at FairHeat

■ The research was selected to feature and be presented at the CIBSE Technical Symposium 2023. Read the full research paper, visit [fairheat.com/research-writing](https://fairheat.com/research-writing)





# Trane Heating. Maximum Comfort. Minimum Impact.

**The world is our building.  
We're all in it together.**

**t** 08457 165 162  
**e** [customer.care@trane.com](mailto:customer.care@trane.com)  
**www.trane.co.uk**



# LIFTING THE LID

Research has shown that the surge in use of toilets during intervals at large-scale events leads to an increased risk of virus transmission. Analysis of CO<sub>2</sub> levels at three venues enabled researchers to understand the issue and suggest how to flush out the problem



This is a summary of conference paper *Measurement of ventilation effectiveness and indoor air quality in toilets at mass gathering events* presented at the AIVC Conference in Copenhagen, Denmark

The authors are: **Ben Roberts** and **Malcolm Cook**, Loughborough University; **Filipa Adzic**, **Liora Malki-Epshtein** and **Chris Iddon**, Department of Civil, Environmental and Geomatic Engineering at UCL; **E. Abigail Hathway**, Department of Civil and Structural Engineering University of Sheffield; and **Benjamin Jones**, the Department of Architecture and Built Environment at University of Nottingham

**A**t the height of the Covid pandemic, the UK government commissioned research on the potential for Covid transmission in sports arenas and other venues attracting large crowds. The studies, carried out in 2021 as part of the Events Research Programme, aimed to establish whether it was safe to lift restrictions at mass-gathering events.

Ventilation and air quality was monitored at Wembley Stadium in London, the Crucible Theatre in Sheffield, and the O2 Arena in London, including bars, arrival/departure areas and toilets. Researchers measured the CO<sub>2</sub> concentration as a proxy for ventilation effectiveness.

Toilets (sanitary accommodation) were identified as an area of potential high risk for the transmission of airborne pathogens<sup>1</sup>, because they are densely and continuously occupied for short

durations throughout events, such as theatre intervals, half-time at sports matches or just after the event finishes. This increases the risk of both short-range and long-range airborne transmission<sup>2</sup>.

Results showed that while the average air quality in toilets was good at most events, there were peaks in CO<sub>2</sub> concentration of up to 3,431ppm when occupancy was presumed high. This indicates that the risk of exposure to exhaled breath, which may contain virus-laden aerosols, is higher in toilets (although occupancy is much lower).

Person-to-person transmission of pathogens is compounded in toilets by faecal particles entering the air by flushing toilets (Best *et al*, 2012; Cai *et al*, 2022; Knowlton *et al*, 2018). A possible faecal-oral SARS-CoV-2 transmission route has been identified (Guo *et al*, 2021) leading to toilets being considered a contact hub for community transmission of SARS-CoV-2 (Dancer *et al*, 2021).

Ventilation that introduces uncontaminated air into a space is an important mechanism to reduce long-range transmission of airborne pathogens, but in transiently occupied spaces the ventilation rates may not be adequate to introduce enough uncontaminated air during the brief period of dense occupancy to dilute or remove airborne pathogens (Dancer *et al*, 2021).

The aim of the work reported in this paper was to measure the ventilation effectiveness of outdoor air in toilets at mass gatherings.

## The research

The concentration of CO<sub>2</sub> in the indoor air was measured in 11 toilets at three different venues at 58 live events (Table 1).

A snooker match at the Crucible Theatre and a football fixture at Wembley Stadium were played in two halves. This meant there were three periods when toilets were densely occupied – pre-event, mid-event interval, and post-event – although attendees were able to occupy the toilet at any time during the event.

The Brit Awards event at the O2 Arena



was televised, with frequent advertisement breaks of up to 15 minutes when presenters and performers were not on stage. It was at these times that people were most likely to leave the auditorium to use the toilets, which were all mechanically ventilated.

CO<sub>2</sub> concentration was measured at two-minute intervals using non-dispersive infrared sensors (400-5,000ppm; ±30ppm) (Malki-Epshtein *et al*, 2023). The sensors (typically one or two in each toilet) were placed on walls at 1.6m to 2.3m above the floor, and away from vents, doors, or windows.

CO<sub>2</sub> concentrations are of interest because elevations above typical ambient levels (420-500ppm) indicate exposure to exhaled breath, in the absence of other sources.

The higher the concentration of CO<sub>2</sub> above typical ambient levels, the higher proportion of indoor air that has been exhaled by the occupants of the space. CO<sub>2</sub> concentration alone does not indicate a risk of transmission of airborne pathogens (Iddon *et al*, 2022; Jones *et al*, 2021), but it does allow for the rapid assessment of

KEY RECOMMENDATIONS

1. Increase the ventilation rates or the room volume in toilets that are expected to be most frequently visited.
2. Increase the number of intervals, or their length, where possible, to spread out the occupancy of toilets over a longer period.
3. Increase the number of toilets available, to reduce crowding, and group them in places of high occupant density.
4. Change the admittance gender for some toilets if there is a predominantly male or female audience at a particular event.
5. Consider where supply air to toilets is being drawn from, and avoid doing this from densely occupied adjacent spaces.



ventilation effectiveness relative to occupancy levels.

Measurement of CO<sub>2</sub> concentration, therefore, indicates the amount of ventilation of outdoor air being received in a space relative to the occupancy levels.

Air quality classifications were used to classify each toilet by the measured mean average and maximum CO<sub>2</sub> concentration during each event. Average CO<sub>2</sub> concentration was both the temporal and spatial average, whereas maximum CO<sub>2</sub> was the single point in time with the highest CO<sub>2</sub> concentration measured at one particular sensor location in the space.

Each space was assigned a band, from Band A (high ventilation relative to the occupancy) to Band G (low ventilation relative to the occupancy).



# REDEFINING WHOLE HOUSE VENTILATION....



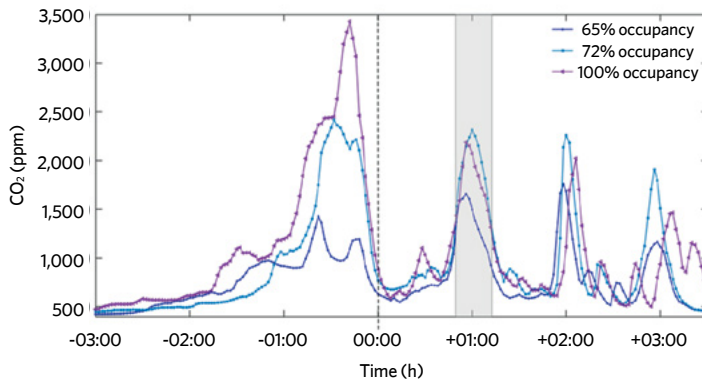
Titon's MVHR HRV Q Plus range just got bigger (the size hasn't though)

## INTRODUCING THE NEW HRV4 & HRV4.25 Q PLUS

- Airflow up to 158 l/s (568 m<sup>3</sup>/h) at 100 Pa
- Low Specific Fan Power; down to 0.38 W/l/s
- Highly efficient heat exchanger; up to 91%
- 600mm (w) x 602mm (h) x 477mm (d)
- Left or Right Hand on site configuration
- Full MODBUS and WiFi connectivity

TITON.COM/BIGLITTLEMVHR





**Figure 1:** Measured CO<sub>2</sub> concentration time series profile in six toilets during football matches at Wembley Stadium showing a high-occupancy event (65 to 100%) male toilet. The dashed vertical line indicates the football match kick-off time, and the shaded region is the half-time period.

» **Results**

Analysing the average CO<sub>2</sub> concentration showed that the majority of toilets (96%) were in air quality bands A and B (400-800ppm) with the remainder (4%) in bands C and D (800-1,200ppm). For maximum CO<sub>2</sub> concentrations, however, air quality bands in toilets were in bands A and B for fewer events (76%), and while some toilets in some events were classified as Band E, Band F, and Band G (more than 1,200ppm), they were relatively small in number (5% of events). This indicates that ventilation was generally sufficient given the occupancy levels in most toilets.

A higher proportion of toilets are in air quality of more than 1,200ppm when classifying using maximum CO<sub>2</sub> concentration rather than when using average CO<sub>2</sub> concentration. This indicates that there are peaks in concentration at specific times that are not sustained throughout the event. This is evidenced by investigating plots of CO<sub>2</sub> concentration against time (Figure 1).

**Wembley Stadium (football matches)**

At Wembley, there were peaks in CO<sub>2</sub> before an event, at half-time, and at the end of the event (Figure 1).

These peaks were most pronounced at the high-occupancy events, but were observed even when the occupancy levels were significantly lower than usual. There were higher maximum CO<sub>2</sub> concentrations recorded during the events with higher occupancy levels.

During the 100% occupancy events, the maximum recorded CO<sub>2</sub> concentration was 3,431ppm in the male toilet versus 1,320ppm in the female toilet. The CO<sub>2</sub> concentration remained continuously above 1,500ppm (classed as a priority for improvement), for periods in male toilets at all the football matches where the occupancy was greater than 65% (Table 1).

**Crucible Theatre**

At the Crucible Theatre, three distinct peaks in CO<sub>2</sub> concentration were observed. These corresponded to the event starting, during the interval, and at the end of the event.

Higher maximum and baseline CO<sub>2</sub> concentrations were observed in three toilets, which were located close to the main theatre auditorium entrance and were the most visited.

Average CO<sub>2</sub> concentrations in toilets close to the main auditorium entrance (first floor) were at least 32% higher than average concentrations in toilets on the ground and second floors.

It was observed that CO<sub>2</sub> concentrations in the three toilets did not fall below 600ppm, even during periods assumed to be unoccupied. This is because extractor fans drew air through toilet-door grilles from densely occupied adjacent spaces.

**O2 arena (Brit Awards)**

The music awards ceremony at the O2 arena did not have a specific half-time interval. Instead, there were a series of 15-minute advert/commercial breaks because the show was televised.

Toilet visits were more evenly spaced and this is reflected in the flatter CO<sub>2</sub> concentration profile. Despite the significantly reduced occupancy (18% of usual capacity), the female toilet on Level 1 reached a maximum CO<sub>2</sub> concentration of 1,169ppm and was sustained above 1,000ppm for more than two hours.

The male toilets, located just next to the female toilets on Level 1, presented with a peak CO<sub>2</sub> concentration of 1,100ppm just before the event started, but fell to an average below 750ppm during the show. Nonetheless, the CO<sub>2</sub> concentrations recorded inside the toilets were considerably higher than those immediately outside.

**Effect of occupancy levels**

It has been shown that higher occupancy levels drive an increase in CO<sub>2</sub> concentration, as this is the only significant factor believed to change between events (the ventilation systems were otherwise operated identically).

At the Crucible Theatre, the effect of occupancy on maximum CO<sub>2</sub> concentration is apparent in all toilets, but especially those visited frequently.

At low occupancy events – for example, »



**Table 1:** Comparing the occupancy to the longest continuous number of minutes where CO<sub>2</sub> concentration was above 1,500 ppm

Occupancy as a percentage of usual capacity (%)	Minutes CO <sub>2</sub> concentration >1,500ppm				
	Before event	First half	Half-time interval	Second half	After event
65	0	0	6	2	4
0	32	0	15	6	16
0	44	0	15	4	8





With over 100 exhibitors  
Build2Perform 2023 is the  
must-attend event in the  
building services sector

Build2Perform Live 2023  
will feature:

Over 100 hours of content

150 speakers across 7 theatres



Register  
to attend

[www.build2perform.co.uk](http://www.build2perform.co.uk)

CABE CONFERENCE SERIES  
**builtenvironment**

LIVE  
2023

5-6 DECEMBER  
EXCEL, LONDON

 BUILD2  
PERFORM

Headline sponsor:

**ADEXON**  
Fire & Smoke Curtains  
Legal + Certified + Better

Join us for a live technical symposium where expert speakers will come together to explore industry challenges.

Hear from the Building Safety Regulator and take part in their dedicated Q&A session.



FREE  
TO  
ATTEND

[#builtenvseries](https://twitter.com/builtenvseries)



Book your place



» around 10% – all maximum CO<sub>2</sub> concentrations were below 800ppm, but the trend line indicates maximum CO<sub>2</sub> of more than 2,000ppm might be expected in some toilets at fully occupied events.

**Conclusions**

The measurement of CO<sub>2</sub> concentration in indoor air does not indicate the risk of long-range transmission of airborne pathogens, but it is a useful way of rapidly assessing the level of ventilation relative to the occupancy of a particular space.

Most of the toilets were deemed to be sufficiently ventilated, but a small number were targeted for improvement using the maximum CO<sub>2</sub> concentration as a performance metric.

The proximity of the toilet to important areas in each venue was a key indicator of performance. This perhaps suggests the ventilation systems in these toilets were undersized and unable to cope with the short periods of very high occupancy.

Venue operators should consider ways to better disperse the event attendees around the various toilets in the venue, to avoid overcrowding in any particular toilet. At the Crucible Theatre, for example, venue operators changed some toilets to unisex to reduce overcrowding in the male toilets.

The mean average CO<sub>2</sub> concentration in 11 toilets was indicative of ventilation that was sufficient relative to the occupancy levels at 96% of the 58 events.

Investigation of the maximum CO<sub>2</sub> concentrations, however, showed that, at some events, there were intermittent periods of

high CO<sub>2</sub>, which indicated poor ventilation relative to the number of occupants. This mainly occurred during half-time intervals at the snooker and football matches, particularly during the higher-occupancy events, and in toilets closest to auditorium entrances.

Key recommendations have been made in the paper (see panel, 'Key recommendations' on p55), including increasing ventilation rates, ensuring supply air is from areas with low occupancy, and allowing different genders to use the same toilets if there is a predominantly male or female audience. [CJ](#)

**References:**

- 1 Dancer *et al*, 2021; Malki-Epshtein *et al*, 2023
- 2 Adzic *et al*, 2022

■ The CO<sub>2</sub> monitoring study was funded by the Department for Digital, Culture, Media, & Sport, which arranged access to the venues and events. The subsequent analysis was carried out by the Airborne Infection Reduction through Building Operation and Design for SARS-CoV-2 (AIRBODS) consortium, funded by the Engineering and Physical Sciences Research Council (EPSRC) grant.



# Adroit®

## Smart Ventilation with Heat Recovery

Allowing you to take control at home or on the go

- Nine models
- Over 90% heat recovery
- Freshly filtered air

- Low energy fans
- Internet enabled
- Economic to run

CERTIFIED COMPONENT

Destroy the airborne contaminants in the HOME





# Air handling units with integrated heat pumps

The HVAC industry has made significant progress in the development of conditioning equipment in pursuit of energy efficiency and optimal indoor air quality. While conventional systems such as direct expansion units and outdoor units have been prevalent, technological advancements have introduced innovative alternatives such as centralised ventilation employing air handling units (AHUs) with integrated refrigerant cooling/heating devices.

## Direct expansion units and variable refrigerant flow systems

Direct expansion (DX) units are standalone systems frequently used in residential and commercial environments. These units consist of indoor and outdoor units, with refrigerant circulating between them. While DX units are relatively cost-effective and straightforward to install, they do possess certain limitations.

One significant drawback is their limited capacity, restricting their use in larger structures, as, typically, each room needs an indoor evaporator unit. Additionally, not all buildings possess a designated location for outdoor unit installation. For instance, the exterior aesthetics of historical buildings could be compromised by the presence of numerous outdoor units.

Variable refrigerant flow (VRF) systems use outdoor condenser units linked to multiple indoor fan coils. These systems provide adaptability and scalability. However, they are complex and have other limitations, such

as maximum refrigerant piping lengths and disparities in installation height. Furthermore, a complex and extensive refrigerant piping system could lead to intricate maintenance and repairs.

## Centralised ventilation with AHUs

These units are widely used in larger commercial and industrial structures to deliver conditioned air across the facility. Komfovent, a provider of innovative HVAC solutions, proudly introduces its RHP series – a complete solution for ventilation and air-to-air heating/cooling that offers several advantages over traditional DX or VRF systems.

AHUs comprise components – including filters, heat exchangers, fans, and integral heat pumps – within the same enclosure. Such systems use a reverse-cycle refrigeration process to deliver both heating and cooling from a single unit, obviating the need for separate outdoor units and conserving precious space in buildings without infringing on exterior aesthetics.

By using extracted air as a heat source, RHP units achieve heightened energy efficiency and reduced operational expenses. In addition, zeolite coating of sorption-enthalpy rotary heat exchangers captures moisture molecules from the air and transfers them to the other airstream with an efficiency of 90%. Such a humidity exchange mechanism reduces the demand for air conditioning power, curtails the need for air humidification and dehumidification, and enhances the efficiency of passive cooling.

## Advantages of Komfovent AHUs with integrated heat pumps

**Energy efficiency:** Sorption-enthalpy rotary heat exchanger and integrated heat pump tandem ensures elevated energy efficiency in comparison with DX or VRF units combined with supplementary ventilation systems.

**'Plug and play' installation:** factory-charged with refrigerant so no refrigeration specialist is required.

**Space:** Integrated units eliminate the need for separate complex piping systems or outdoor units

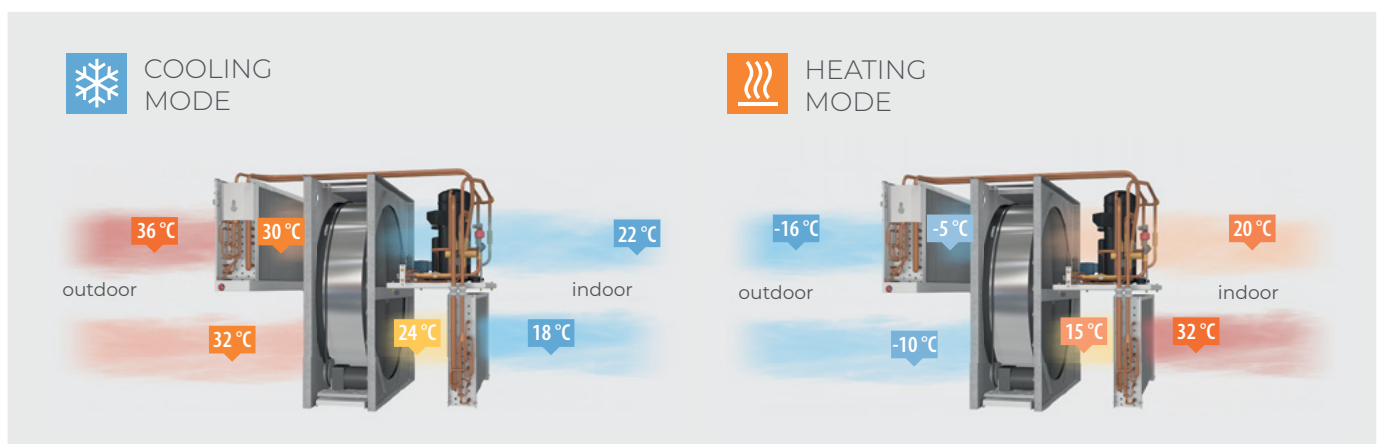
**Enhanced indoor air quality:** Filters and advanced air purification functionalities, such as CO<sup>2</sup> and humidity regulation, ensure a consistent supply of fresh, filtered air, whereas air conditioning systems merely recirculate the air within the premises.

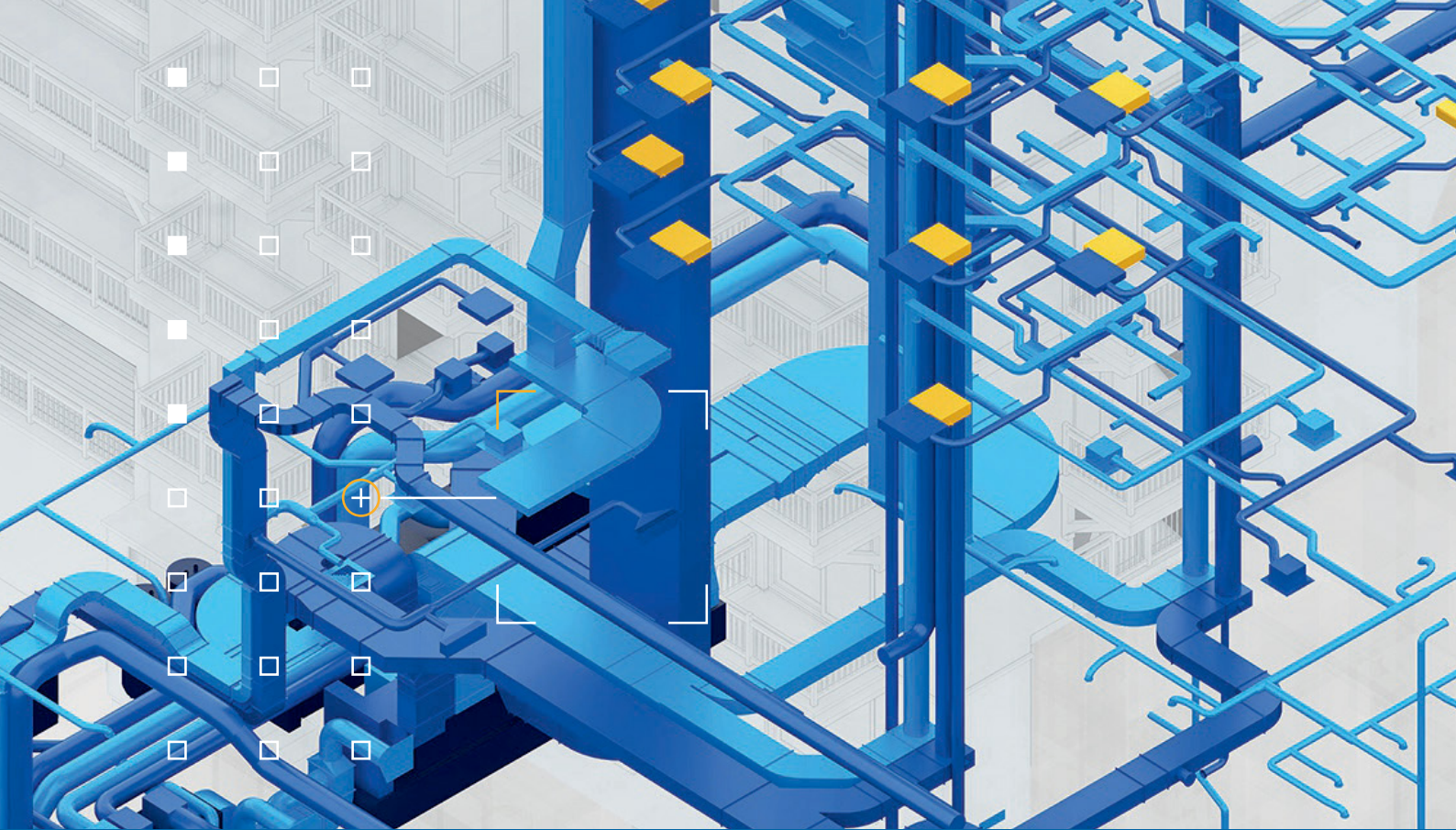
## Conclusion

AHUs with integral heat pumps represent a compelling alternative to traditional conditioning equipment such as DX units or VRF systems. With their energy efficiency, diminished carbon footprint, and advanced air purification capacities, they present a more sustainable solution for attaining optimal indoor air quality within many applications.

# komfovent

■ For more information, contact: [info\\_uk@komfovent.com](mailto:info_uk@komfovent.com) or visit [www.komfovent.com](http://www.komfovent.com)





# CIBSE verified mechanical calculations with Stabicad

**Have confidence in the accuracy of your calculations in Revit.**

Stabicad is the **UK's first** product to complete CIBSE's pioneering Software Verification Assessment program.

Learn more at [mep.trimble.com/calculation](http://mep.trimble.com/calculation)  
or call 01908 608833





## › Products of the month

### The importance of seasonal performance factors in heat pump design

#### Rinnai commissions white paper to address heat pump efficiency

Rinnai is issuing a white paper report that details the potential limitations of manufacturer-issued efficiency measures for heat pumps.

Recognising the crucial role that heat pumps play in achieving energy efficiency and reducing carbon emissions, Rinnai is ramping up efforts to provide comprehensive information to its UK customers.

The white paper will shed light on the limitations of traditional efficiency measures, such as coefficient of performance (COP) and seasonal coefficient of performance (SCOP), in evaluating the performance of heat pump systems.

Authored by Sean Ehlen MEng, the white paper not only presents an alternative approach, but also includes a case study to emphasise the practical implications of this approach.

Traditionally, manufacturers assess heat pump efficiency using COP, which measures the ratio of useful heat energy produced to the electricity consumed at specific external air temperatures and temperature-rise requirements.

While COP is a valuable metric, it has limitations in assessing the overall efficiency of commercial hot water systems (CHWS), which encompass various energy-consuming components.

There are a number of challenges presented by SCOP, which was introduced to try to provide a more comprehensive evaluation of heat pump performance over an entire season.

The measure can fall short in accurately reflecting the system's efficiency as a whole, as it mainly focuses on the heat pump's performance in isolation.

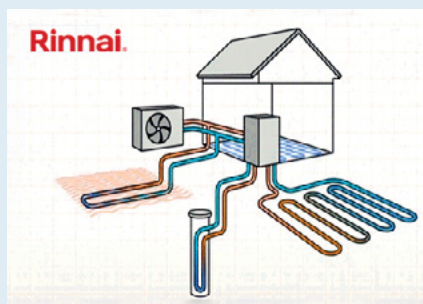
Rinnai has therefore adopted the seasonal performance factor (SPF) in its paper. In contrast to traditional efficiency measures, SPF is used to evaluate the efficiency of CHWS. It considers all energy-consuming components within the system, providing a more holistic and accurate representation of the system's overall performance.

To illustrate the significance of SPF, the white paper includes a detailed case study that examines two distinct approaches to commercial hot water systems:

- **System 1: This relies on a 100% heat pump solution to meet the DHW demand.**



#### “The white paper will shed light on the limitations of traditional efficiency measures in evaluating the performance of heat pump systems”



- **System 2: This employs a combination of a 40% heat pump and an electric cylinder as a back-up heat source.**

The results of the case study reveal a crucial distinction in the performance of these systems when assessed from different perspectives:

When examining the entire commercial hot water system, including the building's piping, System 1 exhibits a higher SPF of 2.75 compared with System 2, which achieves an SPF of 1.49. The difference is primarily because

of System 2 activating the back-up heater during peak demand periods and to recover secondary system heat losses.

However, when evaluating only the heat pump unit's performance, System 2 surpasses System 1, which can potentially mislead customers. While customers might expect an SPF close to 3.33, the reality is that the system operates at an SPF of 1.49.

The primary objective of this white paper is to emphasise the disparity in performance evaluation between different system boundaries.

‘We believe it is essential to provide our UK customers with a transparent and accurate account of their commercial hot water systems' performance,’ says Rinnai.

By doing so, the manufacturer aims to help its customers make informed decisions that lead to cost savings and reduced carbon emissions, while also considering operational expenditure and environmental impact.

In a time of escalating energy costs and growing environmental concerns, Rinnai remains committed to equipping its customers with the knowledge they need to make wise investments.

Rinnai understands the significance of every decision made in this context, and its aim is to share information that, ultimately, benefits its customers, financially and environmentally.

■ **Visit: [www.rinnaiuk.com](http://www.rinnaiuk.com)**

## › Products of the month

### Dimeta and Rinnai join forces to 'green' the gas appliance industry

Companies sign agreement to explore the decarbonisation of the LPG market

**D**imeta, a global initiative aimed at accelerating the production and use of renewable and recycled carbon dimethyl ether (DME), has signed a memorandum of understanding with Rinnai. This strategic partnership is dedicated to exploring innovative ways to decarbonise the liquefied petroleum gas (LPG) market in Europe by incorporating DME.

Renewable and recycled carbon DME represents a groundbreaking development in the energy industry. This clean-burning, sustainable fuel can be synthesised from a variety of feedstocks - including waste, biomass, or biogas - and offers the potential to reduce emissions by up to 85% compared with traditional oil and diesel fuels.

DME shares similar chemical properties to LPG and bioLPG, allowing it to be blended with existing LPG supplies. This presents a seamless route to reducing emissions in Europe's LPG energy consumption, which stands at more than 13 million tonnes annually.

Dimeta and Rinnai have set their sights on investigating the role of DME in conjunction with LPG, whether blended into existing appliances or as a stand-alone, 100% DME energy source. Their research encompasses applications in hot water systems, boilers, and dryers.

Initially, this collaboration will be centred on the European market, with both companies pooling their expertise to demonstrate the significance of a comprehensive approach along the entire value chain.

Rinnai Corporation envisions DME appliances becoming a vital component of its product line-up, which is already influential in off-grid sectors such as leisure, agriculture, and hospitality.

Rinnai is a global supplier, distributing millions of appliances worldwide, and its venture into DME technology aligns with the growing demand for environmentally friendly solutions.

This announcement closely follows the approval of planning for Dimeta's £150m renewable and recycled carbon DME production plant in the UK. Set to begin operations in 2025, this facility will produce more than 50,000 tonnes of DME from non-recyclable waste, equivalent to 25% of the UK's domestic heating LPG consumption.



**“Dimeta aims to accelerate DME as a versatile and sustainable fuel solution, contributing to the transition of the off-grid power market away from LPG”**

Dimeta is not stopping with the UK; it has additional plants in the development pipeline across Europe and the US, as part of its ambitious plan to achieve 300,000 tonnes of DME production capacity by 2027.

Tony Gittings (pictured, left), managing director of Rinnai UK, shared his perspective, stating: ‘Our LPG-fuelled products play a critical role in powering off-grid communities across the world. With more steps being taken to lower global emissions, being able to provide greener solutions is key on the road to net zero.

‘Our collaboration with Dimeta will enable us to further explore the use of renewable liquid gases such as DME and how we can deliver quality appliances that not only work efficiently and affordably for our customers, but also contribute positively to the global environment.’

Frankie Ugboma (pictured, right), chief executive at Dimeta, emphasised the importance of collaboration and support across the supply chain. He believes partnerships with world-leading companies such as Rinnai will maximise opportunities for DME, particularly in the toughest-to-decarbonise sectors, such as off-grid homes and businesses.

Together, they aim to leverage their expertise and knowledge to discover innovative ways to decarbonise the LPG market and pave the way for a greener future.

Established in February 2022, Dimeta is a joint venture between SHV Energy and UGI International, two of the world's leading distributors of off-grid energy. Its mission is to drive the development and use of DME as a low carbon, sustainable liquid gas.

By harnessing the expertise, financial backing, innovation capabilities and distribution power of SHV Energy and UGI International, Dimeta aims to accelerate DME as a versatile and sustainable fuel solution, helping to transition the off-grid power market away from LPG to sustainable, low carbon energy, and establish a net zero economy.

■ Visit: [www.rinnaiuk.com](http://www.rinnaiuk.com)



### A beacon of hope for mental health treatment

An acute psychiatric facility under the Southern Health NHS Foundation Trust has been supplied with anti-ligature luminaires by Luceco.

Leigh House Hospital specialises in offering treatment programmes for young people with mental health issues.

The installation of anti-ligature Atlas bulkheads spans various crucial areas within the hospital, including corridors, bedrooms, and recreation spaces. These luminaires play a vital role in safeguarding vulnerable patients by preventing accidental or intentional self-harm.

The design features reduced apertures between the diffuser and fixture body, minimising protruding or movable components, with rounded peripheries to eliminate attachment points. Anti-ligature Atlas models are versatile, suitable for personal spaces such as bedrooms and bathrooms, and offer dimmable, emergency, and self-test options. They can be wall or ceiling mounted, with flush anti-tamper screws, ensuring only engineer access.

Anti-ligature Platinum downlights were also installed in the hospital's reception seating areas, while LuxPanel Anti-ligature luminaires were used in offices, consultation rooms, and teaching spaces. LuxPanel Anti-ligature can be surface mounted or integrated into standard or SAS ceiling grids.

■ Visit [www.luceco.com](http://www.luceco.com)



### Pump Technology offers pop-up exhibition to showcase products

Pump Technology Ltd is offering a convenient solution for public health consultants to explore the latest equipment from Jung Pumpen. They can simply call and schedule a pop-up exhibition in their reception area or another suitable onsite location.

During these exhibitions, team members can visit, closely inspect products, ask questions, and access technical data. Such 'pop-ups' are gaining in popularity, as they streamline engineers' time and enhance efficiency.

■ Call David Johnson on 07984 520515



## CIBSE JOURNAL

## Future features & specials

January 2024	Heat Networks Battery storage & renewables Retrofitting	July 2024	Fire & smoke design & management Air conditioning
February 2024	Industrial & commercial heating Cooling & ventilation Careers	August 2024	Heat networks & heat pumps Healthcare
March 2024	BIM & digital engineering Air conditioning Heat Pumps	September 2024	Air conditioning, air movement & ventilation Heat recovery systems Smart buildings
April 2024	Heating & water heaters Data centres Education Facilities	October 2024	Pipework, pumps and valves Building safety Hotels & leisure
May 2024	Air conditioning, air movement & ventilation Heat recovery Commercial heating	November 2024	Industrial & commercial heating Cooling & ventilation CPD
June 2024	Chillers, air handling units & heat pumps Air movement & ventilation Health, wellbeing & safety	December 2024	BMS, controls, metering & smart technology Heat pumps Lighting

Editorial submission: Please send editorial proposals/ideas two months before publication date, eg, 1st March for May publication.

Send to: [editor@cibsejournal.com](mailto:editor@cibsejournal.com).

The final editorial copy deadline is one month before publication date.

For advertising opportunities contact:

Jim Folley – 020 7324 2786  
or email [jim.folley@redactive.co.uk](mailto:jim.folley@redactive.co.uk)

**More sense ventilation with Nuaire's iSense-Plus dMEV fan** ✓

Nuaire, a Genuit group company, has announced the iSense-Plus, a decentralised mechanical extract ventilation (dMEV) fan that ensures Building Regulations-compliant, continuous background extract ventilation in new residential buildings.

This cost-effective alternative to whole-house MEV systems is individually installed in wet rooms, and features an adjustable humidistat and run-on timer. Easy installation and energy-efficient operation make it a seamless solution, maintaining a comfortable, mould-free environment, while complying with Part F and L Building Regulations.

■ Visit: [bit.ly/iSensePlus](http://bit.ly/iSensePlus)



✓ **Elco heat pumps installed at Staffordshire secondary school**

Six Aerotop air source heat pumps have been installed at Secondary School Academy in Staffordshire by Elco Heating Solutions. The project involved the deployment of five Aerotop L65 units and one Aerotop M model.

These were integrated into the existing system in a hybrid setup, to provide reliable and energy-efficient heating and hot water for the school's 1,300 students, aged 11 to 18.

Managed by Lord Combustion Services, the installation included new circuits to connect decommissioned plantrooms to the hybrid system. Advanced BMS control systems were also implemented, offering features such as weather compensation, optimisation and operational control, to allow the school to plan and set system levels well in advance of special events.

Stuart Smith, managing director of Lord Combustion, emphasised the project's success in modernising heating and reducing the school's carbon footprint, resulting in greater control and lower utility costs. The academy's director of estates also expressed satisfaction.

The models offer efficiency and sustainability year-round, contributing to cost savings and environmental responsibility.

■ Visit [www.elco.co.uk](http://www.elco.co.uk)

**Ideal Heating announces new commercial heat pump resources** ✓

Ideal Heating - Commercial Products has unveiled a suite of new resources to support the shift towards low carbon heat pumps. This includes a CIBSE-accredited CPD course, 'Heat pumps - technology and principles', which delves into heat pump mechanics, refrigerants, and efficiency.

A white paper, 'Roadmap to decarbonisation - planning your journey,' has also been released, outlining the role of heat pumps in the government's net zero strategy and steps for the transition.

A new brochure on the Ecomod range features specs, accessories, and integration with condensing boilers.

■ Visit [idealcommercialboilers.com](http://idealcommercialboilers.com)



**DIRECTORY**  
Your guide to building services suppliers

UK • EUROPE • MIDDLE EAST • ASIA • USA

**CASWELL FIRESAFE®**

**THIRD PARTY CERTIFIED**

Applus<sup>+</sup> certifire firas UL CERTIFIED ISO 9001 ISO 14001

CASWELL FIRESAFE® is licensed to Manufacturing Partners worldwide by FIRESAFE Fire Rated Ductwork® Ltd

[firesafeductwork.co.uk](http://firesafeductwork.co.uk)





A piling rig makes boreholes for a ground source heat network



Ken Gordon

# Heat pump design from the ground up

New CIBSE guidance on ground source heat pumps is due to be published in early 2024. Here, project lead Ken Gordon outlines the changes.

CIBSE has plans to provide crucial resources for promoting efficient and eco-friendly heating solutions, not least a project to update TM51 *Ground source heat pumps*. No publication date has yet been confirmed; but here, Ken Gordon, CEO of the Ground Source Heat Pump Association, gives an insight into what the updated publication will offer, from system design to inner-city challenges.

## Why is TM51 *Ground source heat pumps* due an update now?

Ground and water source heat pumps are projected to become the dominant technology for heating buildings in the UK. With their immense potential for reducing energy consumption and carbon emissions, there's a necessity for an authoritative guide on best practice, especially as their applications can range from single domestic properties to large district heating or cooling systems.

Ten years ago, when the first edition of TM51 was published, heat pumps were almost unknown as a means for heating buildings. The new, completely rewritten edition aims to lay out how ground source heat pump (GSHP) systems should be designed to achieve maximum efficiency, lowest carbon emissions, and the optimum occupant comfort.

## How would you summarise it?

TM51 *Ground source heat pumps* is a comprehensive Technical Memorandum aimed at promoting best engineering practices for the design, installation and maintenance of ground and water source heat pump systems.

It caters for a wide audience, including system designers, building services engineers, and building owners and occupiers. The guide also examines the specifics of GSHPs and why these systems are well adapted to the unique challenges of inner-city environments.

## What are the three most important things you would like to put across?

- **Understanding of heat pumps:** the guide addresses the lack of understanding surrounding heat pumps, looking at misconceptions and initial cost concerns, and making them more accessible and accepted by a broader audience.
- **Heat networks:** it offers insights into two primary heat network configurations. It also discusses the benefits and challenges of each system, ensuring effective energy distribution and efficiency.
- **Inner-city challenges:** the publication recognises the challenges of space constraints, and introduces innovative solutions, including directional drilling techniques using technology developed by the oil and gas sector.

## Does it cover heat networks and single-building schemes?

Yes, the publication goes into detail on heat networks using a large central heat pump and those using multiple smaller heat pumps on a shared ground loop. The guide also acknowledges the challenges and solutions for implementing GSHPs in apartment buildings, especially in constrained inner-city areas.

## How does it work in conjunction with the heat networks technical assurance scheme (HNTAS)?

TM 51 *Ground Source Heat Pumps* aligns closely with the objectives and core principles set out by the HNTAS. The HNTAS aims to standardise quality assurance processes for heat networks, leading to cost-effective, reliable, and environmentally-friendly heating solutions.

TM51 provides the practical knowledge, guidelines, and best practices to achieve these objectives.

It acts as a tool to ensure that the outcomes focused, preventative, proportionate, deliverable, adaptable, and enforceable principles of HNTAS are effectively implemented and adhered to.

# EVENTS AND TRAINING



## NATIONAL EVENTS AND CONFERENCES

**Façade 2023 Design and Engineering Awards**  
8 November, London Hilton, Park Lane

The Façade 2023 Design and Engineering Awards recognise and reward excellence and achievements in façade engineering, raising the profile of, and drawing attention to, the importance of this discipline.  
[www.cibse.org/facadeawards](http://www.cibse.org/facadeawards)



**CIBSE Build2Perform Live and Light2Perform**  
5-6 December, London ExCel

Build2Perform Live is the meeting place for forward-thinking industry professionals, visionary speakers, leading industry exhibitors and young talent. It is the must-attend event in the building services sector.  
[www.build2perform.co.uk](http://www.build2perform.co.uk)



**CIBSE Building Performance Awards**  
29 February 2024, Park Plaza, London

Booking is now open for the Building Performance Awards, the only industry awards that focus on actual, measured performance outcomes, and not just design intent or performance specifications. Book your place to celebrate with the industry  
[www.cibse.org](http://www.cibse.org)

**CIBSE Technical Symposium**  
11-12 April 2024, Cardiff University

With the theme 'Fit for 2050 - Delivering buildings and defining performance for a net zero built environment', the 2024 symposium will offer a range of peer-reviewed presentations outlining the latest developments in practice, technology and policy, and highlight latest guidance.  
[www.cibse.org/cibse-technical-symposium](http://www.cibse.org/cibse-technical-symposium)

## CIBSE REGIONS AND GROUP EVENTS

Check the web for information on regions and groups meetings, webinars and podcasts:  
[www.cibse.org/events](http://www.cibse.org/events)

**West Midlands: Reflection on the regulation - BR AD O**  
14 November, online

This roundtable brings together experts on overheating, including perspectives from a ventilation supplier and a lead designer for a property developer. With speakers James Healey, Susie Diamond and Sam Potter.

**SLL at LiGHT 23**  
21-22 November, Business Design Centre, London

The Society of Light and Lighting (SLL) is supporting and exhibiting at LiGHT 23.  
[lightexpo.london](http://lightexpo.london)

**Hong Kong Joint Symposium - Shaping the future**  
22 November, Hong Kong

International and local speakers look at advances in building services engineering. The theme is trends and insights for tomorrow's technologies.  
[www.cibse.org.hk](http://www.cibse.org.hk)

**SLL: Light up Oxford**  
30 November

A chance to set up your own lighting installation for the night, with teams given a small plot around Oxford Architect's Victoria villa and a selection of fittings to use.

**CIBSE UAE Awards**  
7 December, Palazzo Versace, Dubai

Featuring 25 categories, the awards aim to cater for every sector of the industry in the region. [www.cibse.org/uaeawards](http://www.cibse.org/uaeawards)

**CIBSE Hong Kong Awards**  
8 December, Hong Kong

The awards celebrate engineering excellence in the built environment in the Hong Kong Region, highlighting outstanding projects.  
[www.cibsehka.org.hk](http://www.cibsehka.org.hk)

## MEMBERSHIP WEBINARS

CIBSE Membership hosts free two-part webinar series to support members with applications for the Associate and Member grades and registration with the Engineering Council at Incorporated Engineer and Chartered Engineer level. Check the website for dates and to register: [bit.ly/CJMar23memweb](http://bit.ly/CJMar23memweb)



## TRAINING COURSES

CIBSE offers in-person and live online training. Corporate delivery is also available in-house face to face, or remotely online. See [www.cibse.org/training](http://www.cibse.org/training)

**Mechanical services explained**  
14-16 November, London  
5-7 December, remote

**Mentoring skills workshop**  
23 November, London

**Fire safety building regulations: Part B**  
22 November, remote

**Low carbon consultant building design**  
21-22 November, London  
12-13 December, London

**Energy efficiency-related building regulations: Part L**  
13 November, London  
27 November, London

**Low carbon consultant building operations**  
29-30 November, remote

**Building services explained**  
14-16 November, London  
12-14 December, remote

**Power system harmonics**  
15 November, remote

**Heat networks code of practice**  
15-16 November, remote  
11-12 December, remote

**Low and zero carbon energy technologies**  
17 November, remote  
21 November, remote  
5 December, London

**Below-ground building drainage**  
20 November, London

**Design of ductwork systems**  
29 November, remote

**Embodied carbon in MEP design**  
1 December, London

**Electrical services explained**  
5-7 December, remote

**ISO 50001:2018 Energy management system**  
7-8 December, remote

## On demand training

CIBSE has a portfolio of on demand courses that contain interactive online content, with quizzes and additional resources to support your learning. See [go.cibse.org/training-mycibselearning](http://go.cibse.org/training-mycibselearning)

Benefits include:

- Online platform accessible on desktop and mobile devices
- Courses and modules available offline when using the app
- Flexibility
- Interactive content
- Corporate training exclusive tools (dashboards, reports).



## CIBSE JOURNAL WEBINAR

The latest *CIBSE Journal* webinar, sponsored by Daikin, is now available on demand. This webinar, titled *Our sustainability journey*, explores how the HVAC market needs to adapt to meet the UK's ambitious environmental targets, and how Daikin is working to lead the way.

All previous *Journal* webinars are also available on demand:  
[www.cibsejournal.com/webinars](http://www.cibsejournal.com/webinars)





 CIBSE  
BUILDING  
PERFORMANCE  
AWARDS 2024

# BOOK NOW

The CIBSE Building Performance Awards are back for their 17th year. Recognising and celebrating engineering excellence in the built environment across 25 categories.

These awards, reward the people, products and projects that demonstrate engineering excellence in the built environment.

**Awards Evening: Thursday 29 February 2024,  
Park Plaza Westminster Bridge**

[cibse.org/BPA](http://cibse.org/BPA)

**@CIBSEAwards**  
**#BPA2024**

Headline sponsor



Sponsors



# CMR

## in complete control

CMR Controls manufactures low air pressure and air volume measurement sensors and control systems for standard air conditioning, clean rooms, sterile laboratories, containment facilities, and fume cupboard extract systems.

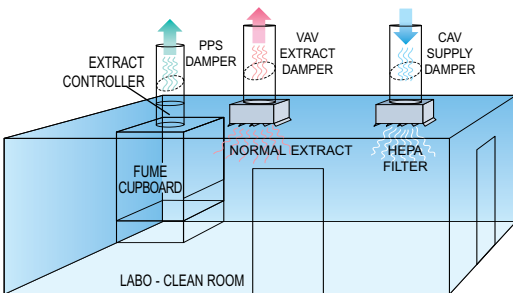


### DPM PRESSURE SENSOR

Panel Mount Pressure or Velocity Transducers with remote alarms, analogue and digital interfaces. Traceable calibration certificates supplied as standard.

### AIR MANAGEMENT SYSTEM

A complete turn-key system to control room pressure to +/-1Pa. Fume cupboard face velocity to 0.5m/s at high speed and provide constant air changes into the labo - clean room.



### DPC CONTROLLER

Fast and accurate controls to drive high speed dampers or invertors. Full PID stand alone controls with BMS interface.

### CAV AND VAV DAMPERS

Accurate air flow measurement with the unique CMR Venturi built into the airtight shut-off damper to control room pressure or constant volume.



Metal Damper

### PPS EXTRACT DAMPER

Poly-propelene control and shut off valve incorporating the CMR Venturi Nozzle. This is essential when dealing with corrosive extract air especially from fume cupboard systems.



PPS Damper

### PRECISION COMPONENTS FOR VENTILATION AND PROCESS CONTROL

# CMR CONTROLS

A Division of C. M. RICHTER (EUROPE) LTD

22 Repton Court, Repton Close,  
Basildon, Essex SS13 1LN. GB  
Website: <http://www.cmr.co.uk>

Tel: +44 (0)1268 287222  
Fax: +44 (0)1268 287099  
E-mail: [sales@cmr.co.uk](mailto:sales@cmr.co.uk)

