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March 2022

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## CIBSE BUILDING PERFORMANCE AWARDS 2022

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## Success and reflection



The steep rise in energy prices over recent months is accelerating the move towards the electrification of heat and power in buildings. CIBSE's new Building Performance Champion is one such building.

St John's College, Oxford, Library and Study Centre was conceived 10 years ago as an all-electric building when net zero designs were rarely being considered. Now, the energy strategy designed by Max Fordham, which includes an in-depth analysis of the building's embodied carbon, is becoming the norm.

Max Fordham was the big winner at the CIBSE Building Performance Awards, which took place in person for the first time in two years last month at the

Park Plaza Westminster Bridge hotel in London. As well as winning 'Building Project of the Year – Public Use' with St John's College, Max Fordham also won the Building Performance Consultancy of the Year Award (51-300 employees). The victory was a fitting – and moving – vindication of the leadership and vision of Max Fordham's eponymous founder who died earlier this year.

Russia's invasion of Ukraine on the day of the awards cast a pall over proceedings, and there was an air of uncertainty over what the war might mean for future stability in Europe and the wider global economy. As we go to press, the human cost is already significant and our thoughts are with those who may be caught up in the conflict or have family and friends in Ukraine.

The invasion has already sparked a big jump in energy prices, and governments in Europe will be desperate to wean themselves off gas and oil as quickly as possible, both for the security of energy supply, and to protect their citizens from crippling energy bills. Whether this is through the exploitation of local oil and gas reserves or renewable resources is up for debate. While some politicians are calling for more exploration in the North Sea, the Climate Change Committee has advised against expanding production of shale and North Sea gas. However, it said that it was up to ministers to make a decision over more drilling, and acknowledged that North Sea gas could be cleaner than gas imported from overseas.

In a sign of the times, GCHQ's National Cyber Security Centre last month issued cyber security guidance to help construction SMEs build up their resilience to online threats. Published in association with the Chartered Institute of Building, the guidance aims to protect firms working with digital tools and interactive software such as 3D modelling packages and business management programmes. The guide offers advice for every stage of construction, from design to handover, and details the common cyber threats the industry faces.

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*CIBSE Journal* is written and produced by CPL (Cambridge Publishers Ltd) Tel: +44 (0)1223 378000.

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

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

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

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### Hywel Davies

If cybersecurity practitioners become regulated professionals then engineers should be among them



### Roka Raslan

The editor of a special housing issue of *B&SERT* explains what 'future fit' housing might look like



### Dave Behan

How building services engineers can help scientists cut emissions from their laboratory buildings



### Tim Dwyer

This month's CPD looks at the impact on heating, cooling and ventilation in multi-residential buildings

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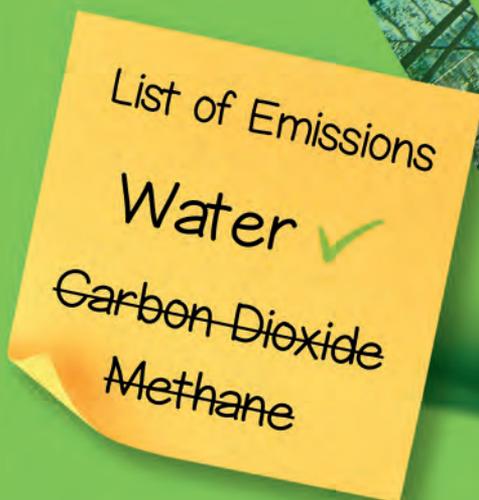
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©CIBSE Services Ltd. ISSN 1759-846X

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

The US annual subscription price is £100. Airfreight and mailing in the USA by agent named WN Shipping USA, 156-15, 146th Avenue, 2nd Floor, Jamaica, NY 11434, USA. Periodicals postage paid at Jamaica NY 11431.

US Postmaster: Send address changes to *CIBSE Journal*, WN Shipping USA, 156-15, 146th Avenue, 2nd Floor, Jamaica, NY 11434, USA. Subscription records are maintained at CIBSE, 222 Balham High Road, London, SW12 9BS, UK.

## CREDITS

Cover image Credit / Carmen Valino P06 Getty images / ARIS MESSINIS P07 iStock.com / VictorHuang P08 iStock.com / Empato P08 Credit / UK Parliament CC by 3.0 P10 Credit / Richard Townshend CC by 3.0 P13 iStock.com / Imaginima P20-25 Credit / Carmen Valino P30 - 31 iStock.com / Godrick P35 iStock.com / Seraficus P39 iStock.com / Suchat longthara P42 Getty images / General Photographic Agency / Stringer P43 Getty images / Sasha / Stringer P58 iStock.com / Intpro



ABC audited circulation:  
17,944 January to December 2020  
Printed by: Warners Midlands PLC

# CONTENTS

30

## News

- 6 News
- 12 CIBSE news

## Voices

- 16 A time to regulate  
Hywel Davies looks at government proposals on the standards, structure and regulation of cybersecurity
- 17 Letters
- 18 Pushing the boundaries  
David Behan explains why engineers should work closely with scientists to help cut carbon emissions from laboratory buildings
- 57 Q&A  
Rokia Raslan explains why more studies are needed on hard-to-decarbonise homes

## Features

- 20 CIBSE Building Performance Awards 2022  
Recognising and rewarding the very best in building services engineering – all the winners of this year's awards
- 28 Walk the talk  
To celebrate International Women's Day, we look at how CIBSE is supporting female members and how the industry can attract more women
- 30 Delivering on the net zero promise  
Andy Pearson looks at how SNC-Lavalin is using data to assess buildings and set clients such as HM Treasury on the road to net zero

## Technical

- Air conditioning and digital engineering
- 35 Cooling news  
A round-up of policy, project and product news
- 39 Dual purpose  
Tim Dwyer looks at the latest research on hybrid direct and regenerative evaporative cooling
- 42 Clear for action  
Richard Farmer explains why pioneering air cleaning techniques were essential in the early days of UK movie studios
- 44 Made in America  
David Arnold outlines how advances in humidity control made by Willis Carrier led to the development of air washers for cinemas and film studios

- 46 To automate we must accommodate the ideas of others  
More AI in buildings is inevitable – but engineers must come together to share knowledge, says Aidan Kelly

## CPD

- 49 Servicing the rise in multi-residential buildings  
Exploring the impact on heating, cooling and ventilation application

## Classified

- 54 Products
- Events
- 58 Looking ahead

## GCHQ publishes cyber security guide for construction

Cyber security experts at GCHQ have published the first guidance aimed at construction businesses to help build resilience to growing online threats.

The new Cyber Security for Construction Businesses guide, issued by GCHQ's National Cyber Security Centre (NCSC), in association with the Chartered Institute of Building (CIOB), provides tailored, practical advice for the industry on how to protect their businesses and building projects.

Aimed at SMEs, the guidance aims to increase protections as businesses rely more on digital tools and ways of working, such as using 3D modelling packages, GPS equipment and business management software. It sets out the common cyber threats the industry faces, including from spear-phishing, ransomware and supply chain attacks. The guide is at [bit.ly/CJMar22NewsGCHQ](https://bit.ly/CJMar22NewsGCHQ)

## UK imposes sanctions on Russia for Ukraine invasion



### Sanctions will prevent key technologies from being exported to Russia

The UK Prime Minister Boris Johnson has announced economic sanctions on Russia following its invasion of Ukraine on 24 February.

Sanctions include preventing key goods and technologies from being exported to Russia

by no longer approving licences for the export of dual-use goods, and banning the export of a range of high-end and critical technical equipment and components.

The sanctions, imposed in close cooperation with the US and Europe, are targeted at the people and financial institutions who have 'underwritten Putin's war machine', Boris Johnson's statement said.

Other sanctions include starving the state of access to finance by introducing legislation to stop the state from being able to borrow in UK markets and issue sovereign debt; blocking the ability of Russian banks to operate in sterling around the world; blocking major Russian state and private companies from raising funds in the UK; and limiting the amount of money Russian nationals can deposit in UK bank accounts.

Johnson also announced the freezing of assets of more than 100 individuals and major defence sector organisations.

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## IN BRIEF

### Heat network customers face huge increase in bills

More than 500,000 households on heat networks face 'huge and unrestricted' increases in their heating and power bills because they are not protected by the energy price cap, a watchdog has warned.

The Heat Trust says consumers and landlords operating heat networks are already reporting price rises of up to 700% because of the recent spiralling increases in the cost of wholesale gas.

Customers on heat networks are not protected by Ofgem's energy price cap – the level of which will increase by 54% in April – meaning they are fully exposed to the commercial cost of gas.

### RICS outlines way to insure timber buildings

The government should update the Building Regulations to enable modern methods of timber construction to be embraced, says the RICS Foundation, in a new paper.

In the short term, hybridisation of traditional and modern building methods offers the best way to meet objectives on property protection and the net zero agenda, the paper says.

In the longer term, however, it says the government has a 'substantial role' to play in developing Building Regulations that address the challenges of more complex construction types.

### FBU warns against undercutting doors

The Fire Brigades Union (FBU) has demanded an urgent meeting with the Scottish government over concerns that a proposal to improve ventilation in schools could be unsafe.

In a letter to MSPs, Education Secretary Shirley-Anne Somerville wrote that the bottoms of doors could be chopped off in classrooms with the highest readings of CO<sub>2</sub>.

The proposal is part of a £4.3m package of measures to limit the spread of coronavirus by improving airflow. Around £300,000 is earmarked for 'undercutting' doors, with the bulk of the cash for air filters and fans. The Scottish FBU has warned that fire doors could be undercut, compromising safety.

# Cladding advice not updated after serious fires, inquiry told

**BRE director says she believed issue would be dealt with in AD B revision**

A BRE director has revealed that she was 'shocked' how quickly a cladding system, similar to that used at Grenfell Tower, burst into flames during a test carried out more than 20 years ago.

Dr Sarah Colwell, director of fire suppression at BRE, also admitted at the ongoing inquiry into the disaster that she did not clarify guidance that aluminium composite material (ACM) should not be used on tall buildings after earlier blazes in France and the Middle East.

The inquiry heard confirmation, previously reported by the BBC, that there had been a severe blaze during a fire test of ACM panels containing polyethylene cores at the BRE in 2001, with flames reaching up to 20m high.

Colwell told the inquiry that she and others present had been 'shocked' by 'very rapid, very large fire growth' during the test, which had to

be halted after six minutes. She also agreed that ACM would not be 'an appropriate product' for use in high-rise buildings without posing a 'grave risk to occupants'.

However, Colwell admitted that she had not updated guidance on the use of ACM to set out that it should not be used on tall buildings following a pair of high-profile blazes in the United Arab Emirates, which she had investigated as part of an industry task force.

The BRE director told the inquiry that she believed the issue would be dealt with in a forthcoming revision of Approved Document B.

The Grenfell Inquiry also heard an allegation that Kingspan threatened a cladding firm with legal action if it revealed the results of a failed fire test. John Lewis, a fire engineer at the National House Building Council, said that cladding firm Sotec had been called by Kingspan, who told them they would take legal action against them if they released the test report.

# London guidance looks to embed fire safety in building design from the start

Mayor of London Sadiq Khan has issued new guidance to ensure that fire safety is embedded from the outset when buildings are being designed and planned in London.

The draft Fire Safety London Plan guidance, published last month, sets out how developers should demonstrate compliance with the London Plan policies to achieve high fire safety standards. It highlights developers' responsibility to demonstrate schemes can be constructed and occupied safely.

The government has already introduced these requirements for higher risk buildings under rules in Planning Gateway one introduced last year. The Plan is looking to extend those requirements to all buildings in the capital.

London Fire Brigade's deputy assistant commissioner for fire safety, Greg Ashman, said: 'It is imperative that developers are considering fire safety at the earliest stage of the building design process.'

● The draft guidance is out for consultation until 20 May.

## Aims of Fire Safety London Plan

- Competent fire safety experts involved at the earliest stage of the design process
- Lifts included in developments to allow evacuation with dignity during an emergency
- Fire safety and evacuation measures identified at the planning application stage, and referred to in each subsequent stage of the development process.

## Stuart Andrew appointed 11th housing minister since 2010

West Yorkshire MP Stuart Andrew has been appointed by Boris Johnson as the new minister of state for housing. He replaces Christopher Pincher, who had filled the portfolio for nearly two years.

The two have swapped jobs, with Pincher becoming deputy Conservative chief whip in a mini-reshuffle that took place on 8 February.

Andrew, a private landlord, was born and brought up in Wales, but has represented the seat of Pudsey since the 2010 General Election. He will lead in the House of Commons on building safety, including cladding remediation, which is part of junior minister Lord Greenhalgh's portfolio.

Andrew is the 11th housing minister since 2010. In 2016, he voted against a Labour amendment to the Housing and Planning Bill to make 'all homes fit for human habitation', one of 72 Conservative MPs who are also private landlords to have done so.



## Bill proposes limit on embodied carbon

A backbench Conservative MP has launched a parliamentary bid to force buildings' whole-life carbon emissions to be reported.

Duncan Baker, MP for North Norfolk, introduced the Carbon Emissions (Buildings) Bill in the House of Commons on 2 February.

The legislation would not only require the whole-life carbon emissions of buildings to be reported, but would also set limits on the embodied carbon emissions in the construction of buildings.

The bill is based on proposals in a report, published last year by the Part Z industry group, on how Building Regulations could be amended to account for embodied carbon.

Baker told the House of Commons that the construction and upkeep of new and existing buildings and infrastructure is responsible for up to 50 million tonnes of carbon emissions, around one-third of the UK total.

Ten-minute rule bills, which are a mechanism by which individual MPs can introduce their own legislation, generally have little chance of being passed in parliament. However, Baker's bill has attracted support from opposition MPs, including sole Green representative Caroline Lucas, as well as other Conservatives.

# One million new homes will need retrofitting, say MPs



## Government urged to bring forward Future Homes Standard to 2023

It is 'naïve to assume' that one million homes due to be built in this parliament will not need to be retrofitted, a House of Commons select committee has concluded.

In its report, *Decarbonising heat in homes*, the Business, Energy and Industrial Strategy (BEIS) Committee added that implementation of the Future Homes Standard (FHS) should be brought forward two years, to 2023.

The report states that one million homes

the government aims to build before the parliamentary term expires in 2024 will be heated by fossil-fuel systems because of the decision not to implement the FHS until 2025.

'It is naïve to assume that these homes will not need to be retrofitted at significant cost,' the committee says. 'We acknowledge that the government wants to give industry the time to develop its supply chains; however, this appears to be to the detriment of new-build homeowners, who will have to pay to retrofit their homes.'

The FHS is a key policy in the energy white paper, published last year, but the committee demands that ministers in the Department for Levelling Up, Housing and Communities 'prioritise this crucial work more clearly in the future'. They also say the government is 'not yet on track' to deliver on its own home heat-decarbonisation targets.

Given the 'extremely limited' state of consumer awareness about why and how heating systems must change, the committee recommends a government campaign to explain the potential costs and benefits of the transition.

The report also recommends the creation of a low carbon heating apprenticeship programme.

## Levelling Up white paper a 'missed opportunity' for housing – UKGBC

The UK Green Building Council (UKGBC) has slammed the government's Levelling Up white paper as a 'missed opportunity' to tackle the scourge of poor housing.

As part of one of its 12 stated missions, the paper sets out the government's 'ambition' for the number of non-decent rented homes to have halved by 2030, with the 'biggest improvements in the lowest-performing areas', such as Yorkshire & Humber, the North West and the West Midlands. Further detail will be set out once the review of the Decent Homes Standard has concluded, the paper states.

However, Simon McWhirter, director of communications, policy and places at UKGBC, said the paper had not gone far enough. 'A major national home retrofit programme is urgently required to insulate Britain's left-behind areas from soaring gas prices, and to create tens of thousands of green jobs where they are most needed,' he said. 'A new ambition to bring only half of private rented homes up to a decent standard by 2030 is disappointing, as private landlords are already required to meet a higher energy efficiency standard than that being proposed.'

It was 'equally disappointing,' he added, that the white paper was silent on government's plans to support the upgrading of owner-occupied homes.

## Homes with poor EPCs face steep rise in bills

The Energy and Climate Intelligence Unit (ECIU) says households living in EPC band D properties are spending, on average, £170 per year more on energy bills than their band C neighbours. This figure rises to £420 for those living in the bottom-rated band F homes.

Below-average energy efficiency makes households vulnerable to soaring gas and electricity bills, adds the ECIU. The proportion of band C homes is less than the national average in the majority of England's 40 most marginal constituencies, it adds.

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## New overheating reg makes compliance hard to achieve

Concerns have been raised about the effectiveness and usability of new Approved Document O, which sets standards for overheating in new homes.

Susie Diamond, founding partner at buildings physics consultancy Inklings, said the document, published in December as part of the update to Building Regulations, could make reporting harder and compliance difficult to achieve.

The two routes to compliance are: a simplified method based on checking glazing areas and window opening areas against fixed limits, based on the unit and room floor area; or a dynamic thermal modelling method following CIBSE TM59 with some minor changes.

Diamond highlighted problems with the calculation methodology that make it difficult to pass, particularly in low-risk areas.

To see Inklings's appraisal of AD O, visit [bit.ly/CJMar22NewsADO](https://bit.ly/CJMar22NewsADO)

# Gove admits taxpayers may pay more for cladding fix



## Secretary of State said industry would originally pay £4bn cladding bill

Michael Gove has admitted that taxpayers may have to pay more than anticipated to make thousands of buildings safe.

The Secretary of State of Levelling Up, Housing and Communities (LUHC) gave evidence to a parliamentary select committee

on his proposals to force industry to pay to remove cladding and to protect leaseholders from exorbitant costs.

In his evidence to the Commons LUHC Committee on 21 February, Gove told MPs that it was proving hard to get companies that made combustible materials for the buildings in question to pay for the remedial work.

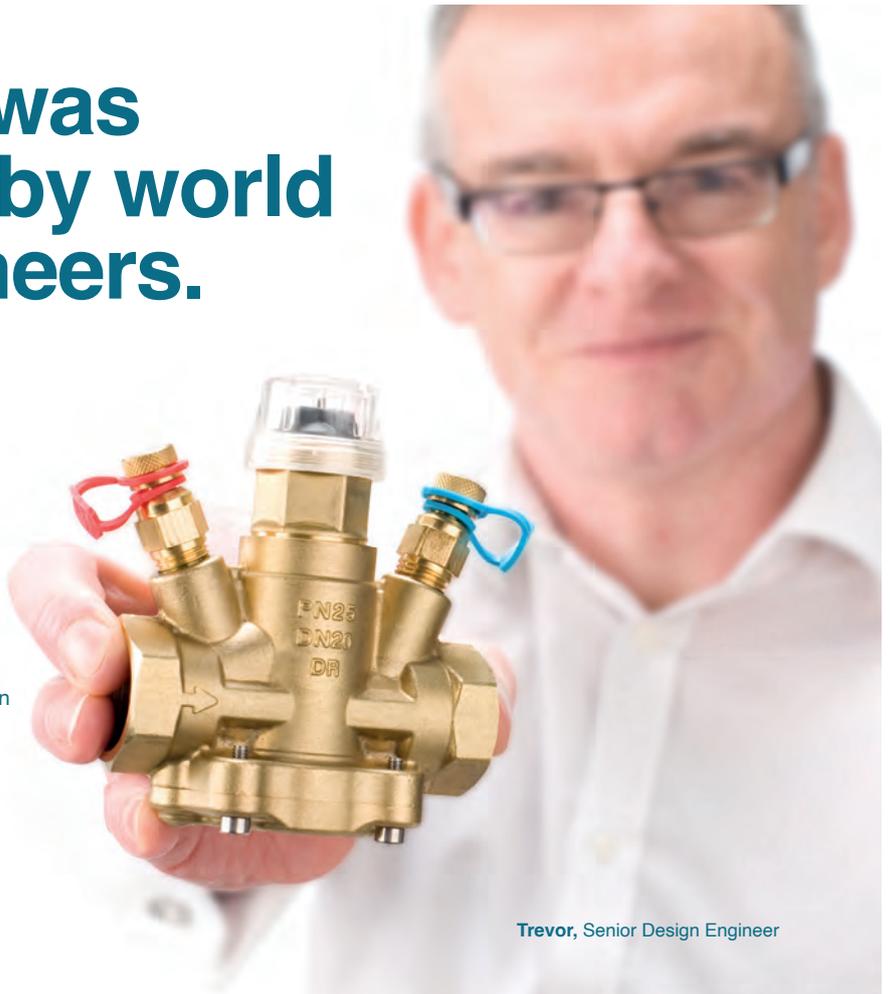
The committee's inquiry on Building Safety: Remediation and Funding is principally examining the announcements Gove made in the House of Commons and his department on the proposals to demand industry pays for the work, which includes £4bn to cover the cost of fixing combustible cladding on residential tower blocks above 11 metres.

The Home Builders Federation said that only a small proportion of the total number of buildings that the Government estimates are in need of remediation have been built by UK home builders.

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Trevor, Senior Design Engineer



Max Fordham was named Building Performance Champion and Building Performance Consultancy of the Year (51-300 employees)

# Max Fordham comes out top at CIBSE Awards

## Consultant is named 2022 Building Performance Champion

Max Fordham secured top honours at the CIBSE Building Performance Awards 2022, with the engineering practice named as both Building Performance Champion and Building Performance Consultancy of the Year (51-300 employees) at the Park Plaza Westminster Bridge in London.

Celebrating the 15th year of the awards, the industry gathered for a face-to-face ceremony for the first time since 2020.

Max Fordham secured the top award for its work on St John's College, Oxford, Library and Study Centre, which was also named Project of the Year - Public Use. Judges praised its consideration of net zero strategies before it had become common to do so.

Aecom also won two awards, with Mike Burton winning Engineer of the Year and the firm winning Project of the Year - Healthcare, for the Clatterbridge Cancer Centre in Liverpool, a Breeam Excellent-rated new hospital facility.

The winner of CIBSE's inaugural Embodied Carbon Award was the Michael J Lonsdale Group, which, the judging panel said, has acted as a champion of the embodied carbon model in the building performance sector, paving the way for clients and other companies to think critically about their carbon output.

Buro Happold won the award for Consultancy of the Year (over 300 employees) for the fifth year running.

There were three product or innovation winners, with Knauf Insulation & Knauf Energy Solutions, Water Kinetics, and Signify winning the thermal comfort, wellbeing, and air quality awards respectively.

Guest speaker Jo Da Silva, director of international development at Arup Group, paid tribute to Max Fordham, who died earlier this year. She said: 'Max Fordham has left a legacy in the buildings he has designed but more importantly in the thousands of engineers who he inspired during his career. He encouraged them to collaborate and to be curious, creative and courageous.'

## New work drives construction growth

Monthly construction output increased by 2% in December, spurred solely by a rise in new work, figures from the Office for National Statistics (ONS) show.

The latest monthly Construction Output data, published on 11 February, shows that the level of new work increased by 3.5% in the final month of the year, despite the emergence of the Omicron coronavirus variant. However, repair and maintenance declined 0.7% month on month.

December's overall monthly growth contributed to construction output increasing by 1% during the fourth quarter of 2021, compared with the previous three months.

Overall, construction output in December 2021 was 0.3% (£35m) above the February 2020 pre-pandemic level. Total new orders are at their highest level (£13.3bn) since the third quarter 2017, boosted by HS2, said the ONS.

## Number of apprentices returns to pre-Covid levels

The number of engineering services apprentices starting in England in 2022 is back to pre-Covid levels, according to Actuate UK.

The sector umbrella body said building engineering services apprentices make up 42% of this year's construction intake. However, it warned that many more new starters are needed to achieve net zero by 2050. Helen Yeulet, of the Actuate UK skills group, said: 'Industry and government must work together to overcome the skills shortage and deliver the homes of the future.'

## IN BRIEF

### Forget hydrogen heating this decade, say academics

New research by Imperial College has concluded that the government's efforts to decarbonise home heating should focus on energy efficiency and electrification this decade, because hydrogen will not be 'viable' within that timeframe.

*The future of home heating* study, published by Imperial's Energy Futures Lab last month, says heat pumps can be deployed now, but pumping hydrogen through the gas grid will probably only be feasible from the early to mid-2030s, 'at the very earliest'. So, government policy should prioritise removing 'significant barriers' to the uptake of heat pumps, such as their high cost relative to gas boilers, and low consumer awareness.

### Fifth of bedrooms too hot to sleep in

The main bedrooms in 19% of English homes were too hot to sleep in comfortably during the summer of 2018, according to research published in the journal *Buildings & Cities*.

To minimise overheating, the report says retrofits should focus on homes that lack rooms where occupants can sleep on very hot nights. Smaller properties, such as flats and bungalows, are 'more prone' to overheating, it adds, saying that pressure to air condition homes is alleviated if people sleep in safe havens or cool rooms.

### Ireland pledges €8bn for insulation

The Irish government has approved an €8bn package of increased support for home insulation.

Its Department of the Environment has announced a new National Home Energy Upgrade Scheme, through which homeowners will be eligible for grants worth up to half the cost of a typical deep retrofit to the B2 Building Energy Rating (BER) standard, an increase on the 30% to 35% grants currently available.

The government has set a target of 500,000 home energy upgrades to BER B2 standard by 2030. The number of free energy upgrades for those at risk of energy poverty will also be more than doubled, to 400 per month.

# Members recognised for services to Institution at President's Dinner

**Accolades for the past two years were presented in honour of volunteers' outstanding work for CIBSE**

Eleven CIBSE members were honoured with Gold and Silver medals at the President's Awards dinner in February.

The accolades are presented in recognition of outstanding service by volunteers delivering CIBSE's objectives of serving society and benefiting the public.

Each year, CIBSE presents Gold, Silver or Bronze Medals to individuals who have made a significant contribution to its work. However, they were not able to be presented for the past two years due to the pandemic.

Gold Medals, the highest accolade awarded by CIBSE, were presented to: Phil Jones, Bryan Franklin, David Wood, David Hughes, Stephen Lisk, Mike Simpson and George Adams, who was not able to attend, but who will be presented with his medal at the President's Awards dinner in October. (See 'Gold medal winners', opposite.)

Silver Medals were awarded to members who have made exceptional contributions to the industry and to CIBSE through their work and time volunteering, helping to improve our Institution and foster the next generation. We thank each of them: Isaac Coker, Roger Edwards, John Forster, Tony Lamberti and Andrew Rowe.

Other awards presented on the night include the 2021 CIBSE Undergraduate Award, which went to Khushbu Mankani, who studied at Heriot-Watt University in Dubai.

She won it for her final-year project, *Optimisation of an air-cooled heat sink for passive cooling of a photovoltaic panel: A computational study*.

The award recognises excellent understanding, application and analysis of building services engineering, science and design, as well as originality and high-quality visual information.

Mankani was unable to make the ceremony, but will be presented with her accolade at the UAE annual awards later this year.

The 2022 CIBSE Undergraduate Award winner, Rosemary Fishbury, from the University of Nottingham, was also presented with her award. Her final-year project was *The effect of coloured daylight on occupants' emotions*. A trophy was also presented to Fishbury's university.

Other presentations were made to the winners of the four awards for technical papers: the Dufton Silver Medal; the Barker Silver Medal; the Carter Bronze Medal for 2020 and 2021; and the Napier Shaw Bronze Medal for 2020 and 2021.

- Full details of these were reported in the December 2021 *CIBSE Journal*, Technical research recognised with awards, and the August 2020 *CIBSE Journal*, Overheating and airtightness papers win awards.



Stephen Lisk (second from right) receives his CIBSE Gold Medal with (from left): Kevin Kelly, Ruth Carter, Olu Babalola and Stuart MacPherson



Isaac Coker (2nd from right) receives his CIBSE Silver Medal with (from left): Ruth Carter, Stuart MacPherson, Farah Naz and Kevin Kelly



From left: Kevin Kelly, Cliff Elwell, George Bennet, Jenny Crawley, Matilda Coker, Jez Wingfield, Isaac Coker, and Stuart MacPherson

## Gold Medal winners

**Phil Jones CEng FCIBSE** joined CIBSE in 1981 and has been a Fellow since 2010. He specialised in the development of scientific concepts and their application to reducing energy demand in buildings through his work as an engineering consultant and university academic, promoting concepts, guides and publications to energy efficiency good practice in buildings. He chaired the CIBSE CHP-district heating and energy performance groups and was a CIBSE Council member for more than 15 years. He has contributed to more than 100 publications, including CIBSE titles, being principal author for many, including *TM39 Energy metering* and *CPI Heat Networks 2020*.

**Bryan Franklin CEng FCIBSE**, now in his seventh decade of membership, has been an active CIBSE volunteer since the early 1980s, when he was a partner at Steensen Varming Mulcahy. A CIBSE Fellow since 2007, he chaired the former CIBSE Technical Publications Board and led major revisions of CIBSE commissioning codes, including Code M, from 1992-2002. He chaired the policy and consultations committee, served on the CIBSE management board, was a long-time member of CIBSE Council and chaired the board of the newly established CIBSE Certification Ltd from 2007 until his retirement last year.

**David Wood CEng FCIBSE**, a former CIBSE President and chair of the CIBSE Benevolent Fund, has been a member of the Institution since 1961. Accepting his award, he said he was surprised and honoured to receive a Gold Medal and talked of the privilege of visiting the Regions during his time as President. He also referred to his experience as an almoner and on the CIBSE Benevolent Fund as very rewarding, and expressed his optimism for the future of CIBSE.

**David Hughes CEng FCIBSE** joined CIBSE in 1963, becoming a

Fellow in 1985. He started as an apprentice in 1963 with design contractor Matthew Hall, where he worked for 25 years, becoming divisional director and establishing an office in Iran. He joined Jaros Baum & Bolles Consulting Engineers as director in 1988 and was responsible for projects such as the refurbishment of the Treasury in Whitehall. A CIBSE professional review interviewer since 2003, he is always keen to mentor new members and share his experience. He has served on the CIBSE Board, Council and as a Benevolent Fund Trustee, and was CIBSE President in 2006, when he led on international coordination and development within CIBSE.

**Stephen Lisk FCIBSE SFL** has been a CIBSE Fellow since 2014, was President of the Society of Light and Lighting (SLL) in 2009, and CIBSE President in 2018. Accepting his medal he said: 'I am very honoured to receive this award in the esteemed company of people that have given so much to the Institution past and present.' Thanking all those who supported him, Lisk acknowledged that recognition such as this is rarely for just one person's efforts, and he dedicated the award to the memory of close friend, and past SLL president and secretary Liz Peck, who died last year.

**Mike Simpson CEng FCIBSE SFL**, a past President of both CIBSE and the SLL, has been engineering lighting installations for more than 35 years and is one of the world's leading lighters. He played a key role in delivering stunning installations at the London 2012 Olympic Games, ensuring they met the new technical demands of HD TV broadcasting. Simpson is passionate about writing technical standards for lighting internationally, and developing the next generation of lighting engineers, teaching on the MSc light and architecture course at University College London and the BA lighting design course at Rose Bruford College. He also established the annual lighting design competition, Ready Steady Light.

## Firefighters and evacuation lifts seminar

The CIBSE Lifts Group was delighted to welcome nearly 150 people to its annual seminar, held online in February.

The theme of the 2022 event was firefighters and evacuation lifts and their use in the context of broader fire engineering strategies, codes and standards, and the new London Plan.

Farrokh Azad, from Sweco UK Fire Engineering, spoke first and enlightened the audience with a glimpse into the world of the fire engineer, covering the strategies, legislation and guidance employed to ensure buildings are safe.

This was followed by a talk from Nick Mellor, of the Lift & Escalator Industry Association, who spoke eloquently on the ever-changing world of codes and standards, and how they apply to firefighters' lifts and evacuation lifts. Precision was a theme of his talk, highlighting the important difference between vintages of 'fire' lifts and the need to select descriptors carefully when dealing with lifts for the use of the Fire Service.

The final speaker, Adam Scott, of Sweco UK Vertical Transportation, updated attendees on the London Plan and some of the challenges it presents to the lift industry. A clear message from his talk was the need for the industry to support the Greater London Authority with the final drafting of some of the guidance associated with implementing the plan.

The seminar was followed by the 2022 Lifts Group AGM, minutes of which will be posted on [cibse.org/Lifts-Group](https://www.cibse.org/Lifts-Group)

● The next meeting of the CLG is planned for early June 2022.



The lifts seminar attracted nearly 150 attendees in February

## Ken Dale bursary open for entries

The Ken Dale Travel Bursary offers building services engineers in the developmental stage of their career the chance to win up to £4,000 to travel the world and research how different conditions impact the built environment.

The winner will have the opportunity to spend three to four weeks outside their own country to research an aspect connected to their field of work, which will benefit CIBSE, their employer and the profession.

Applications for the 2022 award are now open, and the deadline is Friday 15 April. For details on how to apply, visit [bit.ly/CJMar22KenDale](http://bit.ly/CJMar22KenDale)

## Symposium focus is building performance

Delivering a safe, healthy and sustainable built environment will be the focus of the CIBSE Technical Symposium 2022.

Taking place on 21 and 22 April, at London South Bank University, the in-person event will look at the latest research and thinking around ensuring our buildings perform. It will feature peer-reviewed presentations and posters, and bring together practitioners and academics who are applying and researching the latest thinking in building services engineering.

Presentations will outline policy, guidance and practice, showing how engineers can deliver safe, more healthy and sustainable buildings. This year's topics include: development of zero carbon building standards; embodied and operational carbon; and the challenge of refurbishing buildings.

For details, and to book, visit [bit.ly/CJMar22TechSymp](http://bit.ly/CJMar22TechSymp)

# ILEVE gears up for best practices conference

**Hybrid event will feature updates from the HSE, BOHS and ILEVE**

The Institute of Local Exhaust Ventilation Engineers (ILEVE) and the British Occupational Hygiene Society (BOHS) will be holding their seventh joint conference on 26 April.

The hybrid conference, titled 'LEV - Extracting the best practices', will offer in-person attendance at The Studio Leeds, and a virtual attendance option. It is for those with

an active involvement in the LEV industry, including system design, installation, commissioning, thorough examination and testing (TExT), servicing, maintenance work, or all the above.

The theme is 'Design for control', and presentations will cover: different dust filter units; a design case study; design elements from the ACGIH manual; drawing standards; and TExT schematics. There will also be an update from the Health and Safety Executive.

ILEVE will discuss stack design, women in the LEV profession, and clearance time testing methods, and there will be a quiz for participants to vote in and reveal differences in opinion.

The institute said: 'We need to build a stronger relationship between those focusing on the broad field of occupational hygiene and those focusing on LEV. We need to install, commission, examine, test, maintain and assess together.'

● Book your place at [bit.ly/CJMar22LEV](http://bit.ly/CJMar22LEV)



## Water on agenda at SoPHE event

The Society of Public Health Engineers will host a Technical Conference on 24 March, at the Institute of Physics, a CIBSE Building Performance Award-winning building. The conference has the theme 'Water: meeting the challenges of building designs for the future'.

The event will be a chance to hear experts and advisers speak on regulatory and planning guidance. Industry pioneers will also talk about inventive public health engineering solutions being developed to support sustainability and meet the challenges presented by climate change.

The day will include four sessions, with the latest on water and energy efficiency as critical aspects of mitigating climate change, impacting society and the economy.

A full programme will be available shortly. For more information and to book your place, visit [bit.ly/CJMar22SoPHE](http://bit.ly/CJMar22SoPHE)

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



**VELOGRID**  
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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.

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# A time to regulate?

With increasing attention being paid to cybersecurity across all areas of the economy, the government is consulting on the standards, structure and regulation of the cybersecurity profession. Hywel Davies considers the implications for *Journal* readers

The UK is a global leader in technology, in which we see high levels of investment and a fast-growing workforce. Many areas of the economy and public services are increasingly dependent on technology and the workforce that supports it, so we must remain resilient to cyber risks, especially in the new world we have entered recently.

The government is currently consulting on the regulation of the cybersecurity profession<sup>1</sup>, following the launch, last March, of the UK Cyber Security Council, the professional body to lead the cyber workforce. The government is looking to the council to 'raise the bar, acting as a force to raise standards and to ensure that people working in cyber are properly equipped to protect us from criminal gangs and hostile states'.

The proposals being consulted on 'look to provide clarity within the cybersecurity profession as it stands, [and] embed professional standards and pathways'. More significantly, it says that 'this will recognise cyber as a profession similar to more established fields, such as accounting, law and engineering'.

The ambition is for the UK Cyber Security Council to be 'suitably empowered to be the voice of the profession'. It needs to build governance, establish its leadership, and develop partnerships that can 'achieve and embed clarity in the profession'. The government consultation seeks views on how to do this between 2022 and 2025.

There is also an explicit question about adding cybersecurity practitioners to the list of regulated professions. Interestingly, that includes lawyers and actuaries, but not accountants or engineers. It also fails to list architects, who are regulated under the Architects Act and will face stricter regulation as a result of Part five of the Building Safety Bill.

It is clear that the UK needs the highest standards of professionalism in cybersecurity; indeed, in the current circumstances, it must be a very high priority to secure the UK's digital assets against hostile states as, and then to do all we can to maintain that security. Competent, professional people are vital to that



**"Apart from architects and building control practitioners in the near future, we seem to be content not to regulate any other activity in construction"**

endeavour, and it is essential that they are recognised and have clear standards to meet and maintain.

It is also clear that building services must play a part in this – in particular, that our IT and controls group and the Society of Digital Engineering are closely engaged in this ongoing activity. Those within the sector with an interest in building controls systems and digital engineering should be paying close attention to this consultation and considering how we, as building services engineers, should respond.

There is also a potential irony in these proposals. In the pursuit of public interest, to protect us from hostile actors, the government is clearly prepared to contemplate adding cybersecurity professionals to the list of regulated professions. That may mean engineers working on building controls being regulated in future.

Meanwhile, apart from architects and building control practitioners in the near future, under the Building Safety Bill, we seem to be content not to regulate any other professional construction activity. Not even when the consequences of the unqualified, underqualified or incompetent being given responsibility for certain roles carries the risk of catastrophic failure of a building.

Is it time to reconsider the case for regulating the key professionals who work on 'higher-risk buildings', or other tall or complex buildings? Failure of structural, building services, façade or fire engineering can have severe consequences, as we very well know.

We should wholeheartedly support improved standards of cybersecurity – in buildings and anywhere else. We should also ask, however, whether it is right that the only regulated engineer on a building will be the one dealing with cybersecurity in its systems – or perhaps keeping the information model secure – but not those engineering the actual structure?

#### References:

- 1 Embedding standards and pathways across the cyber profession by 2025 [bit.ly/CJMAR22HD2](https://bit.ly/CJMAR22HD2)
- 2 The European Communities (Recognition of Professional Qualifications) Regulations 1991 [bit.ly/CJMar22HD](https://bit.ly/CJMar22HD)

# FEEDBACK

## Ensuring building safety competence

To promote cultural change, the Industry Safety Steering Group has urged the built environment industry to act ahead of legislation. Professional Engineering Institutions (PEIs) are guiding enhanced UKSPEC Competencies for High Risk Buildings, creating a new category of competency alongside CEng/IEng/EngTech.

Alongside, industry will need to develop a body of knowledge to support these new built environment competencies, and that may be under way.

Might I ask why PEIs cannot introduce additional competencies for all new built environment applicants, rather like a UKSPEC 'Section F', to cover post-construction areas such as first responders, structural and compartmentation awareness, fire and occupant behaviours, reporting obligations, and so on? The PEIs surely have some latitude in deciding what they need for their niche, and more explicit competencies would assist new applicants and promote professional development.

By focusing on high risk, could the knowledge become stratified and is there a limit on how many would choose to become 'high-risk' professionals? So, do we need to focus just as much on new applicants in the built environment engineering professions, and more granular building safety competencies? And would screening new applicants with a new building safety 'Section F' be faster acting?

**Chris Jones**

## Journalist – CIBSE Journal

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Please send a covering email and your CV to both Alex Smith, group editor, alex.smith@cpl.co.uk and Phil Minett, editorial director, philip.minett@cpl.co.uk

# Compliance over complacency

Accurately determining whether or not a life safety product or system is fit for purpose is crucial in maintaining the highest levels of protection in buildings, says **Martin Oates**, of SE Controls and the Smoke Control Association

The tragedy of Grenfell Tower in June 2017 has resulted in several

forthcoming improvement initiatives being proposed and implemented including the Building Safety Bill, the Fire Safety Act, the Building Safety Regulator scheme, and an update to Approved Document B. Despite this, a lack of accurate product information, compliance awareness and complacency remain key contributors to non-compliant life safety products being placed onto the market.



For many years, the use of windows for life safety smoke ventilation (commonly called AOVs or NSHEVs) has been common practice. However, the understanding, application and evidencing of compliance for the product has been poorly applied and policed, resulting in increased risk to occupants should a non-compliant product fail as they attempt to exit the building.

A large contributor to this issue is the accuracy and consistency of sales and marketing collateral, which can often be misleading, resulting in ill-informed procurement and sign-off decisions.

This has been identified by the Smoke Control Association (SCA) which is addressing the issue by setting up a working group to improve the accuracy of commercial and technical information within the industry and passing details to the authorities should companies fail to improve after a request to do so.

The SCA has also implemented a third-party audited installer competency scheme for smoke ventilation specialists (SDI 19) with a requirement that all SCA members possess this qualification.

An NSHEVs guidance document has been produced and, like other SCA guides, it bridges design guides, legislation, product certification, product application and best practice. It is an informative publication for all stakeholders and organisations.

The SCA is committed to the continual improvement of life safety compliance within our industry.

● The guide can be found at [https://lnkd.in/d/gyys\\_jw](https://lnkd.in/d/gyys_jw)

# Pushing the boundaries

With laboratories making up a large proportion of energy use in education buildings, Etch's David Behan MICBSE says engineers should work closely with scientists to improve research processes and cut building emissions

We are currently witnessing a meteoric rise in the demand for laboratory space in the UK. The country has fast become a leading centre for life sciences and is projected to be the third-largest biotech cluster in the world. Life sciences generate £64bn of turnover in the UK and employ more than 233,000 scientists and staff. In a number of key clusters across the UK, demand is starting to outstrip supply.

The complex environmental requirements for scientific research mean labs can be incredibly energy intensive, often 3-5 times<sup>1</sup> more than a standard building and up to 8-10 times more for specialist chemistry or containment facilities. Much of this energy is used for ventilation, but small power requirements represent a significant proportion, particularly for equipment such as ultra-low temperature freezers. As a result, laboratories make up a large proportion of the energy used by higher education institutions. At the University of Oxford, for example, science buildings account for 65% of total energy use.

Construction professionals, and science, research, technology and innovation leaders and researchers are increasingly aware of the carbon footprints of buildings and campuses, and are focused on reducing energy use in laboratories. Universities such as Oxford are keen for designers to consider building life-cycles and include provision for science to evolve while minimising energy use.

Building services design must not interfere with the integrity of the science and should be mindful of cost and space constraints. By working closely with scientists, exceptional energy reductions can be achieved by improving laboratory procedures and processes, and reducing base energy loads.

Take -80°C freezers, for example. Typically, these consume as much energy as a standard UK home when new, and up to three times this as they get older. This doesn't need to be the case. Large amounts of energy can be saved by changing the temperature to -70°C, and increasing freezer size and quantity. These actions will reduce capital and operational expenditure.

Building services engineers can also help reduce energy by: contributing to building massing and façade development; influencing laboratory equipment



**“There is a skills shortage and the sector suffers from a dearth of guidance and regulatory frameworks”**

quantities and location; and optimising mechanical ventilation design, which may incorporate innovations such as fume extract heat recovery, wind-responsive exhaust and demand-based ventilation air change rates.

Engineers are uniquely placed to go beyond their core discipline and challenge the norms of laboratory practice to develop strategies that deliver outstanding designs. However, there are key obstacles to improving laboratory design. There is a skills shortage and the sector suffers from a dearth of technical guidance and regulatory frameworks.

We have worked for many years in laboratory design and have found it to be one in which innovation has not been as prevalent as in other sectors. Passivhaus, for example, has become popular in many other sectors, but has only recently been applied, on a modest scale, in science and research settings.

To deliver innovative buildings in the UK, industry bodies need to produce data and reference material to support designers and scientists. There also needs to be a broader regulatory framework to ensure we compete with global competitors. Investment in science and

research in the UK is dwarfed by the US and China, which each invests more than 12 times as much. The US has a history of producing comprehensive technical guidance documentation via its representative industry bodies. As members of CIBSE, we have a responsibility to share our knowledge and support engineers and building physicists to deliver exceptional buildings.

Several measures are necessary to ensure we learn lessons from the past to deliver low-energy laboratories that facilitate the endeavours of our brightest minds.

It is imperative we use Passivhaus as a design tool to deliver outstanding airtight façades, innovative ventilation design and in-depth equipment selection.

There is a necessity for all of us, as construction professionals, to ‘do better’ when it comes to laboratory design, construction and operation. Time is running out.

#### Acknowledgements:

**Sam Walden**, partner, project management, Bidwells;  
**Adrian Gainer**, director at specialist laboratory designer Novus Space;  
**Tom Yearly**, deputy head of sustainability, University of Oxford

#### References:

1 University of Edinburgh & S-Lab, My Green Lab



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# RETURNING TO THE SPOTLIGHT

## Building Performance Champion and Project of the Year – Public use

**Winner: St John's College, Oxford, Library and Study Centre – Max Fordham**

The brief for this project was to explore options for a carbon-neutral study centre and archive in St John's College, Oxford. Max Fordham designed a building with a stone-clad concrete frame to reduce peak temperatures and stabilise the internal environment, along with roof lights and slot windows to enhance natural lighting. The new study centre has proven highly effective in heat loss regulation and passive ventilation, with the ground floor consistently staying at, or below, 24°C.





CIBSE's Building Performance Awards returned to a new venue in London last month to celebrate the cream of the building services industry with prizes for the best projects, innovations and processes

### Engineer of the Year

**Winner: Mike Burton - Aecom**

Mike Burton was selected for this year's Building Performance Engineer of the Year award because his passion, knowledge and holistic approach make him a shining example in the field of engineering. His achievements over the past four years have been commendable. From his completion of the award-winning BBC Wales headquarters to his extensive work on the Institute of Physics headquarters in London, Mike's portfolio that year demonstrates his trailblazing approach to building performance.

'The depth of knowledge and experience Mike showed was commendable,' the judges said. 'He has great pride in his profession.'



## Consultancy of the Year (up to 50 employees)

**Winner: XCO2**

Net zero can be a difficult goal for consultancies to work towards but, in the past two years, environmental engineers XCO2 have risen to the challenge, putting into practice their core values of relationship-building, equality, creativity and teamwork. The team has done an admirable job of reaching its goals during the pandemic and has made considerable strides in its ongoing zero carbon schemes including Eden North in Morecambe.

Judges said: 'XCO2 kept the low carbon ambition at the heart of everything... a model for repeat success.'

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## Building Performance Consultancy of the Year (51-300 employees)

**Winner: Max Fordham**

The judges described Max Fordham's entry as an 'impressive, passionate submission, with honest real-life data on completed projects' that showed 'substantial engagement with peers and industry.' The panel said the firm 'showed a true commitment to building performance' and had 'a real focus on soft landings methodology and introducing post-occupancy monitoring on every project'. Its sustained engagement with the net zero goal, and commitment to inclusion and diversity, make it an ideal candidate for this award.

Sponsored by Airflow



## Building Performance Consultancy of the Year (over 300 Employees)

**Winner: Buro Happold**

In April 2021, Buro Happold reached its goal of becoming a net zero carbon organisation and is the first of 14 companies selected as Business Champions for the collaborative industry change programme CO2nstructZero. Its continued innovation and commitment to inclusion and diversity made it a standout candidate for this award. The judges were impressed with the firm's versatility, the quality of its data collection tools and its ability to establish itself as a high-calibre consultancy even in the context of the pandemic.

Sponsored by ABB



## Collaboration of the Year

**Winner: FairHeat - Echo Court**

Judges said FairHeat and other contributing teams on the Echo Court heat network project had demonstrated the true spirit of collaboration with the client and contractor. Building an efficient heat network for a large residential scheme is no easy task, but FairHeat rose to the challenge with a truly collaborative approach that capitalised on the strengths of each party. Its industry-leading practices and design processes, combined with Imex's technical expertise and the rigorous goal-setting process put forward by Origin and the Hill Group, led to a heat network that now operates within all nationwide performance and heat-loss requirements.

Sponsored by Lochinvar



## Learning and Development

**Winner: Indo-Swiss Building Energy Efficiency Project (BEEP)**

The Indo-Swiss BEEP student camp is an annual, hands-on educational camp aimed at nurturing the next generation of sustainable building design professionals in India. Originally conceptualised as an immersive in-person workshop, the project took the challenges of Covid-19 in its stride and the end result was an outstanding online educational experience with high attendee satisfaction. Sustainability is central to the camp's ethos, and the judges were impressed with Indo-Swiss BEEP's ability to weave environmental issues into the educational programming of the event.

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## Facilities management

**Winner: Hoare Lea**

Hoare Lea and Legal & General Investment Management's (LGIM's) fresh approach to facilities management made it a clear standout in this category. In collaboration with Hilson Moran, Hoare Lea appointed a technical building performance engineer (TBPE) within each building's FM team who would bridge the gap between landlords and technical teams, a vision that took shape in 2019. The judges were impressed with how information was shared between different parties, and how this encouraged a planning approach that connected design, commissioning and construction. They said the project was 'true facilities management work' and applauded the team's drive to improve the building performance sector.



## Innovation of the Year – Thermal Comfort

**Winner: Knauf Insulation & Knauf Energy Solutions**

Currently operating in two pilot projects in Manchester, Knauf Insulation and Knauf Energy Solutions' groundbreaking sensor technology uses machine learning to measure real energy performance accurately, aiming to bridge the gap between notional and actual thermal comfort levels of existing buildings.

The judges said: 'The product addresses the real-life issue of poor insulation and heat loss. It clearly identifies where improvements can be made... to improve heat loss and occupants' wellbeing and comfort.'



## Product or Innovation of the Year – Wellbeing

**Winner: Water Kinetics - Eco-Duo**

Eco-Duo is the world's first and only pipe-within-a-pipe recirculation system that is guaranteed to keep hot water hot and cold water cold, which is essential for controlling the spread of water-borne pathogens and biofilm, while still being highly energy-efficient. A single Eco-Duo fitting can save 2.27 tonnes of carbon over 30 years, equal to more than 6,800 tonnes per building on average. The judges, who commended the firm for including a whole-life carbon-saving calculation for the product, described the system as 'a novel, innovative product that addresses a real-life challenge robustly.'

[Sponsored by TamLite](#)



## Product or Innovation of the Year – Air quality

**Winner: Signify - Philips UV-C Upper Air Disinfection Luminaires**

Judges called the upper-air disinfection luminaires 'a thoroughly thought through and researched product that addresses the current need to disinfect indoor air'. They commended its novel application of existing technologies to address the threat from Covid-19, and the comprehensive information it provided on the product's operation and maintenance. The luminaires can provide the equivalent of up to 30 air changes per hour, a rate that would be 10 times more expensive using a traditional HVAC strategy, and the lack of active parts makes for minimal ongoing maintenance.



## Project of the Year – Retail/leisure

**Winner: McDonald's Global Flagship - Cyclone Energy Group**

McDonald's at Walt Disney World in Florida, believed to be the world's first quick-service restaurant, has benefitted from a state-of-the-art outdoor dining veranda designed by Cyclone Energy Group, complete with custom-built glass with amorphous silicon photovoltaic (aSi PV) solar cells that are outperforming predicted energy production by more than 200%. In this project Cyclone Group has enabled the building to produce 705,000kWh of energy this year, with a net positive gain of 39,000kWh.

Sponsored by Crane Fluid Systems



## Project of the Year – Healthcare

**Winner: Clatterbridge Cancer Centre - Aecom**

The brief was to design a visually striking 110-bedroom specialist facility that creates a positive, uplifting environment centred on patient and staff needs. The Breeam Excellent design integrated modern methods of construction and standardisation to maximise the building's flexibility and adaptability. It also helped to reduce material wastage, as well as the number of onsite trades required. As cancer patients can be sensitive to light and temperature, the façade systems give good levels of natural light and reduce glare without compromising thermal comfort.



## Embodied Carbon Award

**Winner: Michael J Lonsdale Group**

In the last two years, the Michael J Lonsdale Group (MLG) has acted as a champion of the embodied carbon model in the building performance sector, paving the way for clients and other companies to think critically about their carbon output. MLG's innovative approach to measuring, tracking and analysing embodied carbon figures, as well as its commitment to external knowledge-sharing on the subject, makes the company a standout candidate for this award.

Efficient data processing is a crucial aspect of embodied carbon reduction and the MLG Group has demonstrated a strong commitment to ensuring its methodologies are well adapted to new requirements.





# CIBSE BUILDING PERFORMANCE AWARDS 2022

## CONGRATULATIONS TO OUR



The CIBSE Building Performance 2022 Awards Celebration was held on Thursday 24 February 2022 at Park Plaza Westminster Bridge, London

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## **PRODUCT OR INNOVATION – AIR QUALITY**

UV-C Upper Air Disinfection Luminaires – Signify

## **BUILDING PERFORMANCE ENGINEER OF THE YEAR**

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Mike Burton, Director – AECOM

## **PROJECT OF THE YEAR – HEALTHCARE**

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Clatterbridge Cancer Centre – AECOM

## **PROJECT OF THE YEAR - RETAIL/LEISURE**

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McDonald's Global Flagship – Buena Vista – Net Zero Energy – Cyclone Energy Group

## **PROJECT OF THE YEAR – PUBLIC USE**

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St John's College, Oxford, Library and Study Centre – Max Fordham

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## **HIGHLY COMMENDED**

Active Office – SPECIFIC, Swansea University and Naked Energy

## **EMBODIED CARBON**

Michael Lonsdale Group

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## **BUILDING PERFORMANCE CONSULTANCY (51-300 EMPLOYEES)**

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Max Fordham

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Buro Happold

## **BUILDING PERFORMANCE CHAMPION**

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St John's College, Oxford, Library and Study Centre – Max Fordham

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 @CIBSEAwards #BPA2022

# WALKING THE TALK

To celebrate International Women's Day, **Liza Young** and **Alex Smith** talk to prominent female engineers to find out what CIBSE is doing to make the building services industry more attractive to women



**O**utside building services, CIBSE CEO Ruth Carter has never before been lauded for being a female leader. 'I'm almost dismissive of it because it's something I'm not used to hearing,' she says.

It's not surprising that Carter's arrival last year was deemed worthy of attention. The UK has the lowest proportion of female engineers in Europe, making up only 14% of entrants to engineering and technology first-degree courses and 3.4% of engineering apprentices. Within CIBSE, the figure is 11%.

International Women's Day on 8 March is an opportunity to raise the profile of female engineers and galvanise the industry into making the role more appealing to women.

Carter wants CIBSE to help by 'supporting, nurturing and creating role models' and the Institution is keen for women to take up more positions. At the last Board and Council nominations, it insisted no more than 60% of the reviewed candidates could be of one gender. Although CIBSE didn't hit the target initially, it approached individuals who then

put forward their names. 'It's about walking the talk, proactively encouraging people to come forward,' says Carter.

Attracting women to CIBSE is one of the key aims of Kevin Kelly's presidency, and he believes seeing inspirational women in engineering helps girls realise there are opportunities in building services. It is a strategy he followed at Technological University Dublin, where he raised the recruitment of women from 10% to 15% by sending female engineers into schools. 'CIBSE and its members have a role here with outreach to young people and we look to our women members in particular to help us with this,' Kelly says.

### Leading the charge

The profession and Institution are fortunate to have women in prominent positions who are willing to act as role models. 'Now I am in a position to do so, I believe it is important to put my head above the parapet,' says Laura Mansel-Thomas FCIBSE, senior partner at Ingleton Wood. 'I know I am a rarity, leading, with the partnership team, a 220-person



multidisciplinary consultancy,' she says.

As well as being a CIBSE Board member, Mansel-Thomas is a commissioner on the Essex Climate Action Commission, and a Colchester Ambassador. 'It is so important to

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## SOME PROGRESS, BUT STILL A LOT TO DO

By CIBSE President, Kevin Kelly

Diversity and inclusion is the key theme of my presidency, so I am delighted to be asked to reflect on International Women's Day. CIBSE, as a professional engineering institution, reflects engineering generally, which is heavily dominated by white men in the UK and many other western societies.

Getting more women into our membership is a priority for us and we are addressing this by attracting them to the industry in the first place. CIBSE and its members have a role here, with outreach to young people, and we look to our female members, in particular, to help us with this. Research shows Stem events in schools work in attracting girls to consider career options that they might not have thought about.

Later down the line, supporting career returners (who are disproportionately women) can also help – and that's incumbent on companies and individuals involved in recruiting. We particularly ask firms to consider this, because having a more gender-balanced company, profession and Institution is crucial.

Attracting more women will also help with the skills shortage – plus, there's the role of women as part of the wider diversity agenda.

All the research shows that diversity makes good business sense; more diverse and inclusive organisations make better decisions and have more financial success. Obviously, then, it is important that CIBSE has greater diversity in its networks and in its governance.

We really are making strides here. The growing proportion of women in CIBSE will hopefully encourage more to take inspiration and make their way up the ranks, as our top flight of women engineers are so visible. Additionally, our new nomination process is more transparent, and we received a lot of female nominations this year. So, overall some progress – but still a lot to do.



Kevin Kelly

Clockwise from top left:  
Gita Maruthayanar,  
Mary-Ann Clarke,  
Ruth Carter and  
Laura Mansel-Thomas

seriously once her hair went grey. 'As a woman on site, you are often thought to be younger and more inexperienced than you actually are,' she says.

### Attracting female engineers

Mary-Ann Clarke FCIBSE, chair of the CIBSE HVAC Group and regional director at Aecom, believes awareness of climate change is having a huge impact on girls' career choices. 'As building services engineers, it's in our power to make a big difference to the environment and that's appealing. We are seeing more women than men applying for graduate jobs,' she says, adding that holistic degrees seem to attract more women. 'Traditional mechanical engineering degrees are still seen as male-dominated, whereas architectural engineering is more geared towards the environment, which appeals to a wider range.'

Mansel-Thomas says trades-based and degree apprenticeships are a great way of bringing more women into construction. 'They can attract school leavers looking for opportunities, but also women working on the edge of construction, in administrative roles, with all the skills and experience to become, for example, project managers,' she says. The Stemazing scheme could help, too, as it empowers women in construction to deliver Stem sessions to primary-aged children.

To encourage women back to work after maternity and career breaks, firms must be more supportive, says Maruthayanar: 'Women can be nervous about leaving their children at home, and the job may evolve while they are away. There should be help to bring employees up to speed. Women should not feel ostracised.'

### A broader appeal

The drive to increase female representation is bearing fruit, and now nearly a quarter of CIBSE volunteers – and 40% of Board officers and co-options – are women. Of the 92 full-time students who have joined CIBSE since 1 January 2022, 23% are women.

Carter is proud of the way in which the Institution is broadening its appeal, but says more can be done. 'All we're asking is that organisations ignore gender, and take people on merit,' she says. [C](#)

be seen as an example,' she adds.

As chair of CIBSE Home Counties North West Region, Atelier 10 associate director Gita Maruthayanar MCIBSE hopes to encourage more women to participate in her Region by overseeing a committee that has an even split of men and women. She says women offer a different perspective in meetings: 'They can be more empathetic and are good listeners.'

Maruthayanar adds that she has had to work with 'quite old school' men in her career, who haven't been used to women. Her advice is to be understanding and always talk. 'It can take time, but people do change,' she says.

Despite being mistaken for the architect at site meetings, Mansel-Thomas says she has had a largely positive experience as a woman in engineering and construction.

'Much of this is due to working on large projects with big contractors, who were ahead of the curve in terms of diversity and inclusion,' she says. However, a female architect once told her she was taken more

# DELIVERING ON THE NET ZERO PROMISE

Organisations are setting ambitious 2030 targets in response to the climate emergency, but how do they decarbonise property assets in such a short period of time? **Andy Pearson** looks at how SNC-Lavalin is using data to assess buildings and set clients such as HM Treasury on the road to net zero



**I**n June 2019, the UK government passed legislation committing it to achieving 'net zero' greenhouse gas emissions by 2050. For most councils, some of which had declared a climate emergency, the government's target was not ambitious enough. In fact, almost two-thirds of councils in England are aiming to be carbon neutral ahead of 2050, some as early as 2030. It is a worthy commitment and an ambitious target.

It's not just local authorities that are setting progressive carbon targets; some universities, too, have committed to be net zero in advance of the 2050 target. The University of Bristol, for example, has pledged to become carbon neutral by 2030.

The challenge faced by these large organisations, many with large numbers of properties, is to know how best – and most cost-effectively – to decarbonise their estate to meet their carbon aspirations.

One solution being promoted by consultancy SNC-Lavalin is its Decarbonomics initiative, a commercial, data-driven service, aimed at helping public and private sector clients to assess how to decarbonise their properties to meet their carbon commitments.

'Decarbonomics gives a helicopter view of how a portfolio is currently performing, and the property improvements that will require investment – over what period of time – to achieve a carbon target,' says Stephen MacLoughlin, regional director, Faithful + Gould (a member of SNC-Lavalin Group), and the venture's building retrofit workstream lead.

Decarbonomics is a key aspect of SNC-Lavalin's work with the Government Property Agency (GPA), as part of its net zero and life-cycle replacement programmes framework. 'It empowers clients to make



much more informed decisions about their decarbonisation investments,' adds MacLoughlin.

There are three steps to SNC-Lavalin's Decarbonomics approach: benchmarking, roadmap and delivery.

## Benchmarking

An initial benchmarking exercise is undertaken to gain a detailed understanding of how a portfolio of properties is performing. This can be a relatively straightforward exercise when a client has three years of half-hourly energy data to show use profiles across the day, week and year. 'If the data is in good order, we can feed it into our digital tools to create a dashboard,' says MacLoughlin.

Not all clients have detailed energy data, however. 'Quality of data can be an issue. There might be gaps in the data or insufficient detail, for example, so we'll have to work with a client to determine the best



HM Treasury is using SNC-Lavalin's data-driven Decarbonomics service to try to reach its net zero targets

"A big part of the Decarbonomics solution is to make sure that all the systems work together holistically, and that the systems run efficiently"

## CASE STUDY

How Decarbonomics is being used to reach net zero carbon on a portfolio of 1980s office buildings, a data centre and warehouse in southern England.

### Planned net zero retrofit works:

- External wall insulation and improved airtightness
- Roof-mounted PV array
- Air source heat pumps and thermal store to replace gas-fired boilers
- Replace 60% of heat emitters so they are compatible with lower LTHW heating flow and return temperatures
- Dedicated high-temperature ASHP to minimise the risk of legionella in HWS
- Updated BMS with enhanced functionality
- Upgraded electrical supply from DNO
- Planning permission, including meeting acoustic criteria, for adjacent homes
- Contractor appointed for works in summer 2022 (outside of heating season), managed by incumbent FM provider
- FM provider engaged during energy survey and data analysis stage.

### Delivered net zero retrofit works:

- Two-month project to replace 2,000 luminaires with efficient LEDs, coupled with a Wi-Fi enabled control system, while building remained occupied to deliver a forecast lighting energy saving of 75%.



way to understand the carbon performance of its buildings,' MacLoughlin explains.

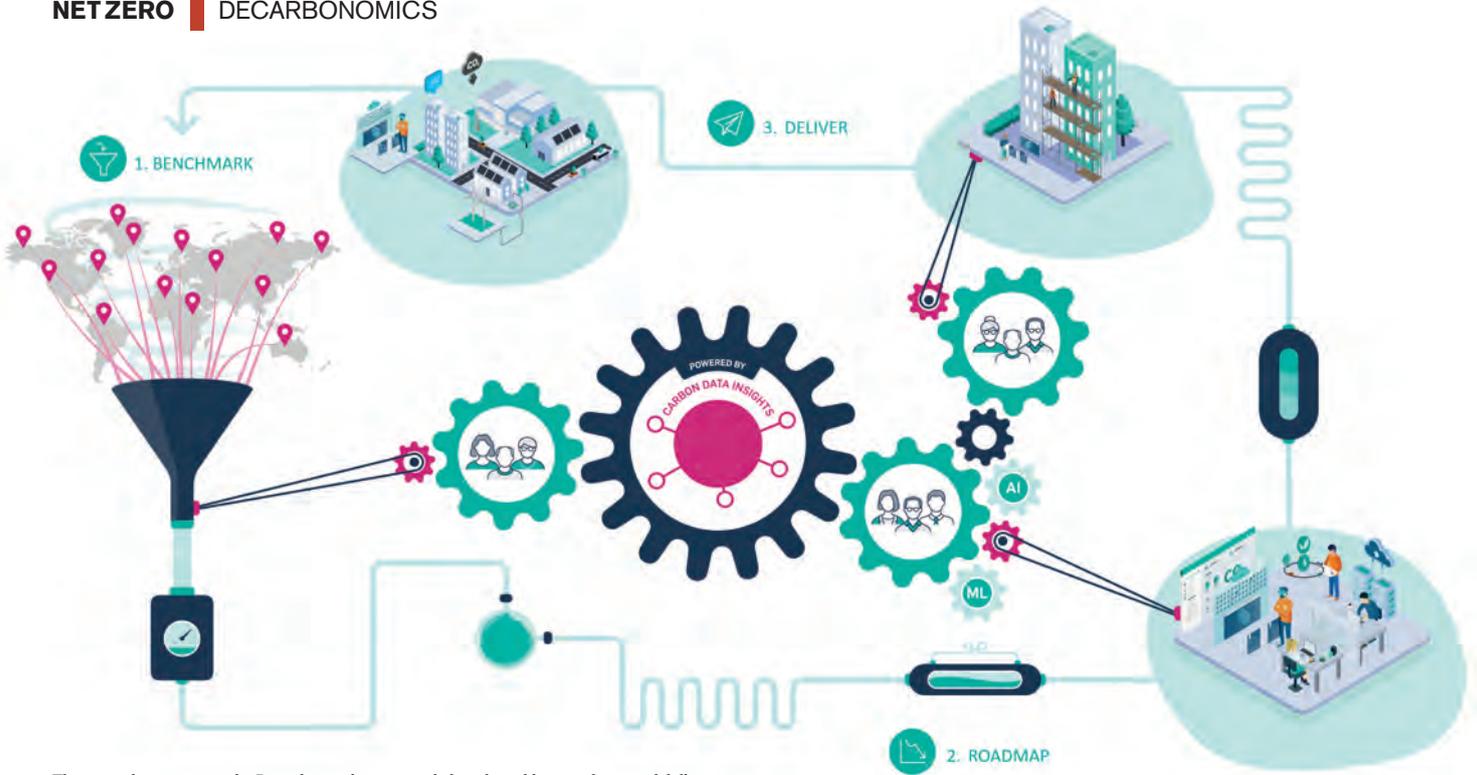
Gas and electricity consumption data are used to provide a baseline of kilowatt hours consumed. This raw data is then contextualised based on a building's internal floor area and information such as

weather data and details of how the building has been used over the three years of energy data, which is likely to have impacted energy consumption.

'The baseline is made up of the statistical analysis of the consumption data, but also a qualitative description of the use of the building so that you can compare carbon performance pre- and post-intervention on a like-for-like basis,' says MacLoughlin.

Once the data is ordered, SNC-Lavalin uses it to benchmark a particular building's energy-use profile against similar properties in similar climates, to see how it compares against the industry average. To do this, the consultant uses data from CIBSE TM46 *Energy benchmarks* and from its own project database.

Knowing where and why energy is being consumed is one part of the benchmarking exercise; knowing the most effective interventions to reduce operational carbon emissions is another. Before the delivery



There are three steps to the Decarbonomics approach: benchmarking, roadmap and delivery

» stage of Decarbonomics, SNC-Lavalin undertakes a site survey to assess the condition of the properties in the portfolio. ‘In scoping the work for a particular project, our engineers and surveyors go to site to identify the opportunities to improve carbon performance,’ MacLoughlin explains.

In its work for the GPA, for example, SNC-Lavalin had a building services engineer and a building surveyor visit various sites to undertake a detailed survey. ‘The surveyors would already have the energy consumption data, so they would be looking at the condition and performance of the building fabric and M&E systems, to see what measures could be retrofitted,’ he says.

The performance benchmark data for a portfolio of properties is presented to the client using a Decarbonomics dashboard and this is key to the next stage of Decarbonomics – the roadmap.

**Roadmap**

The roadmap is intended to show a client how its buildings can get from their current carbon performance to the level that will enable them to reach their final performance destination. ‘Data from benchmarking allows us to develop the roadmap to enable the client to make informed decisions,’ says MacLoughlin.

Perhaps the most fundamental question that needs addressing at the outset is whether the estate and its make-up is right for a client’s needs, both now and in the future. ‘Do they have the right floor area where it is needed, because Covid has caused many organisations to review their

“Quality of data can be an issue... so we’ll have to work with a client to determine the best way to understand the carbon performance of its buildings”

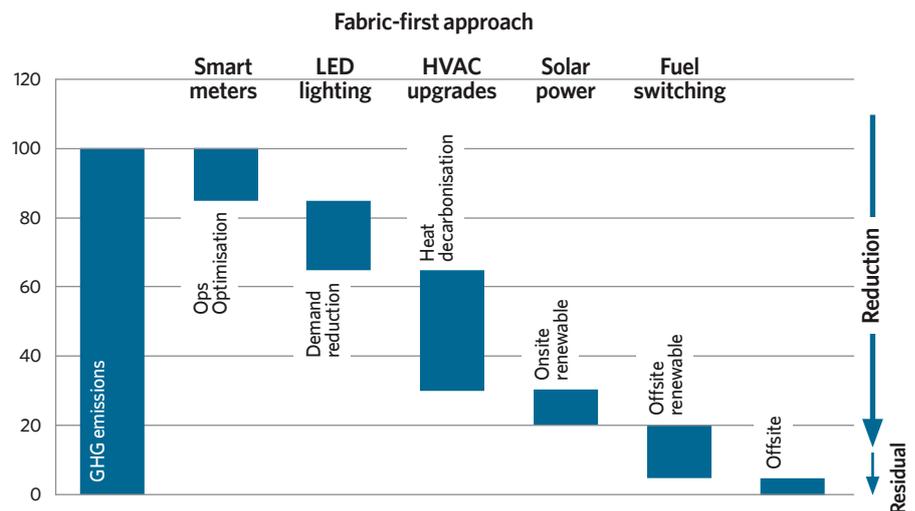
estates in the light of new working practices,’ asks MacLoughlin.

Having decided on the make-up of an estate, SNC-Lavalin then uses what MacLoughlin describes as a ‘systems-based approach’ to assess potential interventions.

‘We’ll look at the impact of interventions to a building’s fabric to reduce heating and cooling loads, whether that’s through adding insulation, replacing windows, adding solar shading or improving airtightness,’ he explains.

‘Once we’ve done that, we’ll end up with a lower residual load that the HVAC systems then need to meet; then we’ll look at decarbonising heat, perhaps by replacing gas and oil-fired boilers with air source heat pumps, which may also

**GPA net zero programme – path to net zero**



The GPA uses Decarbonomics in its net zero and life-cycle replacement programmes framework

have an impact on the ventilation and hot-water systems.'

This systems-based approach includes a review of the building's control systems and BMS. MacLoughlin explains: 'We have to ensure the systems are right for the retrofit interventions we're implementing and that they are optimised.' He adds that a big part of the Decarbonomics solution is to 'make sure all the systems work together holistically and that the systems run efficiently'.

Another aspect of Decarbonomics, which is not systems-based, is ensuring a site's facilities management (FM) team is engaged in the planned journey to net zero. Across the government estate there are incumbent FM providers. Often, they hold the energy data records, so SNC-Lavalin will engage with them at an early stage in the process. 'We need to ensure their buy-in and understanding, so that they can run the building as efficiently as intended,' MacLoughlin says. 'If they don't take advantage of the interventions, you are not going to get the projected performance improvements.'

According to MacLoughlin, there are many routes a client can take to achieve net zero. The one selected will depend on the cost of work needed, timescales, money available, and the final carbon destination.

As a cost consultant, Faithful + Gould is able to access cost information from its

database of retrofit measures. Using the dashboard allows SNC-Lavalin to look at the impact of different cost and programme options with their client, and to assess their potential impact on energy consumption, carbon emissions and financial savings.

'We can say "if you're looking at a 10-year programme, this is how much it will cost you per year, these are the savings per year, so you could go this way, or that way";' MacLoughlin explains.

For a more in-depth consideration of various alternatives and options for one of its central government clients, SNC-Lavalin is using a digital twin created with IES Intelligent Communities Life-cycle software. A digital double enables the consultant to test different scenarios, to understand the most effective and coherent carbon-reduction strategy for a client's built assets. 'We have

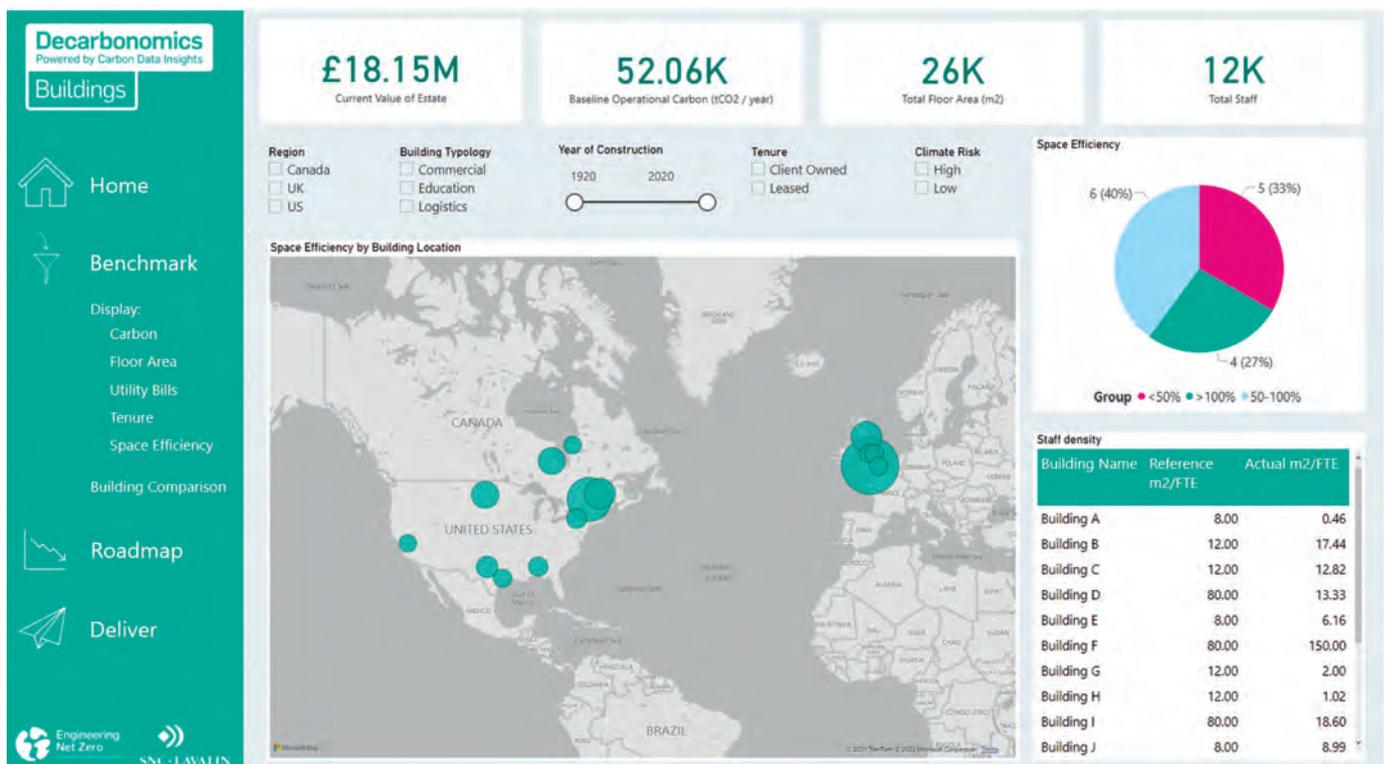
**"We need to ensure the FMs' buy-in... if they don't take advantage of the interventions, you are not going to get the improvements"**

the actual energy consumption data, so we can align the model with consumption data. Using computer modelling and the program's AI, we can look at the impact of different interventions, such as improving U-values of walls and windows, so we'll get an accurate assessment of the impact of these improvements,' MacLoughlin says. 'Our client has more than 800 properties; we're using the digital twin across about 20 typical build types, which we then extrapolate across the portfolio to inform prioritisation of retrofit measures – its proof of concept.'

**Delivery**

Delivery of Decarbonomics interventions – including the appointment of contractors – is the responsibility of the client. 'Our role during the delivery stage is as consultants, to provide programme, project management and technical support during detailed design, construction, commissioning and handover,' says MacLoughlin.

After handover, SNC-Lavalin will measure and verify the results of its interventions. It does not guarantee performance improvements, although MacLoughlin says it is in discussion with one government client about a performance-based contract. Guaranteed or otherwise, with many large organisations aiming for net zero carbon emissions by 2030, SNC-Lavalin should have a lot of interventions to verify. **CJ**



A client's Decarbonomics dashboard

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## Cooling matters at World Refrigeration Day 2022

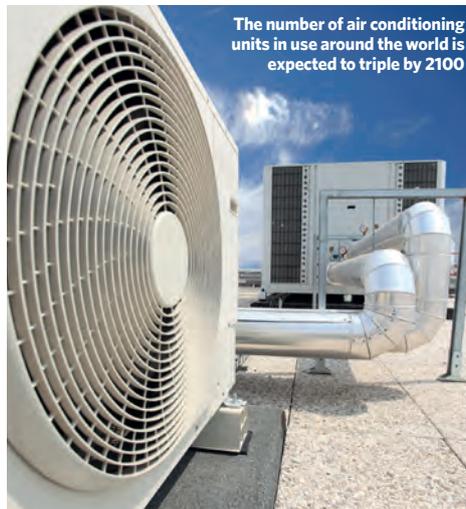
Maintaining and operating systems efficiently are among the most important actions we can take to address climate change

'Cooling Matters' has been announced as the theme for World Refrigeration Day 2022, on 26 June. At a side session held during the 2022 AHR Expo in Las Vegas, founder Steve Gill said the objective was to 'make the public aware of cooling's essential benefits, how cooling impacts daily life, and how technology choices foster environmental wellbeing of future generations'.

According to the secretariat, there is a lack of public understanding of cooling's importance. This is despite policies, standards and codes relating to the refrigeration and air conditioning industry, and issues such as refrigerant transition, emissions reduction, and maximising energy efficiency being addressed by governments for decades. Gill said: 'The public can make choices that minimise environmental impacts when they select, operate and maintain cooling equipment.'

According to the International Energy Agency, the average efficiency of air conditioners sold today is less than half of what is typically available on the shelves – and one-third of best available technology.

Ayman Eltalouny, of UNEP OzonAction, said there are 3.6 billion cooling units in use



today, but this is expected to be 9.5 billion by 2050. 'If left unchecked, emissions from cooling appliances are expected to double by 2030. They will triple by 2100, driven by heat waves, population growth, urbanisation and a growing middle class. Moving to best available cooling technologies would reduce cumulative emissions by 38 gigatons of CO<sub>2</sub> emissions by 2030.'

Gill added: 'Cooling Matters will tell the story of how... cooling technology choices can safeguard the wellbeing of future generations.'

● For details of World Refrigeration Day, visit [worldrefrigerationday.org](http://worldrefrigerationday.org)

## US AC use could cause blackouts

Household air conditioning use in the USA could exceed electric capacity in the next decade as a result of climate change, leading to summer blackouts, a new report has claimed.

The American Geophysical Union (AGU), a group of earth, atmospheric, ocean, hydrologic, space and planetary scientists and enthusiasts, has calculated that average US households can expect up to eight days without air conditioning in the summer if steps are not taken to expand capacity, increase efficiency and mitigate climate change.

The study projected summertime use as the global temperature rises 1.5°C or 2°C above pre-industrial levels, finding demand in the US could rise 8% at the lower threshold and 13% at the higher threshold. Published in AGU's journal *Earth's Future*, the study also found technological improvements in the efficiency of home air conditioning appliances could supply the additional cooling to achieve current comfort levels after 2°C global temperature rise without increased demand for electricity. It claims that, without enough capacity to meet demand during heatwaves, utilities may have to stage blackouts to avoid grid failure.

'We've seen this in California already – state power suppliers had to institute blackouts because they couldn't provide the needed electricity,' said Renee Obringer, environmental engineer at Penn State University and lead author of the study.

● The report is available at [bit.ly/CJMar22AGU](http://bit.ly/CJMar22AGU)

## Chiller plant using reclaimed R134a

Up to 400,000kg per year of reclaimed R134a is being used at Daikin Applied Europe's heat pump and chiller plant in Cecchina, near Rome, according to the manufacturer.

The company joined Daikin's Loop circular economy programme at the end of last year. First launched by Daikin Europe in 2019, with the use of R410A at its VRV air conditioning factory in Ostend, the scheme has now been adopted for R134a. It ensures the continued availability of R134a, avoids its environmentally and financially costly end-of-life destruction and, being reclaimed, is not included in the European F-Gas quota system, Daikin claims.

## Carrier to acquire Toshiba Carrier HVAC business

Carrier has signed a binding agreement to acquire Toshiba's ownership stake in the Toshiba Carrier air conditioning business.

In a deal reportedly worth \$870m, the acquisition will include all of Toshiba Carrier's research and development centres and global manufacturing operations, product pipeline, and the long-term use of Toshiba's brand. Toshiba's train air conditioning business is not subject to the transfer.

The acquisition is expected to close by 30 September, subject to customary closing conditions, including regulatory approvals. Toshiba will retain a 5% ownership stake in Toshiba Carrier Corporation, and Carrier will consolidate more than \$2bn in unconsolidated revenue.

## Data centre cooling range launched

To address efficiency and scale challenges faced by colocation and hyperscale data centres, Airedale by Modine has launched a precision cooling range.

With capacities of up to 1MW, SmartCool ONE includes a deep chilled-water coil that delivers a large surface area for maximum cooling capacity, with low- and high-flow coil geometries to optimise pressure drop, claims the manufacturer. Backward curved 630mm EC fans ensure the coil capacity is matched with powerful airflow to deliver on this potential, with a modified fan plenum to improve operational efficiency, it adds.

The range is optimised for operation with lower approach temperatures and higher water-side Delta Ts, with return air temperature range 28–45°C.

# Q-TON DELIVERS LOW CARBON HOT WATER FOR CITADINES HOTEL



A London hotel has recently upgraded its hot water generation plant using the Q-ton air-to-water heat pump system from Mitsubishi Heavy Industries (MHI).

The Citadines Holborn-Covent Garden London originally had gas-fired boilers, which provided potable hot water to the apart'hotel's 192 apartments and communal breakfast area. Citadines required a replacement that could provide water at high temperatures, whilst ensuring minimal environmental impact. The project at Citadines Holborn-Covent Garden, part of The Ascott Limited portfolio - CapitaLand's wholly owned lodging business unit – is part of CapitaLand's 2030 Sustainability Master Plan targets.

As part of the Master Plan, a phased installation will also see the Q-ton system deployed at four other Citadines sites across the capital, in Islington, Barbican, South Kensington and Trafalgar Square.

## Ideal product

Ryan Jules, regional maintenance manager at The Ascott Limited UK, who hired KiPO Consultancy to assist with the key sustainability carbon reduction project, said:

"This a significant investment and action towards meeting both the UK Government and CapitaLand's 2030 Sustainability Master Plan target of a 78 per cent reduction in carbon emissions by 2035, for the UK Government, and 2030 for CapitaLand." Martin Craxton, of consulting engineers KiPO, worked closely with Citadines to develop a complete renewable solution for the hotel chain. He said: "Q-ton is an ideal product for commercial water heating applications. It uses CO<sub>2</sub>, a natural refrigerant with ultra-low global warming potential, to produce hot water ranging from 60-90 °C. Q-ton holds efficiencies when operating right up to 70 °C, which is required by the hotel to combat legionella growth."

"Whilst the Q-ton solution was marginally more expensive on capital costs than the traditional gas-fired as alternative, the client was willing to make this extra investment, demonstrating their commitment to sustainability.

Central London's atmosphere is now rid of the hotel's 600 kW of gas-burning emissions. Q-ton holds its capacity down to -7 °C ambient and still provides full operation at -25 °C."

Unlike water heaters using gas or oil, renewable heating systems are not usually designed for instant hot water. Instead, KiPO designed the system using a method known as energy accumulation to meet the apart'hotel's usage profile and peak load. The heat pump generates the energy, and a thermal store holds the hot water until it is used. Principal contractor Nationwide Air Conditioning installed three Q-ton heat pump units and six 1000-litre storage vessels at ground level while the original gas-fired water heaters at the roof level were still in use. The transition to the new system took just a few hours towards the end of the project, ensuring minimum disruption to the property. Nationwide Air Conditioning was supported throughout the installation by the MHI specifications team. This included online design, training, system design schematics, a pre-commissioning site visit and assistance with final commissioning.

**"As a modular system, Q-ton is simple to install and commission, with minimal wiring and straightforward controller setup"**



## Overview

-  A 30kW modular heat pump
-  Operates using CO<sub>2</sub> – a natural refrigerant with a GWP of less than 1
-  Produces leaving water between 60 °C - 90 °C
-  Operates at -25 °C ambient temperature
-  No loss in capacity to -7 °C
-  Achieves three BREEAM design points
-  Remote monitoring available
-  WRAS approved

**If you would like to discover how Q-ton can meet your specification requirements, please visit:**

<https://mhi-hvac.co.uk/our-products/q-ton-water-heating>

Daniel Valente, project manager at Nationwide Air Conditioning, said: "The support provided by the MHI specifications team throughout the design and installation period made the project very straightforward. As a modular system, Q-ton is simple to install and commission, with minimal wiring and straightforward controller setup. On commissioning it was evident that the Q-ton equipment was more than capable of producing hot water at 70 °C, and the 6000 litres of storage ensured that the system could cope with periods of peak hot water demand.

"We look forward to installing and maintaining many more Q-ton systems in the future and can see them becoming a crucial tool in collectively reducing CO<sub>2</sub> emissions across many industries that generate large quantities of domestic hot water."

**Perfect operation**

In addition, the building is equipped with a Q-ton Remote Monitoring System (QRMS), a tool that monitors Q-ton's operation, provides the team with a quarterly report comparing energy usage and efficiencies against gas and electric equivalents and self-analyses to highlight any potential operation or maintenance requirements.

Germana Genovese, residence manager at Citadines Holborn Covent Garden, said: "We are delighted to be using heat pump technology as a primary method for our hot water generation. The Q-ton's operation has been perfect, and we're looking forward to seeing how efficiently the system works during its first winter compared to the gas boilers we previously had. Everyone needs to do their bit to help achieve the government targets of net zero and we are proud to play our part."



Three Q-ton modules designed and installed inside a plant room with sufficient air flow



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# DUAL PURPOSE

Switching between modes in dual evaporative coolers can result in large operational savings, according to a recent *B&SERT* paper. **Tim Dwyer** looks at the latest research on hybrid direct and regenerative evaporative cooling

**A**lthough particularly effective for drier climates, the simple direct evaporative cooler (DEC) is successfully employed in many climates to reduce incoming outdoor air dry-bulb temperature towards its wet-bulb temperature, as discussed in CPD 135, in the November 2018 *CIBSE Journal* CPD special. This has the benefit of not requiring mechanical cooling devices. However, as the dry-bulb temperature is reduced, the associated increase in absolute humidity of the cooled air may not be desirable in some situations.

Various forms of indirect evaporative coolers (IEC) overcome this, where cooling is provided from the evaporation of water into a secondary airflow, from a continuously wetted surface running along the channel length of a heat exchanger. This reduces the temperature of the water film and the dry-bulb temperature of the secondary air that is separated by a thin, impervious heat-transferring layer/membrane from the counterflowing primary system air, which is then cooled by passing over the low-temperature heat-transfer membrane surface.

Both primary and secondary airflows often originate from the same outdoor air, and the secondary air will be typically rejected to outdoors after it has achieved its work of cooling the membrane by absorbing the evaporated water vapour.

The primary airflow is cooled towards the wet-bulb temperature of the entering air, but gains no humidity, so it is a sensible cooling

“The cooling energy in the DEC mode is higher than REC, so the direct mode may be more suitable for places with high sensible heat loads where the increase in moisture content is not an issue”

process, often referred to as ‘dry cooling’, but is less effective than a DEC. (James Falconer discusses such systems in ‘Making the case for evaporative cooling’ in June 2017 *CIBSE Journal*.)

The so-called ‘regenerative evaporative cooler’ (REC), based on the principles as variously published by Maisotsenko<sup>1</sup> (and sometimes referred to as an ‘M-cycle cooler’) is a development of the IEC. The secondary airstream in an REC is supplied by splitting off a proportion of the conditioned air from the outlet of the primary airstream and enables the cooler to reduce the outlet primary air towards its dew-point temperature (ie, cooler than its wet-bulb temperature). This is discussed in ‘Clothes to zero’ in the March 2018 *CIBSE Journal*, with examples showing how it can be applied to satisfy cooling loads in a wide range of climates.

This technology continues to be developed, both by academics and commercially, and a recent research exercise, reported in *BSER&T*, provides a useful reminder of the growing interest in applications



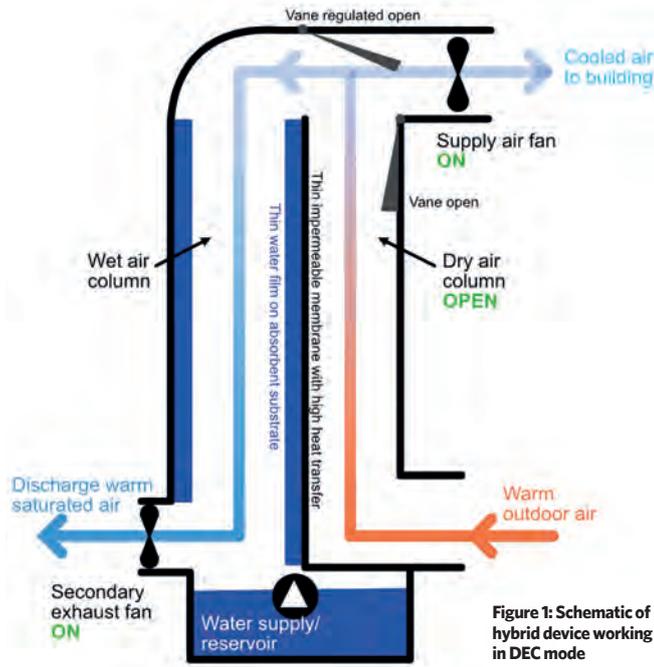


Figure 1: Schematic of hybrid device working in DEC mode

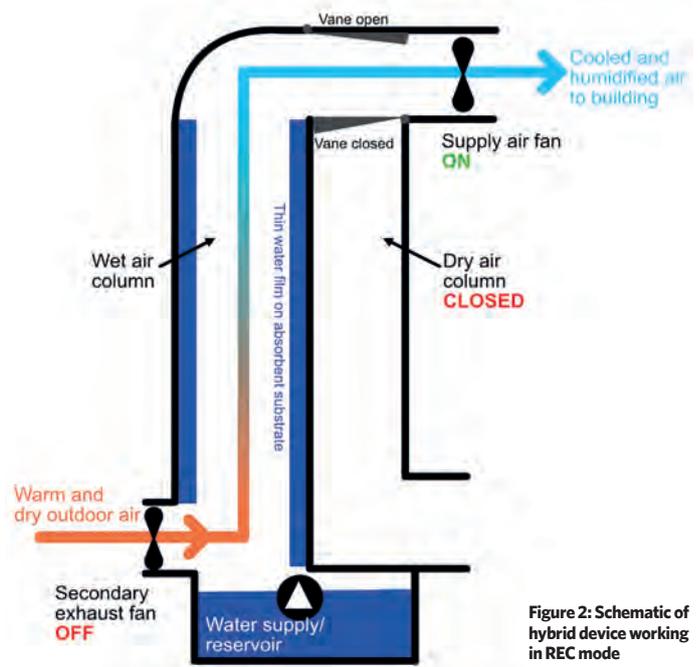


Figure 2: Schematic of hybrid device working in REC mode

» of regenerative evaporative cooling for air conditioning purposes.

This work considered a prototype of a dual-mode evaporative cooler (a two-in-one device) that can operate in either direct or regenerative mode, depending on the seasonal climatic condition. The paper reports on exergy and economic analyses that were performed to check the suitability of both modes of operation, direct and regenerative, for cities that are indicative of five international climate zones. The dual-mode cooler works in either REC or DEC mode, depending on the outside condition. There is a reversible-flow wet air column used in both DEC and REC mode, and a dry air column only employed for REC mode – the flow arrangement being dependent on the positions of the two vanes and actuation of secondary air exhaust fan, as shown in Figure 1 and Figure 2.

In DEC mode, the air is cooled and humidified by passing only through the wet channel (with the secondary exhaust fan off). In REC mode, the outdoor air is cooled sensibly. A proportion of this cooled dry air is sent to provide space cooling and the remaining fraction of the air is drawn by the exhaust fan through the wet channel, where it is humidified and further cooled and discharged to atmosphere. The dual-mode evaporative cooler can be switched from DEC mode to REC mode and vice versa as the outdoor air conditions change.

Sketch psychrometric processes for both modes of operation are shown in Figure 3.

The month-by-month analysis indicated that the cooling energy in the DEC mode is higher than REC, so the direct mode may

be more suitable for places with high sensible heat loads where the increase in moisture content is not an issue – such direct evaporation methods are often used in applications such as data centres.

The exergy efficiency for REC mode is higher than DEC mode and independent of the climatic zone. However, the annual cost of operating the REC mode is always higher, being significantly affected by electricity charges. The paper shows that, with automated switching operation (based on incoming air wet-bulb temperatures) to select between the DEC or REC mode, significant operational savings can be made, particularly in a composite climate zone, as across large parts of mid-northern India. **CJ**

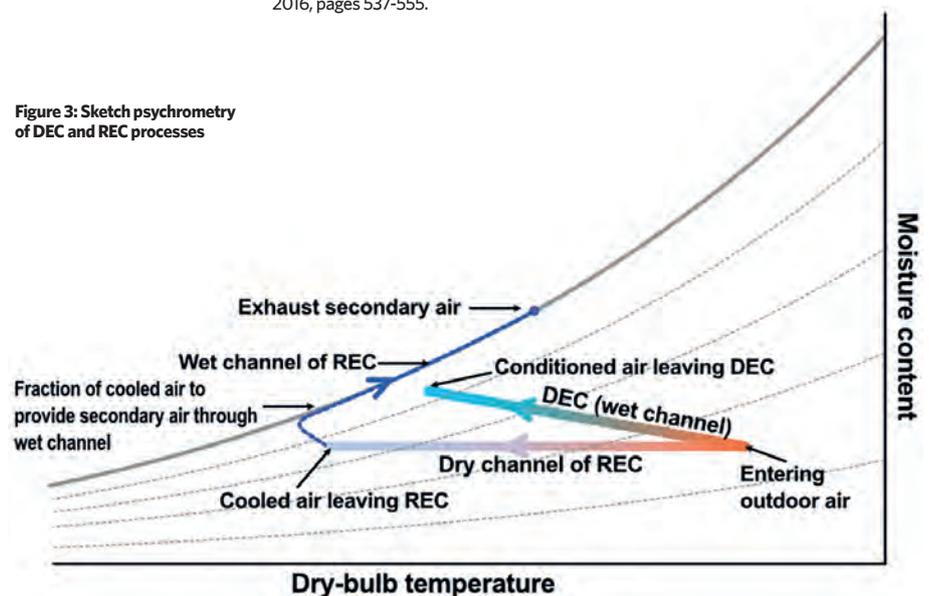
■ The full paper – *Energy, exergy and economic assessments of the dual-mode evaporative cooler for various international climate zones* – by Sarvesh Kashyap et al of the Indian Institute of Technology (BHU), Varanasi, India, may be seen in *BSER&T* at [bit.ly/CJMar22BSERT](http://bit.ly/CJMar22BSERT)

■ **TIM DWYER** is *CIBSE Journal* technical editor and *BSER&T* managing editor

**References:**

- 1 Mahmood M et al, Overview of the Maisotsenko cycle – A way towards dew point evaporative cooling, *Renewable and Sustainable Energy Reviews*, Volume 66, December 2016, pages 537-555.

Figure 3: Sketch psychrometry of DEC and REC processes



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# CLEAR FOR ACTION

In the early days of cinema, the UK's biggest studios were in central London, but pervasive fog – 'pea-soupers' – was entering film sets and causing huge disruption. Richard Farmer describes how pioneering air cleaning techniques saved the studios



A scene from *Sailors Don't Care* at the Gaumont-British studios in London's Shepherd's Bush in 1928

**F**ilm studios were developed in the early decades of the 20th century, in part to offer shoots a degree of protection from the vagaries of the weather. British film-makers, however, found that studio-based production was not a solution to all their weather-related problems.

Located, for the most part, in London, the British film-production sector had to contend with that city's most notable meteorological occurrence: fog. The heavy, industrial-era fogs of the Victorian period – known as 'pea soupers' or 'London particulars' – formed when moisture in supersaturated air (for example, mist) condensed on particles of largely man-made smoke, and persisted well into the 20th century. They were most problematic during the winter 'fog season', which lasted from November to March.

Film producers found that fog worked its way inside the studio, where it disrupted shooting. Even a light fog was visible to the camera – more so than to the human eye – and it was not unusual to lose whole days of filming, and significant amounts of money, to fog. A solution needed to be found if the industry was to remain operational all year round and compete with films made in other countries. Some producers decamped to warmer, clearer climes in the winter, with the French Riviera proving particularly popular. As one director grumbled in 1922, Britain's winter climate meant that, for months each year, 'British pictures can be produced abroad better than they can be in Britain'.

Technological solutions were sought that would permit production to continue closer to home. Heating the stages reduced the relative humidity of the air and prevented water vapour condensing into fog.

It also had the effect of evaporating fog that entered the studio from outside.

The Whitehall studios, at Elstree, boasted an underfloor heating system – 90 pipes of 2in (50mm) diameter – which prevented fog from interrupting filming. Together with the heat given off by powerful electric lights, this could make studios extremely hot, and when *Chu Chin Chow* (1934) was made at Islington, some technicians worked in a state of near undress.

London's industrial fogs also contained particles of pollution, however, that remained in the air even after the water had evaporated. These were visible to the camera, so studios were compelled to clean the air that entered, and then circulated around, their production spaces. Various solutions were proposed, including pressurising the studio environment to prevent fog ingress, and using a direct current brush discharge ioniser to 'bring down soot particles'. This latter idea was never implemented, probably because, as one trade paper noted, such equipment was 'not altogether without effect upon human beings... Drowsiness and nervous symptoms are believed to be sometimes brought on by it'.

More effective, and safer, were air conditioning systems, the first of which was installed at the Famous Players-Lasky studios in Islington – a location described as 'the very worst position for fog in the whole of London'. When the studio opened in the spring of 1920, high- and low-pressure coils were installed on opposite walls of the stages to move foggy air towards the roof, where it was expelled by an exhaust fan. Initial tests found that, even when the fog could not be dispersed entirely, it could be raised to a height of 15 feet (4.5m) above the floor, allowing production to continue underneath.

The system proved unable to cope with heavy fogs, though, and 20 days were lost during the studio's first year. Consequently, a new system was installed. Designed by W E Riley – who, as London County Council's chief architect, had helped design the London Underground's ventilation plant – and S L Groom, of the Carrier air conditioning company, the system consisted of an air washer that circulated up to 3.5 million cubic feet of air per hour (275 m<sup>3</sup>s<sup>-1</sup>). It drew air from

“Particles of pollution remained in the air even after the water had evaporated. These were visible to the camera, so studios were compelled to clean the air”

outside and washed it to remove airborne particulates. The spray water was from the water company’s mains, at a temperature of around 35°F (2°C), and reduced the air to close to its dew point, 100% saturation. This cooling process removed moisture from the air, which was then reheated to prevent condensation by counterintuitively employing a spray washer. This ensured a comfortable working environment. The system was automated to maintain reasonable conditions inside the studio as weather conditions and internal loads varied.

In Shepherd’s Bush in 1927, the Gaumont-British studios were fitted with plant that extracted impurities from the air by means of fabric filters – a process that was developed by engineering firm Hall & Kay for use in Lancashire cotton mills. Gaumont-British had first encountered it while filming *Hindle Wakes* (1927) on location in Manchester. So effective was the Hall & Kay plant that the company boasted, in December 1930,



A significant number of days’ filming were lost to London pea soupers infiltrating film studios

that not a day of filming had been lost to fog since it had been installed.

From the early 1930s, the British film industry trade press carried fewer reports detailing the technical specifications of fog-dispersal plant, assuming that its readership was already familiar with such equipment. Continuing an earlier trend, new studios were erected outside the London ‘fog zone’ – at places such as Denham and Pinewood – and the importance of air clarity to the production of high-end productions meant these were also fitted with fog-dispersal plant.

A combination of fewer fogs, the installation of air cleaning equipment, and the construction of new studios in less fog-prone areas meant reports of disruption by fog became fewer and further between as the 1920s and 1930s progressed.

Given the efforts to which British film-makers went to keep fog out of the studio, it is ironic that numerous types of artificial fog were developed for use in the production of British films. To capture London as it actually was and as it existed in the cultural imagination (Peter Ackroyd has claimed that the London fog became ‘the world’s most famous meteorological phenomenon’), filmmakers often included fog in their production design, seeking a replacement that looked like the real thing, but that was more biddable and photogenic.

The techniques used to create artificial fogs evolved from bonfire smoke controlled by blankets via steam and the application of filters or chemical solutions to the camera lens, to the vaporisation of diesel and increasingly sophisticated chemical fogs, with some technologies being imported from other countries. Three kinds of synthetic fog were used during the filming of *Rent the luck of the sailor* in 1934. Fake fog, like the meteorological phenomenon it mimicked, could also be injurious to health. Actors found that it irritated their eyes, noses and throats, while some crew resorted to wearing gas masks to counter its effects.

The fogs that plagued London into the mid-20th century became far less of a problem as a consequence of clean air legislation, suburbanisation lowering population density in the centre of the city, and electrification of houses. However, although London’s manmade fogs have now cleared, their impact on the geography and mechanical plant of film-making in Britain remains clear. As clear, in fact, as the air of the stages in which so many British films were shot. **CJ**

■ A longer version of this article was originally published in the *Historical Journal of Film, Radio and Television* [bit.ly/CJFeb22RF](https://bit.ly/CJFeb22RF), and thanks are due to that journal for giving permission to republish in this form.

■ **RICHARD FARMER** works on the ERC-funded STUDIOTEC research project at the University of Bristol



Edna Best rehearsing a scene for *Michael and Mary* at Islington Studios circa 1930

# MADE IN AMERICA

Air washing technology was first developed in the US to protect building occupants from outdoor pollution. **David Arnold** says the technological advances made by Willis Carrier to enable humidity control then led to the development of air washers for movie theatres and film studios

**I**n the second half of the 19th century, the air quality in large industrial cities was of concern in Britain and the US. Fog or smog (a mix of smoke and fog) from coal used for power and heating was prevented from rising by temperature inversions that trapped the smog near street level.

After the pea soupers of 1879, the registrar general for London reported that mortality in London had risen 220%, causing the premature deaths of about 3,000 people.

Most buildings were naturally ventilated, so the air indoors was the same, if not worse, than outside. Engineers designing the few mechanically ventilated buildings knew they had to clean the air drawn in to reduce soot deposits and the risk to health.

Cheesecloth filters were tried initially, but they were soon discarded because of the resistance to airflow and the large areas of filter necessary in the supply ducts.

Around 1900, several US inventors filed applications for patents for air washers, but the simplest and most popular was by Richard H Thomas, who lived in Chicago, one of the industrialised cities most badly affected by fog. His patent was for the Acme Purifying and Cooling System, which was intended to be installed at the intake to a mechanical ventilation system.

It was simply a metal casing housing an air heater to prevent freezing, water sprays, and eliminator blades to remove droplets and soot. Dirty air hit the eliminator blades and sooty water drained down to a sump to drain away. The first Acme air washer was installed in the recently built Chicago Public Library, which was having problems with soot and dust settling on the books. It was so successful that the entire building was then treated.

Sackett & Wilhelms, a fine art printer in Brooklyn, had problems of a different sort – controlling humidity in summer and winter for its lithographic printing. The problem was taken to Buffalo Forge, a manufacturer of ventilation fans and air heaters, for a solution.

One of the company's graduate engineers, Willis Carrier, was concerned at the lack of science for sizing heat

exchangers and had been carrying out research work. Perhaps because of this, he was assigned to find a solution to the printer's problems.

His first attempt to control humidity was by passing moist air over a bed of calcium chloride brine, but he abandoned it because it resulted in 'undesirable odours and corrosive action'. He then experimented with chilled cooling coils and realised the counterintuitive process occurring: moisture was being removed from the air by contact with water at a lower temperature on the surface of the coils. Why not then, he asked himself, spray the cold water into the air stream to increase the surface of contact and reduce the resistance to airflow?

Unsatisfied with the air washers available at the time, Carrier decided to develop his own and set about making improvements. He thought the Acme air washer did an excellent job, but the type of spray couldn't provide the right conditions for the exact control of moisture content.

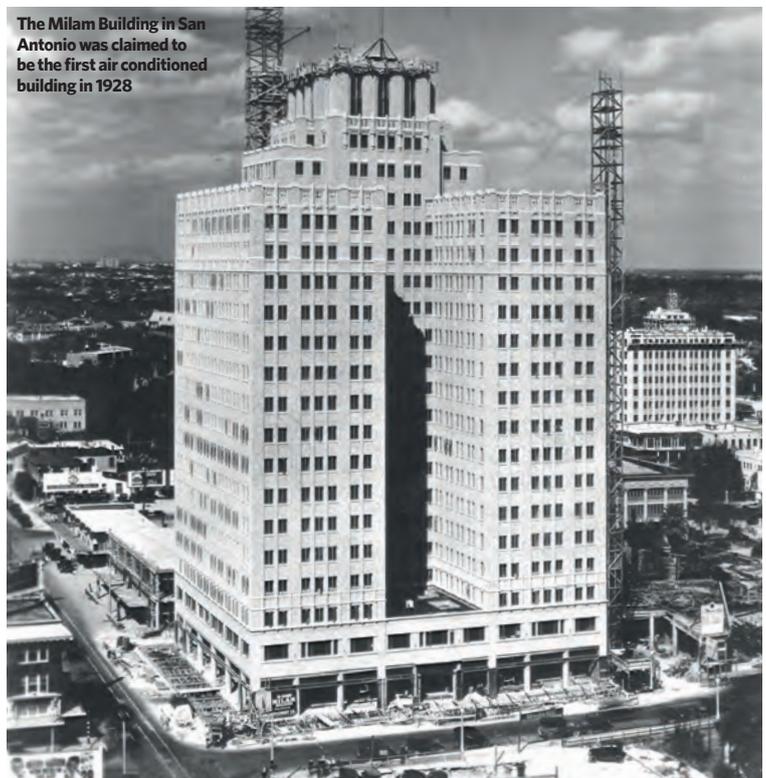
His biographer, Margaret Ingels, relates the story of Carrier's flash of inspiration while waiting for a train in the fog at a railway station in Pittsburgh. He realised, to obtain 100% saturation, he needed to create a fog-like atmosphere in the air washer. Achieving 100% saturation meant the air was at its dew-point temperature and no more moisture could be absorbed. Further, by raising or lowering the temperature of the spray water he could control the air to any given moisture content and, therefore, any relative humidity.

It is a coincidence that achieving a fog-like atmosphere in Carrier's air washer could also be used to remove fog by dehumidifying air drawn into the ventilation systems in film studios. Another coincidence is that one of the most successful markets for air washers in the 1920s was the expanding film studio and movie theatre market.

The first Carrier air washer in a movie theatre was installed above the auditorium in Grauman's Metropolitan Theatre in Los Angeles, in 1923. It was probably the same model installed in the Famous Players-Lasky film studio in 1922 – referred to as a 'fog-dispersal plant' by Farmer – the only difference being that the spray water was cooled by a mechanical refrigeration plant.

Air washers evolved into the first, most common, type of air conditioning installed in cotton mills, cigarette factories, theatres, hotels, offices, public buildings, and sports stadiums throughout the 1920s and 30s, including what is claimed to be the first fully air conditioned office, the Milam Building in San Antonio, in 1928. **C**

**■** CIBSE past President **DAVID ARNOLD FCIBSE** is a partner at Troup Bywaters and Anders, and author of *20th century air conditioning*, published by ASHRAE



The Milam Building in San Antonio was claimed to be the first air conditioned building in 1928



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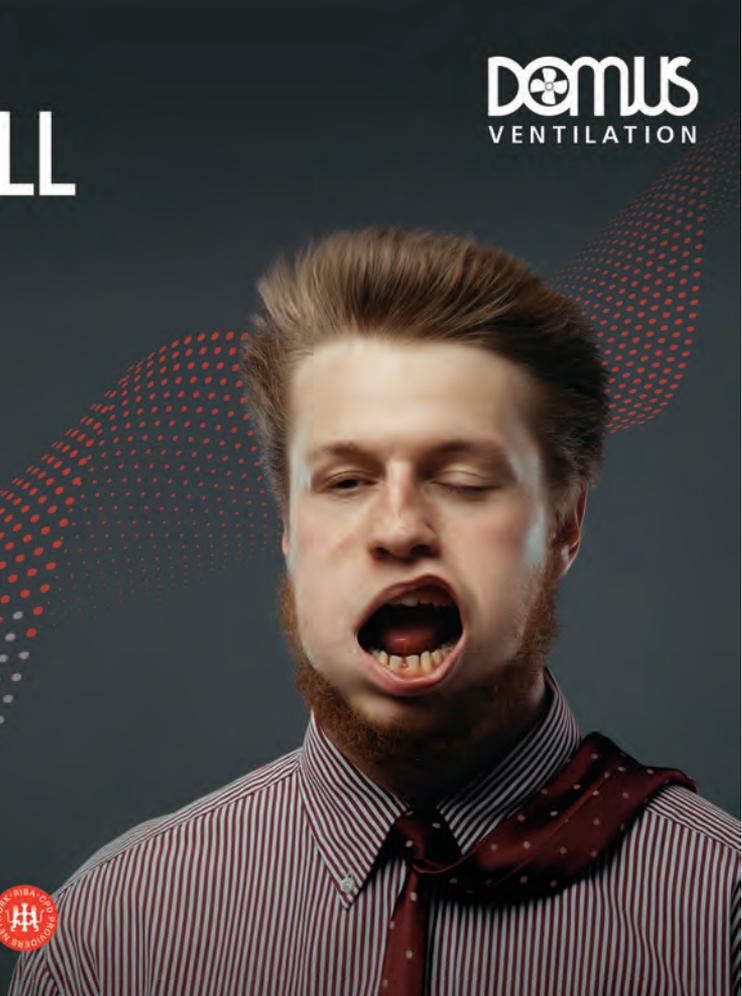
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**DOMUS VENTILATION**

# To automate we must accommodate the ideas of others

Automation in building services will continue to thrive, says XCO2's Aidan Kelly, but only if engineers collaborate and share knowledge through industry hackathons and bodies such as the Society of Digital Engineering

Ever since the invention of the ductulator, building services engineers have sought to automate the time-intensive design processes.

Why? The cynic may say that it's so we can finish our work a day early, or deliver more projects and profit within a given timeframe. But the honest answer, I believe, is something more fundamental: engineers don't want to spend their time doing repetitive processes.

They want time to be spent creatively, critically and quantitatively assessing different approaches, and integrating lessons learnt from past projects with new technologies for an optimal solution, rather than spending days calculating ductwork resistance.

If we want to develop artificial intelligence (AI), however, we cannot do so in isolation. Collaboration can help to break open silos, bringing together new ideas and skill sets.

So, how far have we come since the ductulator? OK – let's consider some examples (there are many more available):

- For many, Revit and its in-built programming tool, Dynamo, have long since banished the administrative processes of project set-up and drawing creation to yesteryear, and allow engineers to design in three dimensions.
- Parametric environmental analysis tools, such as Honeybee and Ladybug, have turbocharged early-stage concept design and optioneering. With a simple 3D model, you can now run multi-objective optimisation routines at the click of a button, to assess different designs and then have the option to produce high-quality visual outputs.
- Generative design tools, such as Space Allowances, will take a few significant MEP load inputs and generate 2D and 3D drawings of plantrooms, along with plant schedules.
- Life-cycle carbon assessment tools for BIM applications streamline the process to such an extent that embodied



“All too often, automation occurs in silos – great work is done by a self-selecting few, and shared with a limited audience”

carbon can be quantified much earlier in the design phases, and used to make key design considerations to reduce the environmental impact of the scheme.

- The new TM65 embodied carbon calculation tool will help more manufacturers to calculate the life-cycle carbon of their products, taking into account not just manufacturing elements, but also transport to site, parts replacement and refrigerant leakage.

This list is not exhaustive, but hopefully provides a peek as to what is happening in our industry.

One issue, however, is that all too often automation occurs in silos – great work is done by a self-selecting few, and shared with a limited audience. As a result of a lack of promotion, or companies keeping their aces tucked up their sleeves, very similar great work is done by another small cohort to another small audience, reinventing the wheel.

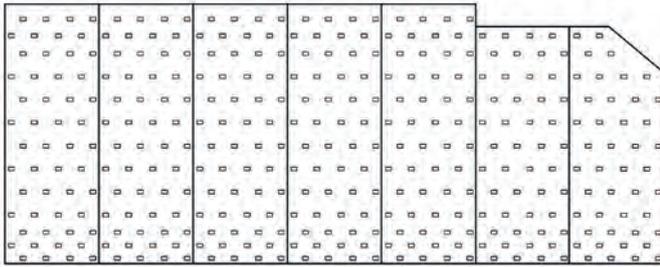
Autodesk University, CIBSE's Technical Symposium and the Build2Perform events and the Society of Digital Engineering (SDE) do a great deal to provide a platform for innovators to present their latest automations. However, the missing ingredient – and the one that I believe can help supercharge automation – is

collaboration. This can be done internally, at the company level, or via inter-company working groups or hackathons.

At XCO2, we have created the XCO2 Lab, an open group to identify time-intensive processes ripe for automation solutions. Through identifying problems, the lab creates an opportunity for interdisciplinary collaboration – solutions can come from anywhere: from graduates with machine learning experience, to senior engineers armed to the teeth with Visual Basics for Applications scripts. Previous automation examples include a daylight simulation project for a warehouse that aims to arrange and minimise glazing area, minimising overheating risks while maintaining high levels of daylight autonomy (see Figure 1 and 2).

**AIDAN KELLY**  
is chair of the Society of Digital Engineering's digital innovations working group and digital lead and mechanical engineer at XCO2.

Baseline design layout of warehouse rooflights



Optimised prismatic layout

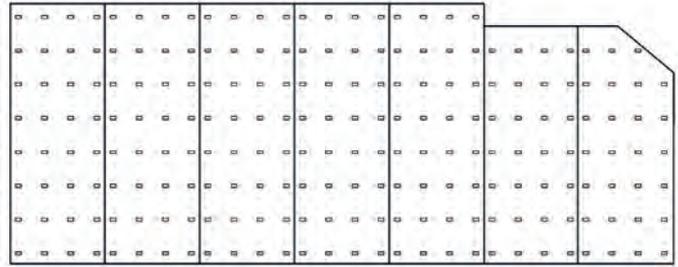


Figure 1: The optimisation process has reduced the amount of roof glazing area from a baseline of 15% to just 4.1%, while still meeting acceptable daylighting requirements' and reducing annual sunlight exposure (ASE) levels to acceptable limits determined by Leed and Well standards

CIBSE's SDE has many working groups bringing together engineers from many companies and the CIBSE membership. I chair the SDE Digital Innovations Working Group that discusses and develops open tools that could be rolled out to CIBSE members. Recent examples include the TM65 tool, and future developments aim to automate the embodied carbon calculation of MEP distribution.

Hackathons are the final piece of the puzzle. A concept borrowed from the world of software development, it is an event that invites teams to come together to tackle a problem within a short timeframe to create functioning software tools and improved workflow automations.

The time limit puts the teams under pressure, in the hope that pressure leads to diamonds. At the SDE, we held our own hackathon event – the 'One Day Design Challenge' – at which teams had a single day to use automation tools they developed to produce as many concept design deliverables as possible [bit.ly/CJMar22AI](https://bit.ly/CJMar22AI)

With an ever more digitally literate workforce, there will be a growing appetite for events aimed at engineers. There are already a host of problems that could benefit from the bringing together of great minds from across the

industry. Seeing what these engineers could rustle up in a hackathon could be an important leap in innovation.

How can we leverage AI into the design or construction process? How do we bridge the gap between design/construction models and digital twins? How can we integrate modern methods of construction at the early design stages? The list could go on and on and on!

So, with collaboration cracked, we would hope to see a snowball effect, where greater awareness results in automations rolled out across the industry to become standard practice, where existing automations are employed to build bigger and better ones. The hope is that more internal labs and hackathons spring up.

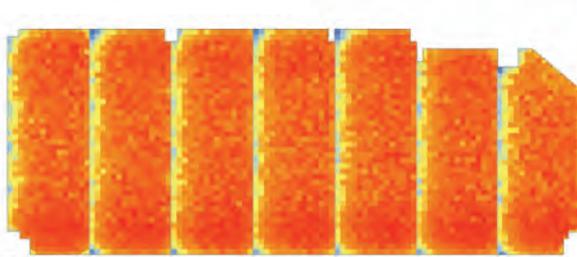
As the balance of power shifts from PowerPoint and Excel to code, prediction, data analysis and dashboards, employing automation will no longer be a chance to get ahead, but a choice to prevent falling behind.

You can get involved in this transformational world of automations by joining up with the SDE.

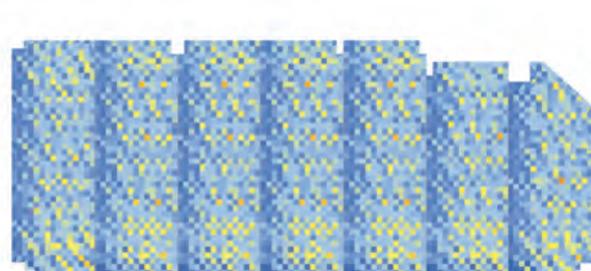
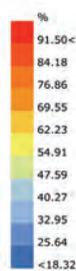
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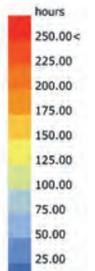
Baseline design layout of warehouse rooflights



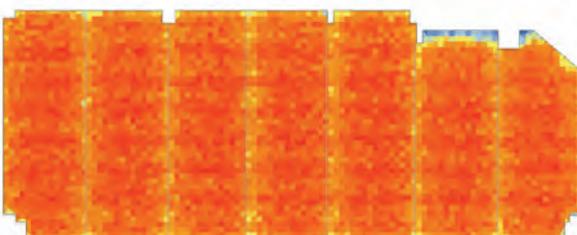
DA Percentage of time meeting target illuminance



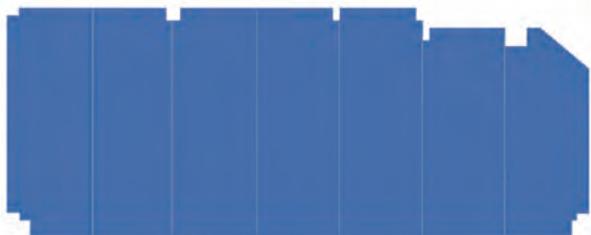
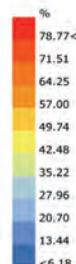
ASE Annual hours exceeding 1,000 lux



Optimised prismatic design



DA Percentage of time meeting target illuminance



ASE Annual hours exceeding 1,000 lux

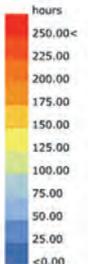


Figure 2: Despite large reduction in roof glazing the percentage of the occupied time when the target illuminance is met did not noticeably reduce (left). In the new design (blue simulations to the right) no areas receive >1,000 lux of direct sunlight. According to Leed 'no more than 10% of regularly occupied floor area should receive over 1000 lux of direct sunlight for more than 250 hours'



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## Servicing the rise in multi-residential buildings

This module explores the increased demand for multi-residential buildings and its impact on the application of heating, cooling and ventilation solutions

There was already a need for growth in the development of new homes prior to Covid-19, but as the UK emerges from the worst ravages of the pandemic, the demand for homes appears to have increased further. This CPD will investigate this demand and – in the context of heating, cooling and ventilation – explore some of the more recent technical options confronting the building services engineer.

The UK government has a long-standing target of 300,000 new homes a year (in England) by the mid-2020s. Recent government data<sup>1</sup> indicates that 216,490 homes were created in England in 2020-21 (243,000 in the previous year), so there is a continuing focus on the delivery of quality homes to fill the gap in supply. National House Building Council registration figures<sup>2</sup> indicate that new homes in 2020 were evenly split between detached homes, semi-detached and apartments. Reporting on recent research, Construction Global<sup>3</sup> notes that 15% of UK high-rise completions between 2016 and 2020 were for offices, and highlights that 78% of high-rise buildings currently planned in the UK are residential-led developments.

The Future Homes Standard is being developed so that homes built from 2025 will produce 75-80% less carbon emissions than those constructed to current standards. In the journey towards meeting the aspirations for 2025, the Approved Documents (AD) Part L and F of the Building Regulations, which were recently revised and have changes coming into force in June 2022, aim for new homes to produce around 30% less CO<sub>2</sub> than under current standards. A new AD O for the mitigation of overheating risk has been introduced, and expands and augments methodologies that were previously included in other ADs. It details methods to assess and mitigate overheating risks, including referencing the dynamic thermal modelling as described in CIBSE TM59, with limiting values of acceptable ranges of input data applied in modelling the building. To meet the requirements of these Future Homes Standard ADs may require 'fabric first' alterations, improved fenestration and shading, or

reconsidered heating, cooling, and ventilation regimes. The introduction of Primary Energy Factors in AD L sets a path towards ensuring buildings have low operational energy demand, as a basis for delivering reduced carbon emissions. To use an active cooling system to remedy overheating risk is a last-resort option, and should only be considered once other options – including the viability of purge ventilation – are out of play.

Coincidentally, with the revised ADs, the recently introduced Building Safety Bill<sup>4</sup> is primarily aimed at establishing a new building safety regime governing the design, construction and occupation of 'higher-risk' buildings, which currently explicitly includes high-rise multi-residential buildings above 18m. The associated 'Golden Thread' aims<sup>5</sup> 'to support culture change within the industry as it will require increased competence and capability, different working practices, updated processes, and a focus on information management and control'. The Golden Thread, together with a new regime of dutyholders and accountable persons, should act as a driver for improved collaborative



» working; this will undoubtedly impact the expectations and quality of delivery and operation of services and systems in multi-residential buildings that reach beyond those normally associated with ‘safety’.

Alongside the new regulations on energy use and lowering carbon, there is also a growing focus on occupant health in buildings, including dwellings. The Future Homes Standard addresses the issues of overheating and indoor air quality (IAQ) as important factors to consider in the design of new homes.

To design, build and operate this new wave of homes, and intrinsically the associated building services systems, will set a challenging task across the whole industry supply chain. In Ashley Bateson’s introduction to a CIBSE Homes for the Future Group event,<sup>6</sup> the head of sustainability at Hoare Lea, and chair of the group, identified five key challenges for future homes:

- Energy efficiency
- Performance-gap issues
- Thermal comfort/overheating risk
- Adaptation to climate change
- Air quality
- Health and wellbeing.

CIBSE TM60 *Good practice in the design of homes* provides a useful guide to meeting the challenges, as detailed by Bateson, to design and deliver homes that are safe, fit for purpose, resource efficient, low carbon, comfortable, healthy, and easy to operate and maintain. It notes that, wherever possible, good practice should deliver both lower capital and life-cycle costs. It highlights that potential future needs should be considered when designing homes, as well as meeting the current needs of occupants.

Overheating in buildings has a negative impact on occupants, with recent UK government figures indicating that there are around 2,000 heat-related deaths each year in England and Wales, with this number expected to rise to 7,000 per year by 2050.<sup>7</sup> London is regarded as a particular risk area because of its geographical location and high building density, which contributes to the urban heat island effect. CIBSE TM59:2017 offers guidance on managing the problem of overheating in homes and emphasises that ‘the health and wellbeing impacts of overheating can be significant for residents, resulting in stress, anxiety, sleep deprivation and even early deaths in heatwaves, especially for vulnerable occupants’.

Building users have become increasingly aware of indoor air quality (IAQ) in homes,<sup>8</sup> particularly with concerns around transmission of infectious diseases. The National Institute for Health and Care

Excellence has recently published a guide, *Indoor air quality at home*<sup>9</sup>, that is aimed at planners, designers and contractors, and which provides a useful overview of contemporary measures needed to improve home air quality. In terms of building services systems, the key overriding recommendation is to ‘adopt a whole-building approach to heating and ventilation, balancing indoor air quality with standards for energy use’, with specific actions to ensure permanent, effective ventilation; minimising exposure to outdoor pollution; and minimising and removing indoor air pollutants from heating, and ensuring that heating and ventilating systems are easily accessible for regular maintenance.

The Centre for Cities<sup>10</sup> reports that, on a per capita basis, cities have a much lower carbon footprint than the rest of the country. On average, a person living in a city emits around four tonnes of carbon a year, against more than six in the rest of the country.

An area of development that has attracted widespread attention is the repurposing of redundant offices in cities. An analysis<sup>11</sup> by the Local Government Association found that office-to-residential conversions account for more than one-third of new homes being developed, in particular in urban areas where housing demand is high. In England, 65,000 homes were created from conversions of redundant offices to residential premises between 2013 and 2019,<sup>12</sup> and approximately<sup>13</sup> 23,000 in 2021. Some of the enthusiasm to create such new homes was driven by the limited local authority planning oversight afforded by permitted development right class O. This is likely to be somewhat assuaged by last year’s introduction<sup>14</sup> of class MA that limits such unrestricted developments to 1,500m<sup>2</sup>. Additionally, there are now specific

requirements, including ‘adequate’ natural light<sup>15</sup> and minimum floor areas,<sup>16</sup> which will hopefully prevent further conversion developments of the type that have been identified as potential ‘slums of the future’.<sup>17</sup> The trend for such conversions is likely to continue, including those larger than 1,500m<sup>2</sup> that require more extensive planning consents.

The recent revision to AD L requires that wet heating systems in new dwellings be sized to allow the space heating system to operate effectively at a maximum flow temperature of 55°C or lower. Gas-, oil- and solid fuel-fired systems continue as potential heat sources in AD L for homes, although a ‘fuel factor’ is no longer applied so that higher carbon emissions are no longer compensated for in establishing the target emissions for a home. Setting a relatively low heating flow temperature eases the application of heat pump technologies, as 55°C is readily – and efficiently – attainable with current vapour compression refrigeration-based systems. (See CPD Module 178, *CIBSE Journal*, May 2021 for discussion on moving towards the increased adoption of heat pumps for heating and hot water.) The average carbon factor for grid-supplied electricity recently published in table 12 of the UK Government’s Standard Assessment Procedure for Energy Rating of Dwellings, SAP 10.2<sup>18</sup> (which is used to evidence compliance with the requirements of the Building Regulations for homes, starting June 2022) is 1.6kgCO<sub>2e</sub>·kWh<sup>-1</sup> and provides a significant reduction from the previous value of 5.19kgCO<sub>2e</sub>·kWh<sup>-1</sup>. The consequences of this are enormous, as it opens up opportunities for heating and hot water systems that employ electricity as the energy source, which – in terms of operating cost – hugely favours heat pumps.



Figure 1: Example of a residential water-to-water heat pump that includes a 170L integrated tank. The unit can supply both low-temperature hot water (LTHW) and domestic hot water (DHW) up to 60°C (Source: Mitsubishi Electric)

The 2021 release of CIBSE AM16 *Heat pump installations in multi-unit residential buildings* provides timely advice for engineers, architects and contractors to help understand how heat pump technology can be best applied on new-build and retrofit applications for multi-residential buildings, including medium- and high-rise apartment blocks, high-density housing, student accommodation and care homes.

Heat networks also provide the opportunity to address heating and hot water requirements at large scale, and particularly in high-density cities and multi-residential buildings. Heat networks can be designed to exploit low carbon heat sources and use heat pumps to deliver space heating and hot water. An example of the integration of heat networks into long-term policy is the London Plan 2021,<sup>19</sup> which majors on heat networks as a low carbon technology for the capital's future heating needs. The recently published *London heat network manual, second edition*<sup>20</sup> includes some interesting updates on the practical application of low-temperature networks, heat pumps and the role of smart controls. It introduces exergy as offering the potential for a more resource-efficient and circular approach to heat supply.

To support this growth, in September 2021 the government announced a Green Heat Network Fund<sup>21</sup> that will open to applicants in April 2022 and is anticipated to remain open until 2025. The fund aims to increase the total amount of low carbon heat used in new and retrofitted heat networks. It will support low carbon technologies, such as heat pumps, solar and geothermal technologies, as applied in heat networks.

The recently updated CIBSE CP1 *Heat networks: code of practice for the UK* offers guidance on carrying out feasibility studies for heat networks, as well as ensuring that the network delivers energy efficiency and environmental benefits. A traditional communal heating system in a multi-residential building employs heat generated in a centralised energy centre that would typically be served by a gas boiler or combined heat and power (CHP) unit. The hot water generated from the energy centre is circulated through the building distribution loop to each apartment, with each served by an individual heat interface unit (HIU). The flow temperature from the energy centre is typically around 60°C, and the HIUs in each apartment provide indirect heating for heating and domestic hot water (DHW) with typically no requirement for DHW storage. An alternative approach is the application of water-to-water heat pumps exchanging heat with the building ambient loop operating at approximately 25°C. A water-to-water heat pump in each apartment, as shown in the example in Figure 1, heats DHW and heating water to suitable temperatures. (See CPD Module 190, *CIBSE Journal*, January 2022 for discussion of the key factors to consider for in-home heat pumps with ambient loop heat networks).

Since the ambient loop is operating at modest temperatures, heat pump technology provides a suitable heat source in the central plant space to maintain the ambient loop temperature. This could be an air-to-water heat pump, or one that employs a local water source such as a nearby river, lake, or canal. The London Plan 2021 indicates a preference for the 'communal low-temperature heating system' employing heat pumps as heat sources, particularly in conjunction with 'zero-emission or local secondary heat sources'.

ADO includes mechanical ventilation as a solution for dealing with excess heat



**Figure 2: Example of a residential MVHR unit with cross-flow total heat exchanger with efficiency up to 90%, a controllable bypass to prevent unwanted heat exchange, coarse 55% (G3) filters, optional NOx 90% and ePM2.5 50% filtration filters, capable of supplying up to 69L·s<sup>-1</sup> (Source: Mitsubishi Electric)**

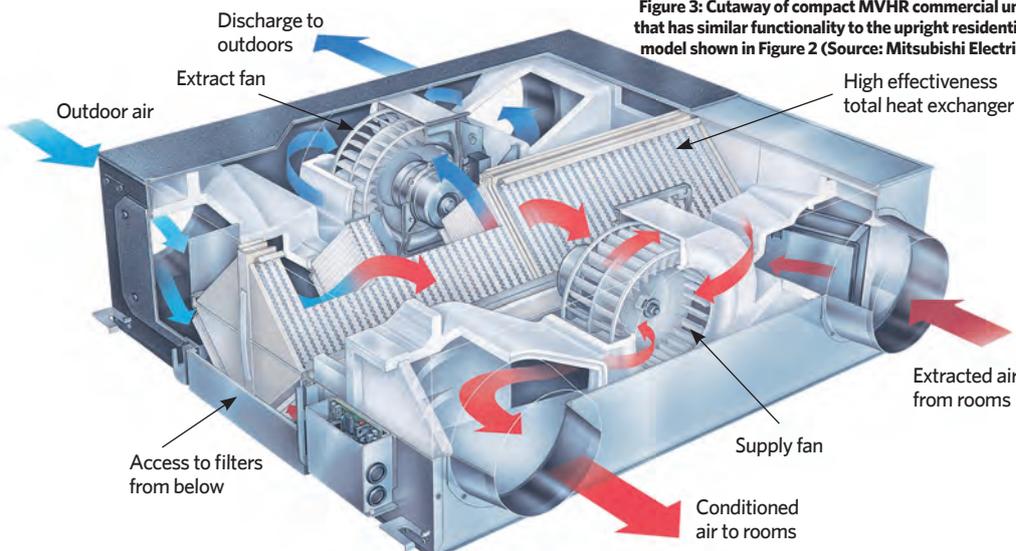
in new residential buildings. However, it notes that any method to reduce overheating must also comply with other parts of the Building Regulations, including AD L for energy efficiency. For buildings with good airtightness, AD F provides guidance in terms of a combination of mechanical extract systems or, to allow heat recovery and air filtration, a single mechanical ventilation with heat recovery system (MVHR). Continuously operating an MVHR, such as the residential unit in Figure 2 and the similarly configured commercial unit in Figure 3, may maintain relatively low flowrates that, in appropriately designed units, can maintain low noise levels<sup>22</sup> – a particularly important quality for residential applications. A properly designed and operated unit is particularly important given the 50% increases in required background ventilation rates in the revised AD F. MVHR units can include air filters and air cleaning devices, as well as integral bypass dampers to avoid overheating in warmer months and enhance energy efficiency. Units are also available that include integrated cooling coils supplied from heat pump devices.

The provision of multi-residential buildings is undergoing a renaissance that, in a challenging and swiftly changing world, can provide the catalyst for the design and implementation of imaginative and holistically effective systems. There are already solutions that offer a solid pedigree of successful application for environmental systems, but there is a sense that this is the start of a technological revolution to overcome emerging challenges – as well as those that are yet to materialise.

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■ Turn to page 52 for references.

**Figure 3: Cutaway of compact MVHR commercial unit that has similar functionality to the upright residential model shown in Figure 2 (Source: Mitsubishi Electric)**





# Module 192

March 2022

» 1. **What was the shortfall in the completion of new homes in England in 1920-21, compared with the government target?**

- A Around 10%
- B Around 30%
- C Around 50%
- D Around 70%
- E Around 90%

2. **By how much are the revised ADs L and F aiming to reduce homes' equivalent CO<sub>2</sub> emissions compared with current standards?**

- A Around 10%
- B Around 30%
- C Around 50%
- D Around 70%
- E Around 90%

3. **What are the reported additional carbon emissions for a country dweller compared with a city dweller?**

- A Around 10%
- B Around 30%
- C Around 50%
- D Around 70%
- E Around 90%

4. **By how much has the average carbon factor for grid-supplied electricity been reduced in the recent version of SAP 10.2 compared with the previously used version?**

- A Around 10%
- B Around 30%
- C Around 50%
- D Around 70%
- E Around 90%

5. **What is the maximum possible total heat recovery claimed for the MVHR unit illustrated in the article?**

- A Around 10%
- B Around 30%
- C Around 50%
- D Around 70%
- E Around 90%

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- 20 *London Heat Network Manual II* - [bit.ly/CJMar22CPD20](http://bit.ly/CJMar22CPD20)
- 21 *Green Heat Network Fund* - [bit.ly/CJMar22CPD21](http://bit.ly/CJMar22CPD21) - accessed 2 February 2022.
- 22 Titmuss, C, *Lossnay proves quieter even with increased airflow*, 2021 - [bit.ly/CJMar22CPD22](http://bit.ly/CJMar22CPD22)

# Rotasoc® by CMD: the market leading under desk power distribution system



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- Control Rooms
- Healthcare Services
- Education
- Retail



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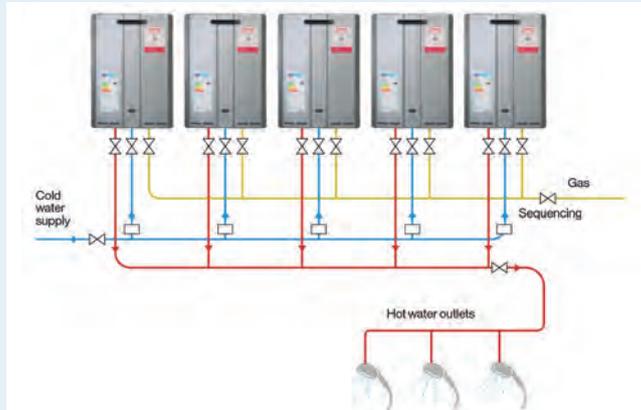
## Product of the month

### Rinnai's success flows continuously with energy-efficient water heaters

New products mean invasive building works can be avoided when replacing an old system

According to recent analysis, Rinnai's continuous-flow hot water delivery units and systems can deliver a reduction in carbon emissions of at least 20% compared to conventional heated storage systems. This has positive implications for both the company's future and for the building performance sector as a whole, for which energy efficiency is becoming more of a priority.

Rinnai specialises in continuous flow water heaters, which provide large quantities of usable hot water for comparatively small amounts of energy and offer a degree of precision that conventional heaters lack. These products come in two sizes, 47kW and 58kW, and are



compatible with hydrogen blends and BioLPG. At 30kg in weight they are compact enough to require only a one-man lift, in contrast with older appliances which tend to be heavy, fragile and difficult to decommission. A typical water storage-based installation will cost £5,662.13 per year, whereas a Rinnai continuous flow water system will cost £2,736.02.

When a stored water system comes to the end of its working life it is assumed that replacing 'like for like' is the best option. Product development engineer Pete Seddon believes Rinnai can break this mould and make continuous flow water heating an industry norm.

'If we look at the like-for-like, out with the old one and in with

the same model stored water heater, there is actually a major amount of work involved in this,' he says. 'The hot water system has to be completely shut down to allow such major works to take place and not all sites can allow this to happen.'

Seddon explains that Rinnai's products can bypass a large chunk of the invasive building works involved in installing a conventional water heating system. 'The other benefit is the ability to cascade these appliances so when more hot water is required you would simply add more continuous flow water heaters,' he adds. 'This would mean that if one unit needs to be shut down the complete site still has ready access to hot water.'

■ For more information, email [sales@rinnaiuk.com](mailto:sales@rinnaiuk.com) or [engineer@rinnaiuk.com](mailto:engineer@rinnaiuk.com), or visit [www.rinnaiuk.com](http://www.rinnaiuk.com).

### Rinnai – we all win with net zero common sense, calm and commitment

Firm pushes for a 'collective, equitable effort' from all sectors to ensure future sustainability

The topic of net zero and carbon emissions reduction in the hot water industry can be a contentious one, but water heater manufacturer Rinnai has responded to this with a stance of common sense, calm and commitment to its values.

Rinnai believes that the best way to achieve the net zero goal is with a measured, pragmatic and transparent approach that involves all stakeholders in the heating and hot water industry: an approach that holds the manufacturing sector accountable for its contribution to harmful emissions while finding solutions that allow for the smallest possible amount of disruption to current standards of living. This will require manufacturers to shift their focus away from trying to create the 'best' net zero product on the market and towards creating a culture of cross-communication and collaboration, fostering a sense of unity across all sectors.



Rinnai managing director Tony Gittings (pictured) says: 'Fact, logic and reason must be employed to achieve the best outcome for all of us. We need decarbonisation, we need net zero, and we need it as soon as possible but in such a way that is pragmatic in terms of catering to the existing populations and markets.'

'We need to look at this from the consumers' viewpoint,' he continues. 'We need to be putting accurate information in the public arena. At the moment, there are a lot of interested bodies and companies showing understandable self-interest in wanting to know they have a future in the marketplace. A collective, equitable effort will give us the result we all want, the result we must have, if we are to have a sustained quality of life.'

'We are a business based on engineering excellence and are employing technological creativity to achieve the targets. In the UK, this will mean that we begin to offer a wider range of products under the H3 umbrella of hydrogen, heat pumps and hybrid systems to enable our customers to achieve their own carbon reductions and eventual neutrality.'

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

## Luceco brings all-girls' school into the spotlight >

Charon, a decorative LED pendant luminaire from LED lighting provider Luceco, has been installed at Chatham Grammar School for Girls in Gillingham. Chosen for its contemporary appearance and longevity, Charon offers 100,000 hours of maintenance-free operational life as well as variants of up to 10,000lm with an efficacy up to 133lm/cW.

Charon is suitable for commercial, public and hospitality environments and is available as fixed output, digital dimmable, emergency back-up variants and Luceco's Wireless Lighting Controls, Platform and Elevate. Finished in a contemporary silver grey with a 60° prismatic refractor, Charon is available in 3,000K or 4,000K CCT.

The main hall at Chatham was also lit with Celeste, an attractive circular LED luminaire from Luceco featuring a 'corona' backlight effect with a direct/indirect light distribution. The luminaire can be suspended using a three-point suspension, wall-mounted or, as at Chatham, surface-mounted.

■ Call 1952238100, email [Uk.sales@luceco.com](mailto:Uk.sales@luceco.com) or visit [www.luceco.com](http://www.luceco.com)



## < Waterloo supplies air distribution products for Rusacks St Andrews Hotel

Waterloo Air Products has supplied the historic Rusacks St Andrews Hotel with a range of high-quality air distribution equipment. The hotel's guest rooms have been fitted with Waterloo's Airline linear bar grilles, wall-mounted exhaust grilles and exhaust valves for the en-suites. For the hospitality and reception areas, Waterloo's continuous linear slot diffusers were selected for optimum air quality. The external fresh air intake and exhaust system is delivered by Waterloo's small format fixed blade external louvres.

■ Visit [www.waterloo.co.uk](http://www.waterloo.co.uk)

## Modutherm joins forces with Alpha Innotec >

As part of its continued growth in the UK commercial heating market, Modutherm has announced a partnership agreement with European heat pump manufacturer Alpha Innotec.

The partnership brings together two companies committed to delivering quality, innovation and technical expertise, enabling contractors and building services engineers to benefit from one of the largest heat pump portfolios on the market. Visit the website for more information about Modutherm and the range of Alpha Innotec heat pumps.

■ Visit [www.modutherm.co.uk](http://www.modutherm.co.uk)



## < For everything Jung Pumpen

Jung Pumpen wastewater and sewage pumping equipment distributors Pump Technology can provide the solutions. The Berkshire-based company's dedicated Jung Pumpen team is available to discuss site wastewater and sewage pumping applications.

Pump Technology are pleased to introduce a number of new and updated products, including an updated Compli 400 pump and a new DrainMajor Duo control panel for duty and standby operations.

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



## > Domus Ventilation adds two new residential CPD courses

Following the release of its newly updated and revised Continuing Professional Development (CPD) CIBSE-accredited course on 'Residential Ventilation Principles and Building Regulations' last year, Domus Ventilation has launched two further complementary courses: 'MVHR Ventilation Design and Best Practice' and 'Pre-Planning Conditions and Ventilation'.

The first covers a wide variety of topics, ranging from airflow rates for different types of properties to noise reduction and the importance of good system design for energy efficiency. The second course focuses on ventilation strategies and how to achieve planning compliance.

All of Domus' CIBSE-accredited CPD courses have been written by the Domus Ventilation Specification team, using their experience and knowledge of the residential ventilation sector.

Each course can be held at a customer's premises or online via Microsoft Teams.

■ Email [megan.bennett@domusventilation.co.uk](mailto:megan.bennett@domusventilation.co.uk) or visit [bit.ly/CJFeb22Chubb2](http://bit.ly/CJFeb22Chubb2)



## > Aquatech Pressmain introduces intelligent combined sprinkler booster

Need to save space and money for your domestic fire sprinkler supply? Take a look at the Aquatech Pressmain AMV-FE combined water and sprinkler booster set. This saves the expense of two separate pumpsets. AMV-FE provides a compact solution which, in the event of fire, is switched by an external BMS signal to supply all available water to the sprinkler system. Complies with BS9251:2021.

■ Email [sales@aqpm.co.uk](mailto:sales@aqpm.co.uk) or visit [www.aquatechpressmain.co.uk](http://www.aquatechpressmain.co.uk)

**Lighting with efficiency >**

LED lighting provider Trilux has installed a range of energy-efficient lights in the recently refurbished office space at 100 Liverpool Street in London. The essential back-of-house areas are now lit by Trilux's Oleveon Fit LED model, chosen for its low glare and efficiency. A highlight of the project is the washroom fit-out, which uses warm-toned LED luminaires to create a lighting environment that complements the oak and brass interior scheme.

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



**< HVAC creates welcoming environment for cosmetic retailer**

A popular high-end cosmetic retailer recently opened new stores at two of the UK's largest shopping centres: Lakeside Retail Park and The Centre at Milton Keynes. Both stores have been fitted with Panasonic HVAC systems to deliver optimum customer comfort. The project design featured four Panasonic ECOi 3-pipe VRF units at Lakeside and three at the Milton Keynes store, as well as ERV units, off-coil temperature control and Panasonic's unique nanoe X sanitary system.

■ Visit [www.aircon.panasonic.eu/](http://www.aircon.panasonic.eu/)



**Mitsubishi Electric showcases its range at Data Centre World >**

Mitsubishi Electric will be bringing its expertise in air conditioning to this year's Data Centre World event in March showcasing products designed exclusively for the unique working environments of IT cooling rooms. Its IT Cooling range makes it possible to keep temperature and humidity constant even with wide load variations, ensuring the correct room conditions all year round.

The full range of products from Mitsubishi Electric can be viewed on Stand D270 at Data Centre World on 11 to 12 March.

■ Visit <https://les.mitsubishielectric.co.uk/>



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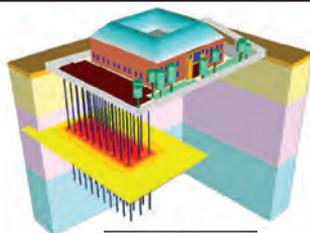
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How will construction methods have to evolve to achieve our future aspirations for housing?



Rokia Raslan

## Fit for the future

More research is desperately needed on hard-to-decarbonise homes if housing stock is to be ‘future fit’, says University College London’s Rokia Raslan, who is editing a *B&SERT* special issue on this vital issue

A special issue of *B&SERT*, Future fit performance housing, will feature the latest research on how to ensure homes are high-performing and resilient. Editor Rokia Raslan explains why more studies are needed on hard-to-decarbonise dwellings, and says much could be learned about the way occupants use their homes.

### Why is the special issue focusing on future fit performance homes?

The houses we are building today, and the ones that already exist, will have to contend with multiple challenges brought on by the climate crisis and changes in our lifestyles. Although we are trying to make our homes perform well now, we also need to ensure they continue to perform as well in the future: in other words, they must be ‘future fit’. The theme of this special issue of *B&SERT* reflects our interest in understanding how this may be achieved.

### How can designers make housing resilient in the face of uncertainty?

One of the ways is by designing for this uncertainty, rather than ignoring it. We have a multitude of tools and methods available to aid and inform the design process to accomplish this. For example, CIBSE and Prometheus weather data predict the climate up to the 2080s and can help envisage future boundary conditions.

Research is now looking into how lifestyle trends will change, how we interact with our homes, and what we expect from them. This knowledge can be used in conjunction with methods such as robust optimisation to identify designs that maintain the desired performance levels within a range of uncertainties.

### In what topics are you particularly interested?

Within the wider ‘future fit’ context, I am interested in research and examples of best practice that demonstrate the use of innovative knowledge, tools and systems to support the future-proofing of the performance of our homes. This includes looking at how building systems and construction methods, such as modular approaches, will need to evolve to deliver our future aspirations for the domestic stock.

Another challenge is understanding the implications of moving from heating-based demand in our homes to both heating- and cooling-based demand as the

climate gets warmer. I am particularly interested in research on hard-to-decarbonise homes. In the UK, up to one in five of us lives in a home that falls under this category, so there is much to be done.

### Where are the knowledge gaps in housing research?

To date, the majority of research has focused on ‘standard’ housing types, where fewer technical or cost-related barriers to integrating or installing energy efficiency and adaptation measures exist. With the exception of a few isolated and small-scale field trials, we know very little about hard-to-decarbonise homes, effectively rendering them a significant area of future uncertainty.

This includes significant knowledge gaps regarding the full range of physical and locational characteristics of these homes, and very limited understanding about the people who live in them. There is an overlap between these homes and occupants who are vulnerable, such as those in fuel poverty and those deemed to be ‘hard to reach’. So, addressing future performance is also a key social priority, integral to making sure we do not ‘lock in’ climate and energy injustices.

Given that hard-to-decarbonise homes are set to be an area of policy focus in the near term, the immediate impact of this lack of knowledge is already being felt – and, unless addressed, it will pose a more substantial risk in the medium and longer terms.

Another aspect we need to understand more is redressing the concept of cost, as it can obscure ‘value’ and, in a sense, limit what we strive to achieve with our homes. The European Union is already looking at new ways of defining cost-effectiveness.

### What can we learn from the way people currently use their homes?

A lot of research has focused on observing occupant behaviour and finding means by which we can change it. But we can learn a lot from looking at the solutions occupants may come up with to improve how they experience their homes. This is especially important for homes that present specific challenges and where this first-hand knowledge can drive people-centred innovation that helps address them.

● **Rokia Raslan** is vice-dean for innovation and enterprise at the Bartlett Faculty of the Built Environment at University College London and an associate professor at the UCL Institute for Environmental Design and Engineering

# EVENTS



## NATIONAL EVENTS AND CONFERENCES

### CIBSE Technical Symposium

21-22 April, London

The CIBSE Technical Symposium will be held at London South Bank University this year. The theme for 2022 is 'Delivering a safe, healthy and sustainable built environment – buildings that perform', and will feature a mix of peer-reviewed presentations and posters.

Topics on the agenda will include: development of zero carbon building standards; embodied and operational carbon; and the challenge of refurbishing buildings.

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

### CIBSE REGIONS AND GROUP EVENTS

Check the website for up-to-date information on regions and groups meetings, webinars and podcasts visit: [www.cibse.org/events](http://www.cibse.org/events)

### Merseyside & North Wales: Masterclass seminar series

7-11 March, 12-13.00 each day

This series is aimed at equipping students and young professionals with foundational skills to help support their understanding of key areas of engineering and

construction. It covers:

**Day one:** Building energy management systems – simplified

**Day two:** Energy assessment using SAP & SBEM, EPCs and Part L compliance

**Day three:** BIM fundamentals

**Day four:** Heat pump technology applications

**Day five:** Mental health awareness and construction. [bit.ly/CJMar22MNW](http://bit.ly/CJMar22MNW)

### SLL and HCNE webinar: Indoor lighting quality vs net zero carbon BS EN 12464

22 March

With speaker Sophie Parry, chair of SLL Technical Publications Committee, and technical and education applications specialist and sustainability ambassador for ZG Lighting UK & Ireland.

### SoPHE Technical day conference

24 March

The theme of the Society of Public Health Engineers (SoPHE) technical conference is 'Water, meeting the challenges of building designs for the future'. The event will be a chance to hear from experts and advisers on regulatory and planning guidance, with industry pioneers talking about inventive public health engineering solutions. [bit.ly/CJMar22SoPHE](http://bit.ly/CJMar22SoPHE)



## CIBSE JOURNAL PODCASTS

The latest *CIBSE Journal* podcast 'The challenge and opportunities of delivering heat networks', sponsored by Grundfos Pumps, discusses the challenges and opportunities of realising the government's ambition of significantly growing heat networks in the UK.

All *CIBSE Journal* podcasts are available on the CIBSE Soundcloud – at [soundcloud.com/build2perform](http://soundcloud.com/build2perform) – Apple Podcasts and Spotify.

## LIVE ONLINE TRAINING COURSES

CIBSE training courses have been reformatted to work online, with a live trainer, so you can expect the same interaction and participation as you would in a classroom setting.

Upcoming courses:

### Electrical distribution design

3 March

### Embodied carbon in MEP design: how to use CIBSE TM65

10 March

### Mechanical services explained

15-17 March

### Heat networks (CP1)

half-day update

15 March

### The importance of energy efficient buildings

16 March

### Design of heating and chilled-water pipe systems

17 March

### Electrical services overview

22 March

### Emergency lighting to comply with fire safety

24 March

### Low carbon consultant design

5-7 April

### Standby diesel generator

6 April

### Building services explained

12-14 April

### Above-ground building drainage

13 April

### Heat networks code of practice (CP1)

19 April

### The importance of energy efficient buildings

19 April

### Energy strategy reports

20 April

For details, visit [www.cibse.org/training](http://www.cibse.org/training)

## ONLINE LEARNING

CIBSE has a portfolio of online learning courses, which contain interactive content with quizzes and additional resources. [www.cibse.org/training](http://www.cibse.org/training)

## WEBINARS

24 March

### Company membership webinar

CIBSE Membership is running webinars for firms looking to support their staff in achieving corporate membership and professional registration, with a focus on achieving Associate grade with Incorporated Engineer and Member grade with Chartered Engineer. [bit.ly/CJMar22Briefings](http://bit.ly/CJMar22Briefings)

## Membership webinars

CIBSE Membership host 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.

To register for this and for all other membership webinars: [bit.ly/CJMar22Webinars](http://bit.ly/CJMar22Webinars)

### Upcoming webinars:

- 15 and 22 March
- 12 and 19 April



For further details and to register: [www.cibse.org/webinars](http://www.cibse.org/webinars)

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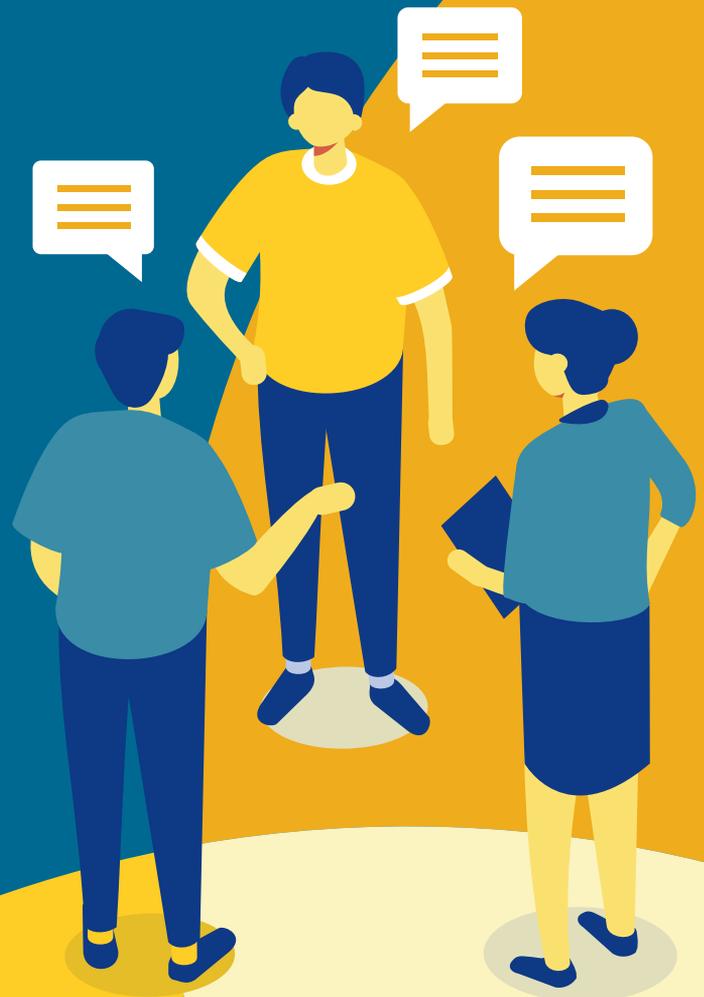
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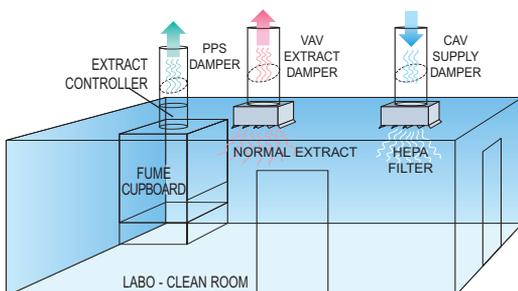


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