

CIBSE **JOURNAL**

#Build2Perform

January 2024

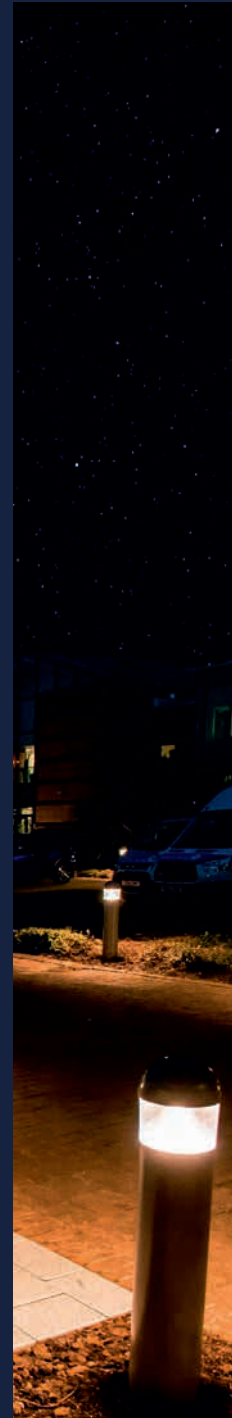
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**CIBSE BUILD2PERFORM
LIVE HIGHLIGHTS
GARETH JONES ON TECHNICAL
STANDARDS FOR HEAT NETWORKS
MANCHESTER'S ALL SINGING AND
DANCING AVIVA STUDIOS**

**COMING TO A
STREET NEAR YOU**

**Bradford is latest UK city to turn to heat
networks to decarbonise urban heating**

What is important in 2024?



New Year, New **Specification.**

Sustainable product design | TM66 | CPDs | Net zero goals | Dark Sky | Wellbeing



Binary choice



There was a lot to digest over Christmas for those tasked with getting to grips with new guidance in the building services industry.

As well as an update to the Net Zero Carbon Buildings Standard, the long-awaited Future Homes and Buildings Standards (FHBS): 2023 consultation was published last month.

The angle that grabbed the headlines was that hydrogen-ready boilers would not be permitted in new buildings from 2025. With no prospect of green hydrogen being piped through the gas mains any time soon, the government has concluded that there are only two main routes to the decarbonisation of

heat in buildings: heat pumps or heat networks. Within two years, nearly every development and home will have to be connected to one of these sources of heat, and the FHBS has put forward new guidelines and standards to ensure these often-complex systems perform as well as the designers intend.

On page 26, we summarise the new higher minimal standards for building services technologies, such as heat pumps and ventilation systems, and look at other measures that aim to improve the quality of buildings and their subsequent performance. These include testing new homes, and the measurement of static pressure and total power consumption in centralised mechanical extract ventilation and mechanical ventilation with heat recovery.

It's clear there will also be more of a focus on the use of competence schemes for installation, and on ensuring that building control has the expertise to carry out post-installation checks on fixed building services. This upskilling is being pursued with rigour by the Building Safety Regulator, which will be improving competence through 'oversight, support and encouragement', as well as via mandatory codes and standards that will apply from April 2024.

With heat networks set to take a vastly more prominent role in the delivery of heat (and cooling) to buildings, we speak to Gareth Jones, managing director at FairHeat, who is the technical author of the Heat Network Technical Assurance Scheme. This will provide the basis for performance standards for existing and new heat networks from 2025.

The challenge for the industry will be to develop the competencies necessary to specify heat pumps and heat networks that perform well enough to ensure that all new buildings are net zero carbon. A tantalising prospect, and a positive step towards the agreement made between nearly 200 nations at COP28 to cut the use of fossil fuels across the globe.

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A look at what is being done in the UK to protect against online threats to cyber security in the built environment



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COP28 emphasised the importance of reducing fossil fuels and of improving biodiversity and performance



David Brand

The challenges of spending the winter as an M&E engineer in the Antarctic, one of the world's harshest climates



Tim Dwyer

This month's CPD module looks at ensuring fire safety in buildings with suitably specified cables

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IN BRIEF

Redcar hydrogen trial is scrapped

The government has abandoned a plan to test the use of hydrogen to heat up to 2,000 homes in Teesside, while backing 11 industrial hydrogen projects

The domestic trial was due to take place in Redcar, with home gas supplies replaced with hydrogen. It has been cancelled because 'the main source of hydrogen will not be available', said the government, which will now focus on a trial in Fife to decide whether hydrogen should be used to heat homes in 2026.

Meanwhile, the government is backing 11 new 'green hydrogen' projects focused on decarbonising hard-to-abate industrial processes. The projects include InchDairnie Distillery in Scotland, which plans to run a boiler on 100% hydrogen for its distilling process

● Ministers have said they will support hydrogen blending of up to 20% in gas networks in a 'limited and temporary role'. Blending would help the UK achieve its net zero targets while it moves away from the use of natural gas.

Nabers to penalise gas

To support a shift towards net zero in the Australian and New Zealand property sector, the Nabers energy efficiency rating is to penalise the use of gas in buildings more heavily.

It is expected that gas-fired plant will be replaced with electric alternatives to help buildings decarbonise and get to net zero certification. Emissions from fugitive refrigerant leakage will also need to be offset for buildings looking to achieve certification.

Hydrogen-ready boilers ruled out in new buildings

Future Homes and Buildings Standard supports heat pumps and heat networks

The UK government is proposing that all new homes and non-domestic buildings in England are built 'zero carbon ready' from 2025.

In its consultation on the Future Homes and Buildings Standards, published last month, the government says the proposals will mean no further work to buildings would be needed to meet zero carbon emissions 'once the electricity Grid has fully decarbonised'.

The proposals focus on improvements to the minimum standards for fixed building services. These include banning gas and hydrogen-ready boilers in favour of air source heat pumps or connection to a 4th-generation heat network. District heat networks will also 'likely be the preferred way of providing heating and hot water to blocks of flats'.

Existing building fabric standards will be

retained, but the airtightness of new homes, warehouses and sports halls will be improved.

The government is also looking to toughen up standards for homes created from buildings that have undergone a material change of use. There is also a proposal to replace the Standard Assessment Procedure with the Home Energy Model to calculate compliance (see below).

The proposals do not include the carbon embodied in building materials and construction processes, which the government says it will consult on 'in due course'.

Feedback from the consultation will be published as new regulations in 2024, with the new standards coming into force from 2025 with a one year transition period.

The UK Green Building Council has criticised the proposals for lacking ambition and for failing to make the installation of photovoltaics mandatory, address embodied carbon, or tackle flood risk. (See page 26.)

New energy model to replace SAP

The government is proposing to replace the Standard Assessment Procedure (SAP) with a new Home Energy Model (HEM), to coincide with the introduction of the Future Homes and Buildings Standards and bring the UK's energy modelling standards in line with international best practice.

SAP is used to calculate compliance with Part L of the Building Regulations in England. It would be replaced by the HEM: Future Homes Standard (FHS) in 2025, to demonstrate that dwellings comply with the FHS. The model is still under development, but the government is consulting on it 'while it is still at a formative stage' so that industry can participate in the development process.

According to Elmhurst Energy, the UK's largest accreditation scheme for energy assessors, the Home Energy Model would eventually be expanded to include production of Energy Performance Certificates. Stuart Fairlie, Elmhurst's MD, said: 'HEM should not be seen as a replacement for SAP, but rather an enhancement to support the transition to net zero.'

Changes to the model ecosystem include an open-source methodology and a revised database of product characteristics, while the calculation methodology includes increased time resolution.

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The end of the closing plenary at COP28

Nations at COP28 agree to end fossil fuel use

Global renewables will be tripled by 2030 under deal signed by nearly 200 nations

The UN Climate Change Conference (COP28) signalled the beginning of the end of the fossil fuel era when nearly 200 countries agreed a deal that calls on all nations to transition away from fossil fuels in energy systems 'in a nationally determined manner' to avert the worst effects of climate change.

The deal also calls for a tripling of renewable energy capacity globally by 2030, speeding up efforts to reduce coal use and accelerating technologies – such as carbon capture and storage – that can clean up hard-to-decarbonise industries. Industrial nations also pledged to contribute to the Loss and Damage Fund for vulnerable nations impacted by climate change.

CIBSE President Adrian Catchpole attended COP28, and participated in a panel discussion about the impact of decarbonisation on fostering good health and wellbeing.

The dedicated Built Environment Day was

intended to create a global dialogue around the reduction of carbon emissions from buildings.

Highlights included:

- The UK, US, Canada and Germany signed a Green Public Procurement Pledge to use public projects to drive demand for near-zero emissions steel, cement and concrete. They also committed to developing harmonised emissions accounting standards and definitions for construction-related materials.
- A report making the business case for financing climate adaptation and resilience was published by Boston Consulting Group and the United States Agency for International Development. It lays out the opportunities for private sector finance.
- The World Green Building Council published a letter, signed by hundreds of global groups, urging leaders to deliver the regulations to drive change within the sector and supporting the Buildings Breakthrough (see below).

Buildings Breakthrough launched

An agreement to facilitate the universal adoption of near-zero emission buildings by 2030 has been signed by 28 countries, including the UK and the US.

The initiative, proposed by the International Code Council as part of COP28's Built Environment Day aims to accelerate and strengthen international cooperation on decarbonising the built environment. The hope is that collaboration will make sustainable solutions and clean technologies more affordable. Building codes to reinforce regulatory action are expected to be the focus of ongoing meetings.

Momentum for the initiative will be maintained by a Buildings and Climate Global Forum, to be held in Paris on 7-8 March 2024. Non-governmental organisations and businesses from across the buildings sector, along with construction ministers from around the world, are expected to attend.

Global progress towards the goals will be monitored by the International Energy Agency (IEA) and the International Renewable Energy Agency.

- The clean energy transition is creating millions of new jobs, according to a report by the IEA. The *World Energy Employment Report* says global energy employment rose by 3.5 million from pre-pandemic levels, to 67 million people. More than half of that growth was in clean energy sectors, including: solar photovoltaic, wind, electric vehicles and batteries, and heat pumps.

IN BRIEF

UK emissions not falling fast enough

Emissions from the UK's built environment are not falling fast enough for the country to reach net zero by 2050, according to the *Whole Life Carbon Roadmap Progress Report*, published by the UK Green Building Council (UKGBC) and launched at COP28.

In the four years since the 2018 baseline, the UK's built environment emissions reduced by just 13%, well short of the 19% required to remain on track, the report says.

Total operational carbon emissions have fallen broadly in line with the roadmap, but embodied carbon emissions fell by just 4% – less than one quarter of the amount needed to reach near-zero emissions by 2050.

The UKGBC says we now need to move 'nearly twice as fast to make up the shortfall and get back on track by 2025'.

ROI is a barrier to sustainability

Cost and return on investment (ROI) are preventing meaningful action on sustainability, according to a survey by the Royal Institution of Chartered Surveyors (RICS), which polled 4,600 real estate and construction professionals in more than 30 countries.

The *RICS Sustainability Report 2023* found that the industry is 'well educated about sustainability, but deterred from investment predominantly by barriers of cost and return on investment.'

More positively, it found that nearly half of respondents reported a 'modest' rise in occupier and investor demand for climate-adapted real estate.

World needs net zero definition

The World Business Council for Sustainable Development and Arup are calling for an internationally agreed definition for net zero buildings, to help stimulate more robust national and local government policies and industry standards.

In their report *Net zero operational carbon buildings: state of the art*, the authors warn that, without major progress, the built environment will be unable to reach the UN goal of all new and refurbished buildings from 2030 being net zero carbon in operation.

IN BRIEF**ASHPs may fall foul of one-size-fits-all noise assessment**

The main assessment for air source heat pumps (ASHPs) does not account for different levels of background noise, according to new government-commissioned research published on 30 November. It says ASHP installations under permitted development (PD) rights could be 'unnecessarily denied' in areas with higher background sound levels because of the 'one size fits all' approach to noise in the Microgeneration Certification Scheme assessment. The research was carried out before the Autumn Statement, when it was announced that PD rules governing heat pump installations would be relaxed.

Another 89 properties sign up to Zero Bills

Octopus Energy has teamed up with The Hill Group on the most extensive 'Zero Bills' housing development to date. The energy supplier and housebuilder are collaborating on the 89-home scheme in Newport, Essex, where residents have been guaranteed that they will pay no energy bills for a minimum of five years. Each of the homes will boast solar panels, high-quality insulation, heat pumps, and battery storage. Octopus says it has so far accredited nearly 1,000 'Zero Bills' homes through contracts with developers. The scheme includes the first 'Zero Bills' affordable-rent homes.

Scotland proposes gas boiler ban after building sales**Heat in Buildings Standard would require boilers to be removed after fixed period**

Homeowners and businesses in Scotland could have as little as two years to rip out their fossil fuel heating systems, the Scottish government has announced.

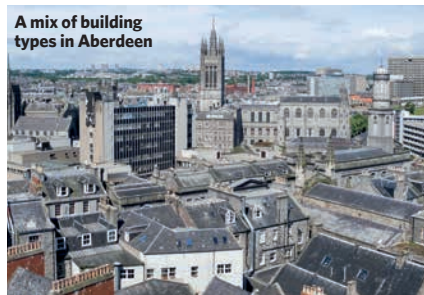
A consultation on a proposed Heat in Buildings Standard, published on 28 November, outlines tough new targets for accelerating uptake of energy efficiency and low carbon

heating measures. It confirms that the use of 'polluting' fossil fuel heating systems will be prohibited after 2045.

To facilitate this ban, those buying a home or business premises will be required to end their use of polluting heating systems within a 'fixed period' following completion of the sale. The consultation proposes a 'grace period' of two to five years to get the work carried out.

The ban on fossil fuel heating will be backed up by the introduction of a new requirement on homeowners to make sure their homes meet a 'reasonable' minimum energy efficiency standard (MEES) by 2033. Private landlords will be required to meet this by the earlier date of 2028 because such properties typically have a poorer standard of energy efficiency.

Owner-occupiers who use electrified heating systems or a heat network by 2033 will not be required to meet the MEES. However, private landlords will have to meet the new standards even if they install clean heating systems.

**Manufacturer heat pump fines cut**

The government has cut the fines that boiler manufacturers will have to pay if they fail to meet targets in its new scheme to improve delivery of heat pumps.

The response to the recently concluded consultation on the Clean Heat Market Mechanism, published on 29 November by the Department for Energy Security and Net Zero, eases the scheme's requirements on manufacturers.

Changes include reducing to £3,000 - from £5,000 - the payment-in-lieu that boiler manufacturers will have to find for every heat pump they fail to install relative to the number of fossil fuel boilers they sell.

The scheme begins operating in 2024, and the mandate will only oblige manufacturers to deliver one heat pump for every 25 boilers they sell.

Manufacturers will also have larger allowances to carry forward unmet heat pump installations into the following year.

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DOMES LIFT CAPS YEAR OF PROGRESS AT HINKLEY

The £245m steel dome was lifted into place by Big Carl



'Big Carl', the world's largest crane, has placed a 47m-wide dome onto Hinkley Point C's first nuclear reactor buildings. Closing the building will allow installation of the reactor next year. Two nuclear reactors will provide electricity for six million homes.

Offsetting to be voluntary in net zero buildings standard

NZCBS update promises beta test version of standard in spring 2024

Major updates to the draft UK Net Zero Carbon Buildings Standard (NZCBS) have been announced following a consultation.

The update states that offsetting will be a voluntary requirement that will be 'encouraged'. Where it is pursued, sufficient carbon offsets must be purchased to cover all carbon emissions required to be reported under the standard.

If offsetting, operational carbon emissions must be reported annually for existing buildings. These include operational energy, refrigerant gases, operational water and significant sources of in-use embodied carbon from components used in repairs.

For new buildings, the scope of reported carbon includes operational carbon during the first year of operation, plus upfront embodied carbon at practical completion.

Renewable electricity procurement may be used to offset Scope 2 carbon emissions from Grid electricity, in place of purchasing carbon credits to meet the standard.

Initially, the standard will only apply to whole buildings and not to individual tenant demises. Subsequent iterations of the standard are planned that will define and develop a delineated approach between owners and occupiers and/or between individual tenant demises.

Once the delineated update is available, net zero verification will be achievable independently for different demises.

A beta testing version of the standard is set for publication in spring 2024, with Version 1, including guidance and supporting documents, planned for publication in late 2024.

The standard will apply to new-build and retrofit/existing buildings. A project can only be verified, by a third party, as net zero carbon after one year of metered data following occupation.

QODA Consulting associate Katie Clemence-Jackson has become chair of the standard's technical steering group, replacing Clara Bagenal George, who remains on the steering group as a representative of Leti.

Sixty countries support Global Cooling Pledge at COP28

Taking measures to reduce the power consumption of cooling plant would cut predicted sectoral emissions by 60%, according to a report by the UN Environment Programme-led Cool Coalition.

Published to coincide with COP28, *Keeping it chill: how to meet cooling demands while cutting emissions*, lays out sustainable cooling measures in three areas: passive cooling; higher energy efficiency standards; and a faster phase-down of climate-warming refrigerants.

The report has been released in support of the Global Cooling Pledge, a joint initiative between COP28 hosts the United Arab Emirates and the Cool Coalition.

More than 60 countries signed the pledge, with commitments to reduce the climate impact of the cooling sector.

UK Minister for Energy and Climate Graham Stuart, who signed the pledge, said: 'We need innovation in this sector... if we are to protect our power supplies and keep 1.5 degrees within reach.'

Cooling represents 7% of global emissions while consuming 20% of the electricity produced today. This figure is expected to double by 2050, leading to increased greenhouse gas emissions from power consumption and refrigerant gas leakage.

Government commits extra £1.5bn to Boiler Upgrade Scheme

The Boiler Upgrade Scheme (BUS) has been allocated a further £1.5bn by the government to support the move away from gas and towards electric heat pumps in England and Wales from 2025.

The BUS was launched in 2021 with a £450m budget. It provides upfront capital grants to support the installation of heat pumps in homes and non-domestic buildings. Acting on behalf of property owners, installers can apply for: £7,500 off the capital cost of an air source or ground source heat pump or a biomass boiler.

The government's aim is to grow the heat pump market to 600,000 installations a year by 2028 and up to 1.9 million a year by 2035.

The extension of the Boiler Upgrade Scheme coincided with a wider package of measures to accelerate energy efficiency improvements. This includes the launch of a new £400m energy efficiency grant scheme in 2025 to enable households in England to make changes such as improving insulation.

IN BRIEF

CIBSE UK membership application deadline

The next deadline for UK Associate (ACIBSE) and Member (MCIBSE) applications with IEng and CEng professional registration is 1 February 2024.

CIBSE offers a wide range of application support services, including:

- Monthly webinars about routes to membership and registration
- Sample reports
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- Interview guidance
- 1-2-1 membership advice.

Submit your application by 1 February to be interviewed in the spring. Find out more at bit.ly/CJAppsup

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 - Increased visibility via CIBSE channels to attract new clients
 - Enhanced recognition as the directory is viewed as a high-quality resource.

See www.cibse.org/cpd-directory

Heat networks training grants

CIBSE Training has secured grant funding from the Department for Energy Security and Net Zero for heat networks training. Each delegate can get £500 off the cost of either the one-day *Introduction to heat networks and Code of Practice*, or the two-day *Heat Networks Code of Practice (CPI)* full course – www.cibse.org/training

The grant will be awarded on a first come, first served basis, and is only available to delegates living in England. To apply, please email training@cibse.org and provide proof of address.

Koronaivos and Sood win simulation awards

Winners of CIBSE Building Simulation and Young Modeller awards were unveiled at Build2Perform

The CIBSE Building Simulation Awards have recognised two modellers for their work in driving down carbon in retrofits and housing.

Georgios Koronaivos MCIBSE, associate sustainability engineer at Savills Earth, won the CIBSE Building Simulation Award for his project *Integrated modelling workflow for retrofit building performance optimisation*. A refurbishment and extension of an existing two-storey office building in Weybridge, the project implemented various modelling techniques from RIBA Stage 2 to 4 to optimise the building's performance and

adhere to net zero carbon standards. The approach encompassed detailed modelling for fabric optimisation, operational energy, thermal comfort, loads assessment, compliance modelling, and daylight. Notably, Nabers modelling resulted in a 5.5-star rating, surpassing the initial target of 5.0 stars.

Gabriela Costa, head judge and CIBSE Building Simulation Group committee member, highlighted the breadth and depth of this retrofit project, which included a review of passive design features, integration of mixed-mode ventilation and detailed modelling using a variety of tools.

Divyanshu Sood, doctoral researcher at University College Dublin, was named CIBSE Young Modeller of the Year. The judges were impressed by his strong technical outlook in driving energy modelling in the field of domestic archetypes. This is significant in driving the net zero carbon transition.

The accurate predictions achieved with energy modelling will make a significant contribution to the transition of large-scale building stock to net zero. Sood's dedication to knowledge sharing and application of energy modelling skills for charitable causes was also recognised.

There was a record number of submissions to both categories, and the judges said it was satisfying to see how the industry and academic applications of dynamic building thermal simulation have spurred exploration of advanced modelling techniques. These are playing a vital role in shaping integral national and international policies.



New Special Interest Group will act as hub for sustainability



CIBSE has announced the establishment of a new Sustainability Special Interest Group. This group will curate existing active groups, such as the Air Quality Task Group and Health and Wellbeing groups, and new groups, which will include embodied carbon, circular economy, acoustics and climate resilience.

The Sustainability SIG aims to promote holistic thinking, and will act as a hub for sustainability issues – collating information from other groups, and sharing information to other groups. If you want more information, please contact groups@cibse.org

The CIBSE Air Quality Task Group has been set up to use engineering skills to support the pursuit of healthy air in the built environment bit.ly/CJAQTG



CIBSE President Adrian Catchpole addresses a session at COP28

CIBSE President and CEO contribute to COP28

Catchpole and Carter acknowledged value of contributing to global discussion

Engineering leadership, the net zero agenda, embodied carbon and climate resilience were among the issues addressed by CIBSE President Adrian Catchpole and CEO Ruth Carter when they represented the Institution at COP28, in Dubai, in December.

The pair spoke at a number of sessions, and participated in panel discussions on efficiency and reduction of embodied emissions in building, and the impact of decarbonisation on fostering good health and wellbeing in green cities and communities.

Their presence helped raise the profile of the work of CIBSE and its members, particularly the TM65 embodied carbon methodology, which has had global impact.

Catchpole and Carter acknowledged the value of being able to contribute to global

discussions and shape attitudes to embodied carbon and climate resilience.

Catchpole said: 'I felt the built environment was out in force, with a determination to see action - it is no longer about how to do it, but how to do it quickly. We need further regulation from government to accelerate the impact, but we now have the tools and ambition to deliver.'

As part of their visit to the UAE, they visited Heriot-Watt University, Dubai, and University of Birmingham Dubai, while Catchpole also signed a memorandum of understanding between CIBSE and the Society of Sustainability and Green Materials, agreeing to collaborate to promote membership and shared priorities.

Their trip was rounded off with the CIBSE UAE Annual Dinner and Awards, details of which will be published in the February edition of *CIBSE Journal*.

CPD on building safety and sustainability now compulsory

As of this month, it is mandatory for CIBSE Licentiates, Associates, Members and Fellows to undertake continuing professional development (CPD) on sustainability and building safety.

Each member is now required to take part in, and reflect on, semi-structured activities on these topics, such as supplier webinars, CIBSE events, or internal company presentations. This will focus learning and development on these two key industry issues, ensuring engineers deliver more efficient building designs and stay informed about the latest technology and techniques in building safety.

CIBSE has introduced new CPD icons (right) to help signpost relevant training and events, so look out for these on the website and on training information.

CIBSE Members must also abide by the CIBSE Code of Conduct, which includes recording their CPD activities in a log. The easiest way to do this is by using CIBSE's online tool mycareerpath, but it can also be done on a spreadsheet.



IN BRIEF

Ken Dale Bursary for 2024 is up for grabs

Applications are now open for the Ken Dale Travel Bursary 2024.

The bursary makes awards of up to £4,000 to CIBSE Members in the developmental stage of their career who wish to spend three to four weeks outside their own country researching aspects connected to their work.

Ibrahim Qadir won the 2023 bursary with his proposed project *Technical challenges and opportunities of future AI technology in buildings: A comparative study*.

The deadline for entries is 1 May 2024. For more information on how to apply, visit <https://bit.ly/CJKEND>

Wanted: nominations for CIBSE medals

CIBSE's gold, silver and bronze medals recognise exceptional, outstanding and distinguished service to CIBSE and the wider building services industry.

The Institution seeks to recognise those whose contribution has been made through long and loyal service, and those whose work has inspired us all - and has helped raise the profession's profile.

Proposals for 2024 are now invited and the deadline for submissions is 31 March. Visit <https://bit.ly/CJJan22CN>

Post-nominal for past presidents

CIBSE past presidents will now be able to write PPCIBSE after their name. The new post-nominal was approved by the CIBSE Board of Trustees following a proposal from the Nominations Panel.

The Board and panel feel this will provide recognition of the considerable and long-term commitment and effort invested by presidents for the benefit of CIBSE and its members.

The new post-nominal was announced at the Past Presidents Lunch in December, and all past presidents are now invited to use it with immediate effect.

Dr Jeremy Cockroft remembered

The CIBSE Scotland Regional Committee is saddened to report that committee member Dr Jeremy Cockroft has died.

Jeremy had a big impact on many in the Region through his volunteering work at CIBSE Scotland. He received a CIBSE bronze medal in 2023 in recognition of his exceptional service. He was dedicated to his field and to the Region, and he was very proud to be recognised by CIBSE in this way.

Jeremy joined the CIBSE Scotland Regional Committee in 2007 and has been a very active member ever since. He had been the Technical Meetings Convenor and organised a huge number of well-attended and educational technical seminars for the Scottish Region.

If you would like to pass on any messages or photos of Jeremy to his family, please send them to scotland@cibse.org

Comedian Zoe Lyons to host Building Performance Awards

Zoe Lyons, comedian and series regular on BBC2's *Mock the Week* and Radio 4's *The News Quiz*, has been announced as host of the 2024 CIBSE Building Performance Awards.

The awards remain the only ones that recognise the actual measured performance of completed buildings.

They will be presented at a ceremony taking place at the Park Plaza Westminster Bridge hotel, London, on Thursday 29 February 2024.

To book your place to celebrate with the best in the industry, visit www.cibse.org/bpa

CIC appoints Les Copeland to its board

Les Copeland FCIBSE has been appointed to the board of the Construction Industry Council (CIC).

Copeland is a CIBSE vice-president and member of the Board of Trustees. He is also Buildings Global Major Projects & UK commercial director at Ramboll. His initial term of office on the CIC board is three years, which can be renewed for a further three years.

The CIC is the representative forum for professional bodies, research organisations and specialist business associations in the construction industry.



Buro Happold's triple win at SDE Digital Awards

Consultancy scoops three prizes as entries hailed as most varied ever

Buro Happold was the big winner at the Society of Digital Engineering (SDE) Digital Awards, which took place at Build2Perform Live last month.

It was not only named best consultancy, but also picked up the Best Project and Collaboration and Digital Champion awards for its Digital Twins for Cities scheme.

Red Engineering was highly commended in the Best Consultancy category, while the Best Contractor award went to BAM Nuttall. The Best Digital Engineer was James Thomson MCIBSE, deputy head of digital engineering at Ramboll UK.

Kinship was named Best Manufacturer and WSP's Grasshopper Embodied Carbon and Thermal Analysis tool won the Best Process and its Application award.

The inaugural Outstanding Contribution Award for services to the digitalisation of the built environment went to May Winfield, global director of commercial, legal and digital risks at Buro Happold. SDE chair Andrew Krebs, said: 'May's contribution to the legal framework around BIM and digital information exchange on projects has, and

will continue to have, a foundational impact on all of us.'

Entries to the awards were the most varied ever seen. Krebs said: 'I would like to thank every entrant for their time and effort in submitting to the awards. The judges also deserve immense credit, and my thanks go to them for enabling the awards to take place.'

Krebs presented the outgoing CIBSE head of digital engineering, Carl Collins, with a life membership of the society for his 'unsurpassable contribution to the creation and running of the Society from its inception'.



Carrasco takes title with new circadian light assessment tool

Teresa Aguilar Carrasco has been named SLL Young Lighter 2023 for her project CircaLight, a new circadian light assessment tool for Grasshopper environment.

Carrasco was announced as the winner at Light2Perform in December, following the finals in November, when the four finalists presented their papers at LiGHT23, in Islington, London.

Carrasco, who graduated from the University of Seville in 2019, is a researcher in the Department of Architectural Construction at the Higher Technical School of Architecture of Seville, studying for a PhD in architecture. Her doctoral research encompasses lighting and energy efficiency, and focuses on the impact of lighting on visual comfort and the health of individuals, particularly its effect on circadian rhythms.

The judges felt that her work took a number of processes and presented a new way of tackling the challenges of daylight assessment of different metrics, delivering a consistent methodology to present and communicate the outcomes.

The other SLL Young Lighter 2023 finalists were: Anna Freiesleben (Michael Grubb Studio), Irene Mazzei (Edinburgh Napier University/Stoane Lighting) and Tom Ruddle (EGG Lighting). All received a cash prize, plus a year's free SLL membership. If you would like more information about the SLL Young Lighter competition and how to enter in 2024, email sll@cibse.org.

The CIBSE premises in Balham have been subject to a BUS survey

Occupant survey is first move in CIBSE relocation

BUS survey aims to measure wellbeing, comfort and productivity of staff

Moving office premises can be a daunting task at the best of times. Doing so with the added responsibility of providing building services for your staff and 22,000 members, as the leading international institution for building services, sharpens the focus of everybody involved.

The process of selling and finding premises is ongoing – and there will be more news on this in future *Journals* – but this has not stopped CIBSE from putting in place some best practices.

One of its first actions was to investigate the current premises at Balham and how this was performing for its staff. Led by Laura Mansel-Thomas, senior partner at Ingleton Wood and chair of CIBSE's people and culture group, the team agreed that the best way to do this would be by employing the Building Use Studies (BUS) methodology.

BUS is a building occupant survey and benchmarking tool, by which occupants complete a study and the results are benchmarked against other responses. Red/

amber/green graphics and percentile plots show how the building performs against the benchmarks. Comments are quality-checked and collated by question.

The project was put out to tender, and Arup was awarded the contract.

The survey was completed in November and the findings will be reported in the new year. They will be key to informing the decision-making process for what is required from the new CIBSE headquarters building for staff and membership.

How to use a BUS survey

Arup's advice when using BUS is to capture the sentiments of occupants beyond what conventional metrics reveal. Traditional evaluation methods prioritise metrics and key performance indicators on which senior leadership might focus, but BUS emphasises occupant wellbeing, comfort, and productivity.

Its benchmarked data sets allow organisations to compare their building's performance against peer institutions, using qualitative and quantitative insights to drive strategic decisions for workplace relocations. Using and implementing BUS to its fullest extent will help create a workplace that aligns with CIBSE's operational goals and the holistic wellbeing of its staff, says Arup.

Security engineering AM among new CIBSE publications

CIBSE has revealed its publishing plan for the first quarter of 2024. It will issue two TM65 guides on embodied carbon in building services, an Applications Manual on security engineering, and three Digital Engineering Series publications covering pre-qualification questionnaires, employer's information requirements and BIM execution plans. Full details of the publications are:

- Security engineering: Strategy (AM4.1)
- Embodied carbon in building services: logistics (TM65.x)
- Embodied carbon in building services: A calculation methodology for the United Arab Emirates (TM65UAE)
- The Digital Engineering Series:
 - Pre-qualification questionnaires
 - Employer's information requirements
 - BIM execution plans.

The Institution is seeking volunteers to beta test digital web tools. Current tools in the testing phase are: pipe-sizing calculator; public health; embodied carbon calculator; and air-cleaning calculator.

Volunteers are also being sought to author and review guidance in the following areas: smart buildings; air quality; climate change risk and services; and electrical loads and power densities, including the electrification of heat and electric vehicle charging.

For more information, visit www.cibse.org/knowledge-research

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CIBSE HONG KONG CELEBRATES EXCELLENCE

Three project winners crowned at third regional awards and excellence in facilities management and digital innovation recognised


The third CIBSE Hong Kong Awards took place last month, with three projects recognised for outstanding performance and accolades given for Facilities Management Team of the year and, for the first time, Best Digital Innovation.

The new digital category acknowledges the integral role that digital innovation will play in shaping the future of building services engineering.

The awards recognise organisations that have played pivotal roles in the design, construction, installation, commissioning, or operation of low-energy buildings with a high-quality built environment.

In his opening speech at the ceremony, Gary Chiang, CIBSE Hong Kong regional chair, said: 'These awards go beyond design intent or performance specifications, truly acknowledging the impact and effectiveness of engineering solutions in Hong Kong.'

'In an era of sustainability and environmental consciousness, the importance of building services engineering cannot be overstated.'

CIBSE Hong Kong was the Institution's first non-UK region and is the largest outside of the UK, representing 59% of non-UK and 15% of total membership. 

WINNERS AT A GLANCE

Project of the Year Award – Commercial/industrial building

The International Commerce Centre,
Kai Shing Management Services

Project of the Year Award – Public use

Kowloon East Regional Headquarters and Operational Base cum Ngau Tau Kok Divisional police station,
Architectural Services Department and Electrical and Mechanical Services Department

Project of the Year Award – Retrofit building

TKO Plaza
Arup

Facilities Management Team Award

Design-Build-Operate a district cooling system (DCS, phase II works) at Kai Tak Development, and operation and maintenance services of DCS in West Kowloon Culture District,
Hong Kong District Cooling Company

Best Digital Innovation Award

Integrated Smart Management System
Hongkong Land (Property Management)

The winners

Project of the Year Award – Commercial/industrial building

Hong Kong's tallest building, the International Commerce Centre (ICC), won the Project of the Year Award – Commercial/industrial. Managed by Kai Shing Management Services, the mission is for the building to become the greenest in Hong Kong.

Using innovations such as chilled water battery technology, artificial intelligence (AI)-driven predictive analysis, and augmented reality maintenance management, the ICC has achieved a remarkable 20 million kWh reduction in electricity consumption over the past decade.

Beyond its architectural prowess, stakeholders in the ICC – including tenants, academic institutions, and non-governmental organisations – collaborate to drive sustainable development and contribute to national and local carbon-neutrality goals.

Project of the Year Award – Public use

This award was claimed by the Kowloon East Regional Headquarters and operational base cum Ngau Tau Kok divisional police station.

The judges felt that the project – a reprovisioning effort by the Architectural Services Department and Electrical and Mechanical Services Department (EMSD) – stood out from the



Professor Horace Mui, chair of the awards organising committee (left) and Gary Chiang, chair of CIBSE Hong Kong region

Project of the Year - Commercial/Industrial



other entries for its innovative sustainable design and energy-efficient features.

The 16-storey complex in Kai Tak integrates renewable energy sources, demand-control ventilation, rainwater harvesting, and a district cooling system, and achieves a 20% reduction in electricity consumption compared with Building Energy Assessment Method Plus estimates.

The project also showcased novel construction methods, employing modular integrated construction/multitrade integrated mechanical, electrical and plumbing, and BIM applications, for enhanced quality, productivity and safety.

Project of the Year – Retrofit

TKO Plaza, a commercial shopping centre owned by Nan Fung Group, received the Project of the Year – Retrofit award for the project team's outstanding commitment to carbon neutrality and sustainable development.

Led by Arup, the project integrates corporate Science-Based Targets with asset-level retro-commissioning, addressing challenges such as data availability and operational implications.

A comprehensive energy analysis of the building identified improvement opportunities, overcoming hurdles with a building management system. TKO Plaza's success with retro-commissioning and using a digital twin to enables accurate evaluations of energy-saving and wellness strategies, sets a benchmark for sustainable development, said the award judges.

Project of the Year - Retrofit



Facilities Management Team Award



Facilities Management Team Award

Hong Kong District Cooling Company won the Facilities Management Team Award for Design-Build-Operate of a district cooling system (Phase II) in Kai Tak and operation/maintenance services in West Kowloon Cultural District.

The second phase of works at Kai Tak has an ultimate cooling capacity of 81,000 refrigeration ton (RT), with a long list of consumers, such as the EMSD Headquarters and Kai Tak MTR Station. In West Kowloon, the M+ district cooling system, initiated in March 2022, supports WKCD Tower and the M+ Building, with a capacity of 4,900RT. The project prioritises reliability, temperature control, energy efficiency, safety, and seamless integration of new customers, showcasing excellence in district cooling.

Best Digital Innovation Award

Hongkong Land (Property Management) was the winner of the new award category, Best Digital Innovation, for its Integrated Smart Management System (ISMS).

The system includes components such as an integrated building management system, Internet of Things integration, an AI data analytic platform (Jedi), in-app personal comfort control, and an integrated security management system.

The ISMS, initiated in 2012, connects operational systems across buildings, offering valuable insights for enhanced efficiency and sustainability. Components such as Jedi use AI to optimise chiller plant operations, while Centricity empowers tenants with personalised comfort control.

Best Digital Innovation



A secure new year?

Cyber security is easily seen as an imposition and a dark art, but it is an essential discipline in an increasingly virtual world, keeping us safe from a wide range of threats and malicious actors. Hywel Davies explores the topic and what is being done to protect the UK online

The National Cyber Security Centre (NCSC) is the UK's technical authority for cyber security and is a part of Government Communications HQ (GCHQ). Opened by HM Queen Elizabeth in 2016, its goal is 'to make the UK the safest place to live and work online'.

NCSC's seventh annual report was published in November 2023, highlighting key milestones in the year ending August 2023. The report also looks ahead to future challenges.

In 2023, we witnessed growing interest in artificial intelligence (AI) and the rise of ChatGPT (other AI tools are available). Such systems have the potential to bring many benefits to society, but there are also some broad, dystopian predictions of how AI will affect almost every aspect of our future lives.

The field of AI is much broader than large language models (LLMs) such as ChatGPT, presenting a range of cyber threats. The NCSC has focused on understanding the cyber-security challenges and opportunities of AI for many years.

While much debate around AI focuses on broader existential risks, its rapid development also brings many immediate security concerns. As this technology develops further, ongoing cyber research aims to understand its vulnerabilities and keep track of how our adversaries are seeking to exploit AI irresponsibly



and unethically, often for malign ends. The NCSC is working with industry, academics and international partners to provide clear guidance to help us all understand and manage these risks.

While the risks of AI are significant, it is basically a type of software – and while it creates new challenges, we have learned many lessons from previous generations of cyber-security practice that can be used to secure this rapidly developing technology.

AI also presents the cyber-security sector with significant opportunities to develop new and innovative defences against hostile actors.

On 1 and 2 November 2023, the UK hosted the first AI Safety Summit at Bletchley Park, with governments, leading technology organisations, academia and civil society coming together to consider rapid national and international action in response to AI development. The resulting 'Bletchley Declaration' acknowledges the

"AI has the potential to bring many benefits to society, but there are also some dystopian predictions of how it will affect every aspect of our future lives"

DR HYWEL DAVIES

HonFCIBSE is chief technical officer at CIBSE. He chaired the Building Regulations Advisory Committee golden thread working group





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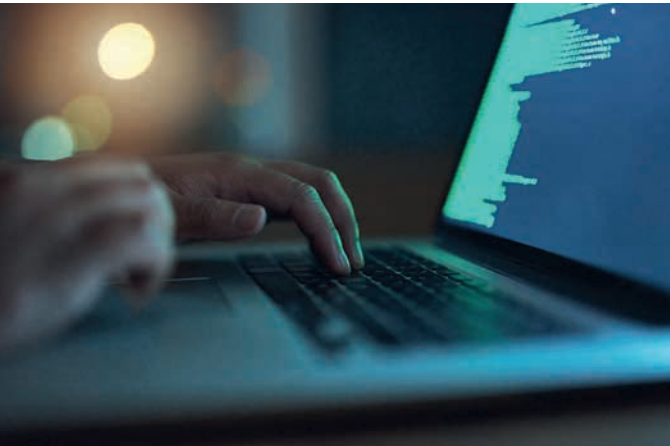


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need for inclusive and collaborative action to address risks around the most advanced and cutting-edge 'frontier' AI.

The summit emphasised the importance of a 'secure by design' approach to cyber security in AI development. This is the key principle behind the new *Guidelines for secure AI system development*, published by the NCSC, the US Cybersecurity and Infrastructure Security Agency, and 21 other international agencies at the end of November.

The guidelines are primarily for providers of AI systems, but are also relevant to stakeholders who are using AI within systems to enable informed decisions to be made about their design, development, deployment and operation. They make recommendations about the considerations and mitigations that will reduce risk in organisational AI-based systems development.

AI is not the only consideration, however. Last month, the NCSC met representatives of the UK cultural sector to discuss protection of institutions' online collections, which pool millions of digital records and increase public accessibility to materials with unique social and cultural value. This makes the cultural sector an attractive target for opportunistic threat actors looking to exploit and disrupt these assets through ransomware, causing a loss of income not only for the organisation concerned, but also for society at large.

Even closer to our sector, the NCSC and US recently issued guidance to address active and malicious exploitation of Unitronics programmable logic controllers in the water, energy, food and healthcare sectors. Key messages include the need for multifactor authentication and use of unique strong passwords, and not defaults. This is but one example of the threat to UK national infrastructure posed by cyber operations.

I wish readers a secure new year and encourage you all to check in with the NCSC website soon.

Relevant links:

- NCSC website - www.ncsc.gov.uk
- The Bletchley Declaration - bit.ly/BLDEC23
- Culture sector cyber summit - bit.ly/NCSCSum23
- 'IRGC-affiliated cyber actors exploit plcs in multiple sectors, including US water and wastewater systems facilities', US Cybersecurity & Infrastructure Security Agency (IRGC is the Iranian Revolutionary Guard Corps) - bit.ly/Cybthr23

Competence culture change is essential

Smoke control system maintenance should be carried out regularly by competent contractors, says the Smoke Control Association's **David Mowatt**

Smoke control systems can only be relied upon to operate effectively if they are checked regularly and maintained by competent operatives. Waiting until there is an incident to find out that a system isn't functioning as intended can have catastrophic consequences.

BS 7346-8 Components for smoke control systems – Code of practice for planning, design, installation, commissioning and maintenance provides details of maintenance requirements and templates for test records and service certificates.



Building owners and managers should ensure they have documented performance criteria for the installed system that confirms the basis of its compliance with Building Regulations. This should include a detailed cause and effect, which then forms the basis of the test and maintenance regime.

This regime should include daily, weekly, monthly, three-monthly, six-monthly and annual testing and maintenance. Some of these tasks may be undertaken by a suitably trained in-house individual, but others will require a certified and accredited service provider.

A qualified contractor can carry out regular maintenance on the system and ensure that any faults are rectified promptly. There is now also a requirement to notify the local fire and rescue service of any faults that are not rectifiable within 24 hours.

It isn't unusual to find smoke control system maintenance bundled in with fire alarm maintenance. However, the skill set of a smoke control engineer is different from that of a fire alarm engineer, encompassing airflow and pressure differential measurement, fan, damper and ventilator testing, and smoke and CO detection.

A fire alarm engineer may not be equipped to carry out the measurements required to confirm the correct operation of most mechanical smoke control systems.

Routine inspection and maintenance of the smoke control system should also be carried out in accordance with BS 9999:2017. BS 9999 provides recommendations and guidance about the design, management and use of buildings to achieve acceptable levels of fire safety for people in and around buildings.

A culture change is required to ensure that building owners understand the importance of smoke control systems and make sufficient provision for regular testing and reporting of faults.

● **David Mowatt** is chair of the Smoke Control Association

Reimagining education

University courses will have to evolve if they are to ensure the next generation of building services engineers have the skill sets to deliver healthy, net zero buildings. Dejan Mumovic FCIBSE summarises a recent *REHVA Journal* special that addressed the issue

The role of buildings in the transition to net zero carbon emissions and the wellbeing of human society has increased significantly in importance since the turn of the century.

Transcending multiple disciplinary boundaries is becoming necessary for devising solutions that create healthy and sustainable buildings. As a result, the role of building services engineers has extended to every stage of a building's life.

Responsibilities are wide ranging and now include preparation and briefing, concept design, spatial coordination, technical design, manufacturing and construction, handover, operation and reuse.

Undergraduate building services engineering programmes play a critical part in developing new competencies and attributes necessary for the built environment professional of tomorrow.



To understand the necessary skill sets needed by the next generation of building services engineers, the Federation of European Heating, Ventilation, and Air Conditioning Associations surveyed 46 industry professionals and university staff from 14 European countries. The results were published in June 2023 in a special issue of *REHVA Journal* on educational challenges and opportunities for sustainable development.

We aligned the survey results with common learning outcomes of national engineering councils across Europe covering science and mathematics, engineering analysis, design and innovation, the engineer and society, and engineering practice. We then evaluated the extent to which climate change, health and wellbeing, decarbonisation and energy flexibility have been integrated into accredited university courses.

The conclusion was a call to evolve undergraduate HVAC programmes to meet the needs of the new roles in building services.

The profession is facing a number of challenges, including a shortage of qualified engineers, the need to adapt to new technologies, and a need to address social and environmental issues. Therefore, it is essential we improve the way we educate engineers.

In the UK, there is evidence of flexibility embedded in the Higher Education Institutions enabling access routes into university, and there is potential for combining courses from different disciplines and mixing full-time and part-time experiences.

CIBSE has the opportunity to bring together engineering educators from a range of backgrounds to develop new approaches to engineering education. It can be a bridge between universities in industry to explore various related topics (see panel 'New approaches to engineering education').

Whatever vehicles are used to develop student knowledge and skills, all these challenges will require collaborative learning environments that encourage interdisciplinary approaches by integrating knowledge from various disciplines and working with students and practitioners from different fields.

CIBSE has an important role to play in reimagining the role of building services engineers, improving engineering education and ensuring the building services engineering profession is ready to meet the challenges of the future.

● If you are interested in the topic please get in touch at d.mumovic@ucl.ac.uk

DEJAN MUMOVIC

FCIBSE is professor of building performance analysis, and director at the UCL Institute for Environmental Design and Engineering

NEW APPROACHES TO ENGINEERING EDUCATION

What educators should be discussing to prepare the next generation of engineers

- Preparing students for the challenges of the 21st century
- Making engineering education more accessible and inclusive
- Using technology (including AI methods) to enhance engineering education
- Engaging students in social and environmental issues
- Addressing the climate emergency and net zero in teaching, research and application
- Engaging students in real-world projects
- Leveraging resources across (CIBSE) accredited centres of education to benefit society
- Sharing pedagogical knowledge and skills across educational providers
- Increasing reputation and visibility of outstanding teaching staff and students in the UK and across the globe.

PAPERS FROM REHVA JOURNAL'S EDUCATION ISSUE

- Inspiring and preparing the next generations of the built environment professionals for a net zero future: revolutionary evolution. Professor Mumovic Dejan
- Delivering sustainable, safe and healthy buildings for a net zero future: educational challenges and opportunities. Dejan Mumovic, Duncan Grassie, Elizabeth Cooper
- Teaching the fundamentals of building performance simulation in the 21st century. Ian Beausoleil-Morrison
- Mainstreaming education for sustainable development: vertically integrated projects for sustainable development: a case study from the University of Strathclyde. Scott Strachan, Louise Logan, Stephen Marshall
- Integral design: a necessity for sustainable building design. Wim Zeiler
- Advancing transdisciplinary architecture and engineering education: defining the needs of a new multidisciplinary built environment design professional. Elizabeth Cooper, Sonja Oliveira, Dejan Mumovic
- A new learning programme to facilitate nZEB Implementation. Florin Bode
- A structured approach to online education of future HVAC and energy professionals. Laure Itard, Philomena Bluysen, Paula van den Brom

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PLATFORM FOR CHANGE

CIBSE Build2Perform Live was a platform for industry professionals and academics to highlight the issues vital to the built environment tackling its net zero challenges while ensuring the safety and comfort of end users. **Alex Smith, Molly Tooher-Rudd and Mike Sewell** report

With CIBSE involved in key policies and guidance around net zero and building safety, CIBSE Build2Perform Live 2023 offered insight into the engineering strategies and technologies that are dominating the industry at the moment.

Speakers and exhibitors focused on key topics, including the impact of the Building Safety Act, embodied energy, heat pumps and digital tools. There was time for celebration, too, with the CIBSE Building Simulation Awards and Society of Digital Engineering Awards held during the event (see page 11).

Among the seven stages at London ExCeL was, for the first time, Light2Perform, and content around building safety was provided by CABE's Built Environment Live, which ran alongside the main event.

Build2Perform Live was opened by CIBSE vice-president David Cooper FCIBSE, who told delegates that it had attracted a record number of registrants. He was followed by a keynote from the team developing the Net Zero Carbon Buildings Standard (NZCBS), which includes Julie Godefroy, head of net zero policy at CIBSE, and Katie-Clemence Jackson, sustainability associate at QODA and chair of the NZCBS technical steering group.

The group aims to achieve a robust definition for net zero buildings in the UK and create a rule book to assess new and existing buildings. A new tool is also being developed to balance 'top-down' budgets and 'bottom-up' performance levels to produce net zero carbon pathways and limits.

'We have modelled different scenarios of decarbonisation to help set new limits and requirements in the standard, treating operational energy and embodied carbon as one entity', said Clemence-Jackson. Godefroy spoke about future updates. 'We need to look at district heating and cooling networks, and how we assess these and set limits,' she said.

Andrew Moore, from the Health and Safety Executive, led a talk on the Building Safety Act. He explained that there are significant new requirements to demonstrate competence on all regulated building work, not just on 'higher-risk buildings'. 'Competence cuts across the whole of the



It's about data-driven decision-making; without data you're just another person with an opinion – Phil Birch, Amazon"

industry. It's a key driver to improving the built environment, to reach all of our strategic aims, not just building safety,' he said.

'We want to see how you ensure that your work is in compliance with the Building Regs; industry needs to step up and take responsibility for its designs.'

TM65's growing influence

CIBSE's TM65 series has helped engineers understand and calculate embodied energy in designs and systems. A further four TM65 documents are set to be published around calculating embodied energy, including local addenda for the USA and the UAE.

Francisco Sierra, senior lecturer at UWE Bristol, highlighted the lack of data in the UAE on embodied carbon. He said the TM65 aligns with local decarbonisation policies.

DO'S AND DON'TS OF LIGHTING

A Light2Perform session on the Top 10 Do's and Don'ts of Lighting was a popular draw.

Experts discussed the importance of a well-crafted specification that balances innovation, client budget, and sustainability. 'A good spec will set out the requirements of the employer, but in a way that the engineer can design an innovative solution while taking into account all of the standards,' said Sophie Parry FSLL, head of Trilux Akademie at Trilux Lighting.

Hoare Lea project director Ruth Kelly Waskett MCIBSE FSLL highlighted that the process needs continual client involvement when considering each aspect of a project, including energy reduction, disassembly, repair, and reuse.

Parry agreed, emphasising the importance of education and awareness in lighting, and advocating for open sharing of knowledge with designers and clients.

The discussion delved into the significance of energy reduction, sustainability and cost. Simon Robinson FCIBSE FSLL, technical director at WSP, stressed the importance of these criteria for engineers in achieving energy certification. 'Anything that helps get us there should be entertained. Lighting is visible, so we can make a statement with this,' he said.



Julie Godefroy speaks at a session on evaluating retrofits



Amazon's senior programme manager for sustainable buildings, Phil Birch, outlined how the company has used TM65 to align with its Climate Pledge. 'We're doing countless calculations to work out the embodied carbon of our primary buildings, as well as the MEP we use. It's about data-driven decision-making; without data you're just another person with an opinion,' he said.

Amazon is working with Introba to create TM65.3, which will cover embodied carbon in logistics buildings to improve the accuracy of calculating the carbon footprint of these spaces. Other future versions, such as TM65.4 will cover embodied carbon in office HVAC systems, are in progress.

Kristina Allison MSL MCIBSE, vice-president of the SLL discussed 'practical journeys through TM66 (which she co-authored) and TM65.2', a circular guide and tool that helps assess lighting embodied energy.

Making cities resilient

Reducing emissions from the cities will be fundamental if issues around global climate change are to be solved. This was the message from physical geographer Gerald Mills, who highlighted that 70% of the world's CO₂ emissions are from cities.

Mills, associate professor at University College Dublin, stressed that a combination of adaptation and mitigation was required to ensure the world's cities could cope with the impacts of current and future hazards. He cited the example of the French city of Nîmes, which has implemented measures to create accessible outdoor cool spaces. Heat gain has been reduced by maximising shade via tree canopies, increasing the amount of water cover, and enhancing ventilation.

Other speakers included Darren Woolf, head of building physics for Wirth Research and visiting professor at Loughborough University, who explained the role of the UK Urban Environmental Quality Partnership. Hosted by CIBSE, members are working on publications covering topics such as urban vegetation systems, outdoor thermal comfort, city wind microclimate guidelines, and modelling of outdoor air quality.

The challenge of tackling overheating in the UK's housing stock was examined by Passivhaus designer Joseba Perez de Larraya Sola, of Pollard Thomas Edwards, and Kai Salman-Lord, senior engineer at Max Fordham. They looked at how greater use of shading devices for buildings could help tackle this problem, especially in a residential setting. The pair have been heavily involved in the launch of a new guide from

the Good Homes Alliance, *Shading for housing*, which seeks to embed shading as central to a building's design and built in from the start.

Staying cyber secure

An important issue that is often overlooked in the industry is cybersecurity. Sweco digital manager Andrew Krebs shed light on the pervasive impact that breaches of digital security can have, saying 'it affects everything we are doing, from safety to decarbonisation'.

Carl Collins, head of digital engineering at CIBSE, highlighted the existing gaps in securing energy systems, pointing out a lack of understanding of how building elements interact: 'We need to really understand the connectivity of what we are installing, and the information to which it has access.'

He urged the audience to seriously consider security, and drew parallels with the comprehensive approach taken towards other potential threats, such as fire.

CIBSE's technical officer Hywel Davies HonFCIBSE expressed concern over the apparent lack of interest in cybersecurity. 'It is often referred to as the monster in the room, but it only becomes scary when you don't think about it. Understand where threats may come from and address it,' he said.

A session introduced by Julie Godefroy gave an overview of the Retrofit Revisit project, supported by Historic England and CIBSE and co-led by Studio PDP and CIBSE. The project applied building performance evaluation techniques to 10 homes that had been subject to a deep retrofit over the past



Tim Galloway, deputy director, building safety programme, HSE



» 10 years. It particularly looked at energy performance and indoor air quality, and found that the retrofitted homes still performed extremely well in terms of energy use. 'Energy performance has not significantly degraded at all, which is a very positive finding. It's much better than the national average, and many of the homes perform more or less in line with Leti targets,' Godefroy said.

Air leakage was slightly higher, with degradation of doors and windows being the key contributor. Feedback from residents was that conditions were comfortable, but summer comfort rated less well than winter comfort. There were some issues around system maintenance, said Godefroy, with complex services generating more problems.

The risk of mould from ambient conditions, was assessed by measuring relative humidity and surface temperature, and tests looked at the movement of moisture through the fabric. Mould related to ambient conditions was rated as very low risk across seven of nine homes tested and there was generally low CO₂ across all homes, indicating good ventilation.

Pumped for growth

Independent consultant Roger Hitchin shared research by the IEA Heat Pump Technologies programme on non-domestic heat pump retrofits. The Annex 60 programme (Heatpumpingtechnologies.org/annex60) is an international collaboration aimed at identifying and quantifying technical options for non-domestic retrofits, and providing advice and tools to help decision-makers.

'There is very little guidance for building owners and tenants,' said Hitchin. 'We want to provide high-level guidance so they can look at different heat pump systems.'

The project will link to case studies and Hitchin is particularly keen to include studies showing comparative costs. An online tool will invite users to describe the building and its HVAC systems and the degree to which fabric will be upgraded. It will then come up with a shortlist of solutions worth investigating.

Ken Gordon, CEO of the Ground Source Heat Pump Association (GSHPA), spoke of the upcoming revised TM51 guidance on GSHPs, which would include information on shared ground loop systems. These are increasingly popular because they offer economies of scale, said Gordon.

Accessible acoustics

In a discussion about wellbeing in the built environment, Foster & Partners associate partner Milena Stojkovic FCIBSE said: 'We have a responsibility to create environments



Kristina Allison
MSLL MCIBSE, vice-president of the SLL

that are healthy and inclusive to use.'

There has been a shift away from traditional accessibility measures focused on physical impairment to a more inclusive approach for neurological conditions, said Rob Turpin, head of sector healthcare at the BSI. Challenges have been identified relating to lighting, acoustics, route preview, signage, and clarity in buildings.

Turpin introduced PAS 6463 *Design for the mind*, a world-first standard that covers designing for neurodiversity. He hopes it will be a catalyst for international standardisation.

Tin Oberman, senior research fellow at UCL, discussed the importance of soundscapes and inclusive acoustics. He and Turpin highlighted that the majority of auditory research acoustics have been driven by healthy-hearing participants, and knowledge about how most people perceive sound is missing.

Speakers noted that the event did not create the most accessible acoustic environment. Rachel Smalley, head of inclusive design at Jacobs, said future approaches must ensure the environment is suitable for a diverse population, and that requirements are integrated from the outset.

Crossing generations

A Young Engineers Network (YEN) panel focused on how to foster collaboration between older and younger members, including 'buddy' systems and mentoring.

Ruth Tatanga MCIBSE, chair of YEN London emphasised the importance of examining what seniors can learn from younger colleagues, and Jack Kenny, senior M&E consultant at RLB, agreed.

'Play to the strengths of both generations, foster flexibility, and provide opportunities without rigidity,' he said. **CJ**



The event attracted leading building services brands from across the industry

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Left: Dubai, in the UAE, was the venue for COP28

After attending COP28, Hoare Lea's **Ashley Bateson FCIBSE** is more acutely aware than ever of the need to avoid fossil fuels, embrace biodiversity and focus on performance

INSPIRING ACTION



For two weeks last month, the United Arab Emirates (UAE) played host to 90,000 visitors for the annual UN climate change conference (COP). In the various meeting rooms, pavilions and plenary halls at Dubai Expo City, people sought to share insights, participate in discussions and negotiate strategies to lessen the effects of, and adapt to, climate change.

COP28 provided an impressive platform for a vast range of stakeholders – from scientists, policy-makers, energy companies and experts, to non-governmental organisations and groups representing marginalised communities.

In the various halls and meeting rooms, I found there was universal agreement for the need to limit global warming, but also disagreement about how to achieve this. It was an overwhelming experience, as there was so much to take stock of, and much to be gained from dialogue with others.

Triple crises

Several speakers at COP28 highlighted the triple crises the planet is facing: climate change, global pollution, and biodiversity loss. There is an international perspective to this, as pointed out in various talks, with representatives from some regions highlighting how they are particularly affected.

Indigenous communities in South America emphasised the continued deforestation on their continent, with consequences for their traditional lifestyles and loss of animal and plant species. Meanwhile, among African countries, representatives from Nigeria outlined how oil extraction has caused

land, water and air pollution that is detrimentally impacting local agriculture and businesses.

The role of nature in mitigating the climate crisis was the topic of a session with Professor Nathalie Seddon, director of the Nature-based Solutions Initiative in the Department of Biology at the University of Oxford, and Dr Tony Juniper, chair of Natural England.

Seddon said that not only can increasing biodiversity improve microclimatic conditions and climate adaptation, but green infrastructure can also provide co-benefits for people's mental and physical health. Juniper added that more needed to be done to reconnect Western societies with nature and said education could raise appreciation of the benefits of incorporating nature into developments.

At other sessions, representatives from banking, pensions and insurance funds acknowledged that more needs to be done in



Ashley Bateson (left) with author of the *Independent Review of Net Zero*, Chris Skidmore and journalist Terry Slavin (right)



the finance sector to decarbonise investments, set objectives to support sustainable development, and assign metrics for assessing climate resilience.

Scientists stated that, while adaptation is about the need to design interventions to cope with climate impacts – such as overheating and flooding – building resilience requires a broader appreciation of how to anticipate and recover from severe climate impacts.

The energy transition

At a fringe event arranged by UK-focused organisations, Sir Alok Sharma MP, president for COP26 in Glasgow, emphasised the need for nations to keep alive the ambition to limit average global temperature rise to 1.5°C above pre-industrial levels – the Paris Agreement signed by more than 190 countries in 2016.

Sir Alok said the latest analysis shows that the world has already exceeded an average 1.1°C temperature increase above pre-industrial

levels. Global energy demand and greenhouse gas emissions continue to increase, with a risk that we may exceed 2°C if further policy interventions are not implemented.

There are, however, positive indicators of progress in some areas of the energy transition to zero carbon emissions. According to the International Energy Agency (IEA), significant improvements have been made in renewable energy generation growth. Around 30% of the world's electricity production is now generated from renewable energy sources and 85% of new capacity being built is renewable.

In some parts of the world, the uptake of renewable energy generation has been particularly high. There are times, for example, when 100% of electricity demand in Denmark is met by wind, and spells when energy-hungry California gets more than 95% of its power from wind and solar. Significant progress has been made in the UK to decarbonise the Grid, with more than 40% of annual electricity consumption coming from renewables.

From a built environment and industry perspective, Sir Alok reinforced the IEA recommendation that the pace of energy efficiency improvements needs to double, to approximately 5% demand reduction each year. The IEA believes there is an important role for the finance sector in decarbonisation and is calling for 'innovative, large-scale financing mechanisms to support low carbon investments'.

At another session, hosted by the UK Green Building Council, MP Chris Skidmore, lead author of the government's *Independent review of net zero*, celebrated the launch of the Buildings Breakthrough.

This is a new pledge from more than 27 countries to make net zero and resilient buildings the new norm by 2030. These countries – which include the USA, China, the UK, France, Morocco and Japan – are collectively responsible for half of the world's emissions. The details of the pledge are yet to be defined, but they will be developed over the coming months.

Personal takeaways

From a personal perspective, I have three key takeaways from COP28. First, the need for our sector to embrace performance-based design, with a focus on net zero carbon outcomes. At the end of COP28, there was a global agreement to 'transition' away from fossil fuels. As engineers, we should aim to eliminate fossil fuels from the built environment as soon as possible.

Second, we need a broader appreciation of the stakeholders affected by our projects, so we can better understand how our buildings impact people and the environment.

Finally, we need to design for climate-change resilience. This includes incorporating nature-based solutions and increasing biodiversity in developments. This will not only reduce temperatures and mitigate flood impacts, but it will also enhance wellbeing and make the future planet more habitable. [CJ](#)

■ **ASHLEY BATESON** FCIBSE is director at Hoare Lea

■ To read about CIBSE at COP28 go to page 24

THE FUTURE STARTS HERE

Government net zero proposals for the Future Homes and Buildings Standards gave CIBSE Members plenty to digest over the Christmas period. **Alex Smith** looks at the proposed changes and how they will affect the specifying of low carbon technologies

The publication of the Future Homes and Buildings Standards (FHBS) consultation last month was intended to put the UK firmly on the path to net zero carbon.

Due to come into force in 2025, the standard sets performance requirements to ensure new homes and non-domestic buildings are 'zero carbon ready' so that no further work is required when the electricity Grid is decarbonised. This rules out fossil fuel heating, including hybrid and hydrogen-ready boilers.

One thing the standard will not do is change the minimum building fabric standards. The government has said that the 2021 uplift in standards in Approved Document Part L, which have applied since June 2022, were intended to meet the specifications in the FHBS.

However, improvements are proposed to the minimum standards for fixed building services and onsite electricity generation. There are also plans to improve guidance and minimum standards for heat losses from building services that directly support the installation of 'zero carbon ready' technologies.

The government expects low carbon heat networks to be a key route to compliance. New buildings can be connected to existing heat networks, but they must meet the performance requirements laid out in the FHBS. This means they must use heat supplied by low carbon networks or low carbon extensions to existing networks that may be powered by gas boilers.

New performance requirements

New 'notional buildings' are proposed to set the standard for homes, non-domestic buildings and heat networks. Notional buildings are benchmark specifications that meet performance standards, and they can be used by engineers and architects to model the performance of their designs, to gauge whether they meet the requirements.

Two domestic notional building options are proposed. Option 1 maximises carbon savings and reduces energy bills, but has higher upfront costs for the developer because it features more low carbon technologies, including PV panels, decentralised mechanical extract ventilation, and wastewater recovery. Airtightness is also higher than Option 2, at 4 rather than $5\text{m}^3\text{ h}^{-1}\text{m}^{-2}$ @ 50Pa.

For blocks of flats of more than 15 storeys, solar panels will be removed. For single-storey dwellings, wastewater heat recovery systems will be removed, as horizontal systems are more expensive and less efficient than vertical ones.

The heat network notional building has similar options to above, but a 4th-generation heat network is assumed, with primary losses of 12% and a seasonal coefficient of performance (SCOP) for plant of 3.0.

For non-domestic buildings, the proposals base notional buildings on two sets of proposals: one for top-lit spaces in buildings and one for side-lit spaces. A heat pump is proposed for side-lit spaces and radiant electric heating in top-lit spaces. Enhanced efficacy of lighting and heat-recovery efficiency is also proposed.

Like the proposal for homes, there are two options for non-domestic buildings, one with roughly double the amount of PVs for both side-lit and top-lit spaces. The government recommends option one, with higher levels of PVs. The consultation proposes the same fabric requirements as the 2021 standards, with the exception of warehouses and sports halls, which would have higher levels of airtightness to support the installation of low carbon heating.

The standard will apply to homes and non-domestic buildings from 2025



Updated guidance and minimum standards

There are plans for higher minimal standards for building services, including: heat pump efficiencies and controls; comfort cooling efficiencies; ventilation system efficiencies; lighting efficiencies; and fixed lighting controls. Standards will also apply to existing homes.

In response to smarter, more complex heat pumps, the government also proposes additional guidance on heat pump controls and wants to see more information fixed to the heat pump or hot water vessel.

There are also changes to guidance to limit heat loss in new homes, with new minimum standards for hot water storage vessel insulation; the consultation says increasing insulation standards is necessary to ensure good heat pump performance.

There are proposals to change minimum building services efficiencies and controls for new non-domestic buildings. Heat pumps will follow Ecodesign Regulations and heat pumps not covered by these should have a minimum COP of 2.5. Minimal standards for lighting and heat pump efficiencies will also apply to existing buildings.

NEW STANDARDS FOR MATERIAL CHANGE OF USE

The consultation is proposing to improve the performance of buildings that have been converted from one purpose to another (material change of use) by setting better fabric and building standards.

The consultation is also looking at widening the scope of Part O of the Building Regulations to include homes created through a material change of use (MCU). Currently, Part O only applies to new dwellings or other residences. The consultation says that extending Part O to MCU has potential for climate adaptation benefits.

It says the Building Safety Regulator is carrying out technical research on the impact of applying the Part O requirements to homes created through a MCU, with the research planned to be published in 2024.

To limit heat losses from building services in new communal areas of flats and non-domestic buildings, the government is proposing to refer to CIBSE *CPI Heat Networks: Code of Practice*. This provides insulation standards for building heat distribution systems that contain multiple dwellings. It will also refer to CPI for heat distribution system installations in new apartment blocks.

Lifts, escalators and moving walkways are not covered by the notional building and National Calculation Methodology, so new minimum standards – using calculations and testing/commissioning standards made under the BS EN ISO 25745 standard – are proposed.

Ensuring real-world performance

The proposals are looking at two ways of improving the real-life performance of homes: fabric performance testing and better Home User Guides.

Different options are being explored for a performance test for developers. The government wants it to be simple, scalable and non-intrusive for occupants, and says that a smart meter-enabled thermal efficiency rating (SMETER) could be the most suitable method. This will require smart meters to be more widely installed, so the government plans to update guidance for their installation and commissioning in four key areas: the location of installations; spacing around smart electricity meters; materials that block signals to the communications hub used by the smart meter; and logistics.

There are ongoing concerns about poor designs and installations of ducted ventilation systems leading to fans operating at near maximum to achieve design airflow rates. This leads to excessive noise, high fan running costs, and a shorter fan life. So, when installing centralised mechanical extract ventilation or centralised mechanical ventilation with heat recovery, the consultation proposes that static pressure and total power consumption be measured.

The success of the Future Homes Standard will depend on heat pumps and mechanical ventilation being installed well, says the consultation. There are two routes to certification of these works: installers can self-certify or a building control body can do so. Guidance on this will be added to Approved Documents, as will details of enforcement action if work is not to standard.

For domestic buildings, the government is separately consulting on the new Home Energy Model, which will replace the Standard Assessment Procedure for the energy rating of new homes.

To help readers evaluate the proposals, the Department for Energy Security and Net Zero has published a Home Energy Model: Future Homes Standard assessment tool. On the National Calculation Methodology (NCM) website www.uk-nem.org.uk there is a consultation version of the NCM and the Simplified Building Energy Model that implements the methodology.

Developers won't have too long to get to grips with the changes. The FHBS will come into force either six or 12 months after the legislation is passed in 2024, and there will then be a 12-month transitional period. **CJ**

■ Details of how to respond to CIBSE's submission to the consultation will be available at bit.ly/CJMar23CN4

Manchester's new arts venue, Aviva Studios, features two huge events spaces that can host anything from poetry readings to mega-raves. BDP had the challenge of devising a flexible lighting and services strategy that could adapt to any artistic situation, as the consultant's Steve Merridew and Nick Meddows explain

SETTING THE SCENE



Aviva Studios (formerly The Factory) is the UK's largest investment in a national cultural project since the opening of Tate Modern in 2000. The 14,000m² new landmark, built on the site of the former Granada TV Studios, is designed to accommodate a wide variety of performance art, from theatre and dance, to music, visual arts and poetry.

The building is made up of three spaces. The main event space is the 21-metre high warehouse, which can be split into two. It is complemented by the hall, a 1,603-seat auditorium with a flexible stage, while a seven-storey tower at the back of the warehouse provides green rooms, dressing rooms and office space.

The building's façades, of concrete and corrugated metal, contrast with the refurbished brick warehouses and newly built flats, offices, and television studios that make up the new St John's neighbourhood.

Building services and lighting design had the challenge of responding to the multiple uses of the building while maintaining an industrial aesthetic.

Gas boilers are used for heating currently, but the building is designed to connect into the future St John's heat network. The hall and warehouse are air cooled and heated, while the tower and social rooms' loads are met with local emitters. Chillers provide cooling.

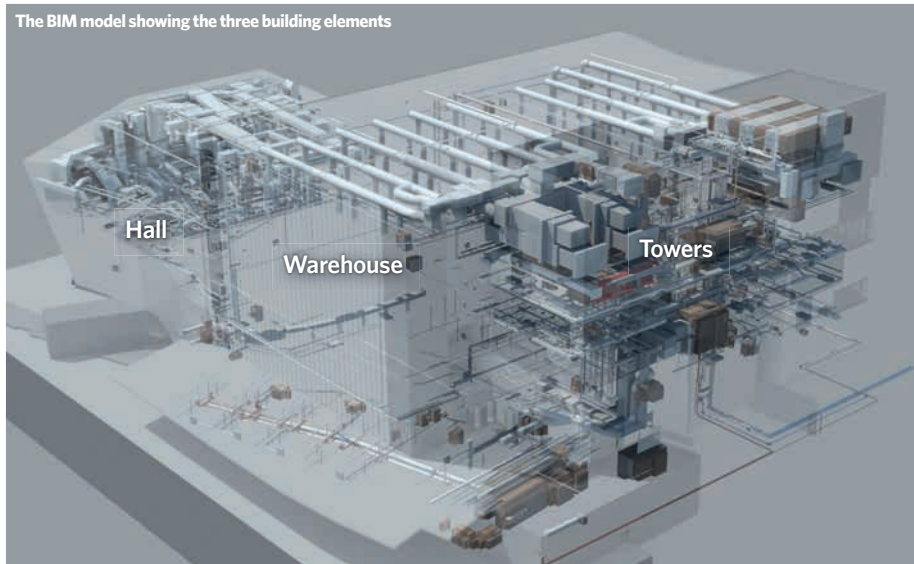
Close collaboration between BDP's electrical, mechanical, lighting and digital engineers was essential because of the complex nature of the internal building geometry, and a BIM model was created to coordinate services.

The lighting team worked closely with architect OMA and interior designer Brinkworth to coordinate lighting concepts. The result is a combination of general,

architectural, experiential, complex emergency, and technical theatrical lighting systems, threaded through the internal building geometry. Three bespoke luminaire types that worked with the contemporary façade design were developed with Stoane Lighting and Zumtobel. In total, 164 luminaire types were used throughout the building. The energy model demanded >100lm·W⁻¹, a significantly higher requirement than that in Part L, which was 60lm·W⁻¹ at the time of design in 2018; in the 2021 revision it is 95lm·W⁻¹. Illumination criteria for general and emergency lighting was determined using the *Technical standards for places of entertainment 2015 – The association of British theatre technicians* in combination with the usual CIBSE and British Standards.

The warehouse has capacity for up to 5,000 people standing, and can be divided by a movable, full-height acoustic wall. The hall has

The BIM model showing the three building elements





Left: The design of Aviva Studios has opened up public space towards the River Irwell in central Manchester

“The building’s façades, of concrete and corrugated metal, contrast with the refurbished brick warehouses and newly built flats and offices”

PROJECT TEAM

Client: Factory International
Lighting, acoustics, M&E: BDP
Architect: OMA
Contractor: Laing O’Rourke
Interior designer: Brinkworth

a flexible stage that can house an audience of up to 1,600 seated or 2,000 standing. The warehouse and the hall can work together, allowing the stage to extend to a depth of 45 metres. The lighting includes house lighting, management lighting, high output working light, technical space task lighting, and back-of-house blue lighting.

House lighting was provided by ETC ArcSystem luminaire types. These warm white digital multiplex (DMX) fittings mounted to the technical grid allow super low-end DMX dimming to achieve 0.2 lux management light levels. High-output working light illumination of >600 lux was provided by 58,000lm downlights from Glamox.

In areas where people are working without windows, a 5,000K correlated colour temperature (CCT) has been selected to increase

the perception of brightness. Technical spaces use a combination of >500 lux white-light illumination and a blue lighting system for access during a performance.

The hall is a traditional raked theatre with removable seating. A range of luminaire types was integrated into the interior architecture to celebrate and delineate the internal geometry, and contribute to house lighting levels. Details include a balcony shadow gap, in-floor uplights, skirt detailing, and uplighting to the soffit from the technical grid edge. A bespoke luminaire was developed to illuminate stair treads. The restricted floor buildup of the auditorium did not allow for a more traditional step-tread lighting solution, so a free-standing, floor-mounted step light was developed that could be installed in the voids below seating.

The warehouse is designed to be a blank canvas. Vertical DMX colour-change linear luminaires around the perimeter can support events with a full-scale lit feature. The general and emergency lighting arrangement allows for cellularisation of the space for set building and isolated space uses.

The tower has multi-level mixed-use spaces connected to the warehouse and includes offices for Manchester International Festival, the green room, and dressing rooms. Most of these spaces have no ceilings and exposed services, so a trunking system was used to minimise ‘visual clutter’. The trunking houses pre-wired power and data, reducing the requirement for secondary containment, making it time- and cost-effective. A range of luminaire types can be inserted, including standalone emergency modules.

The main foyer has multiple uses, which is reflected by the lighting. The design responds to the brick arches of the 19th-century railway line that forms part of the foyer. A mixture of adjustable cool-white wide-beam and warm-white narrow-beam track spots are used to create day and evening scenes, combined with uplighting on brick facades.

Integral lighting was used for bar fronts and shelving, and lighting was integrated into the stair handrails, providing localised illumination to the steps, reducing shadowing, and adding a sense of drama. The handrails also provide high-risk emergency lighting. That the building contains very few windows has been used to its advantage by the team, which has harnessed the



Danny Boyle’s version of *The Matrix* launched the venue last autumn

» transformative quality of light to create a variety of scenes and evoke different atmospheres for day and night.

Outside the building footprint, in the public realm, an undercroft is illuminated with levels suitable for pedestrians and cyclists, ranging from 15 lux to 250 lux, appropriate for daytime and night-time use.

The design of the services prioritises flexibility, responding to each individual performance and accommodating shows with diverse sets.

Electrical infrastructure

The electrical infrastructure divides into two systems: house services and a dedicated performance system. This segregation prevents any interference, and handles uneven load distribution. A network of busbars and tap-offs feeds into multi-outlet power panels, complemented by fixed outlets distributed throughout.

The building boasts an extensive stage lighting and audio visual (SLAV) system, interconnecting outlet panels to form a robust network. A centralised control system oversees this network, employing various AV and data cabling types to match the different shows and setups.

Strategically placed outlets and power panels in every part of the performance electrical system offer flexibility for main and breakout productions. This, combined with SLAV outlet panels, allows for dynamic show configurations. An advanced performance lighting



A room in the tower

control system, connected to a central hub, governs performance and house lighting, offering flexible control.

Ventilation and acoustics

A top-down supply ventilation strategy, using swirl jet diffusers, was adopted for the theatre and warehouse to maintain flexibility without introducing physical constraints. To address potential noise challenges, careful diffuser selection was crucial.

Rather than applying a uniform building service noise criterion, specific criteria were established for each event scenario, allowing for more relaxed standards where higher building service noise levels were acceptable. This flexibility matched the requirement for events that needed increased airflow rates, such as high-capacity concerts.

Building physics modelling was employed to manage potential noise concerns during heating. This verified that when the hall and warehouse were pre-heated before a show (when higher service noise levels were acceptable) temperatures could be maintained during performances.

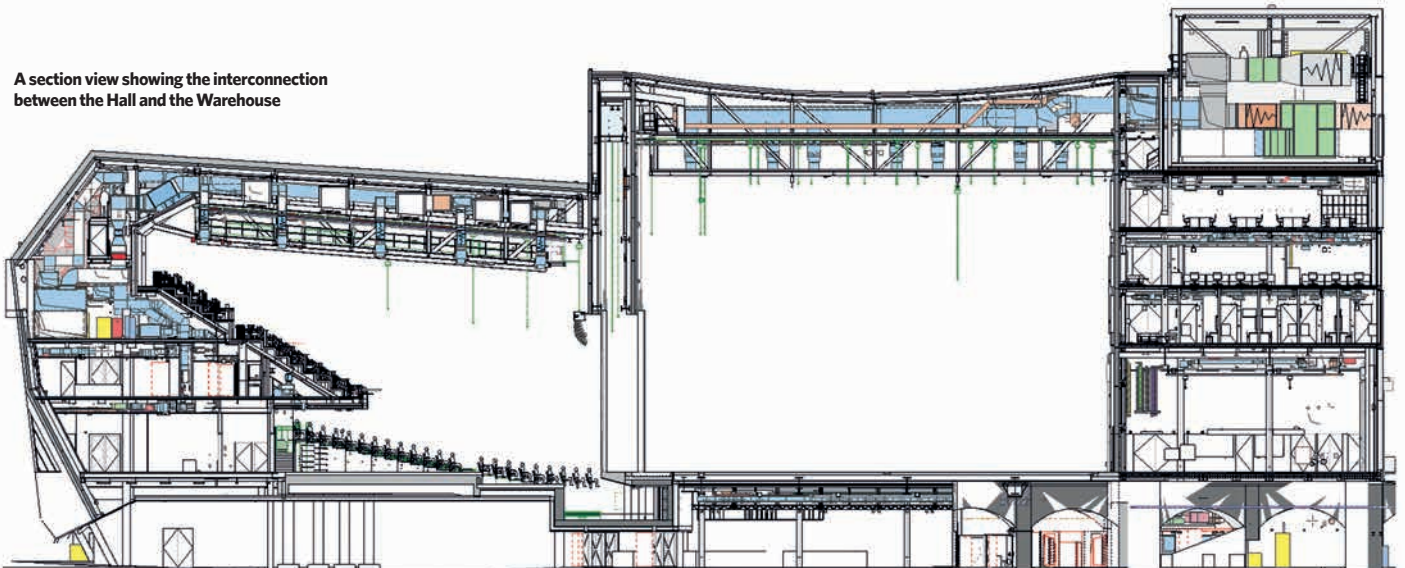
Aviva Studios is an exciting new addition to Manchester's vibrant cultural scene and the innovative building services engineering and bespoke design allow the operator to create a myriad of performance spaces that put visiting artists in the best possible light. **C**

■ **STEVE MERRIDEW** is a building services engineering director and **NICK MEDDOWS** is senior lighting designer at BDP



Underneath the auditorium

A section view showing the interconnection between the Hall and the Warehouse





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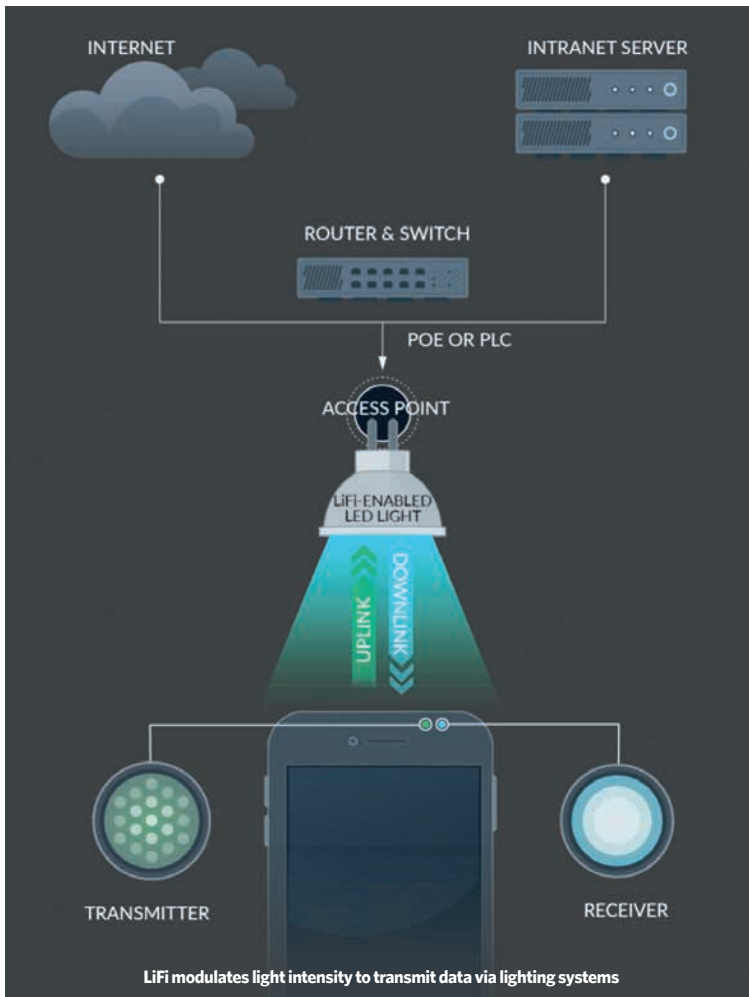


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INFRARED SHIFT

A new standard covering the use of infrared in LiFi communication catapults the technology into mainstream relevance – a move that could redefine data communication in built environments, says LiFi.co's **Jeroen van Gils**



facility for faster data transmission enables LiFi to accommodate more complex and data-heavy tasks seamlessly.

In addition, infrared (IR) light, unlike visible light, is invisible to the human eye, making it significantly more versatile for various applications, including those where aesthetic integrity is vital. This characteristic is crucial in applications where the appearance and quality of lighting are important – for instance, in museums, art galleries, or high-end retail environments. In contrast, visible light-based LiFi might compromise the visual aesthetic because visible light would have to be switched on to transmit data.

The arrival of this standard has a range of implications for smart buildings. Lighting fixtures will soon serve a dual purpose: providing illumination and acting as data-transmission hubs. This development allows for the integration of IR emitters, which can be retrofitted into existing lighting systems. Consequently, the typically high costs associated with adopting new technologies could be reduced markedly, as built environments can adapt existing infrastructure to meet these new needs.

Moreover, the standard serves as a crucial reference point for vendors, ensuring the creation of globally standardised and interoperable products. Such standardisation is a milestone that could expedite the integration of LiFi across different built environments, from commercial spaces to residential buildings.

Transforming communication

Until recently, the primary means of transmission within smart buildings rested on Wi-Fi and wired connections. However, in situations where Wi-Fi signals are weak or disrupted because of structural barriers, LiFi can offer a reliable, secure alternative. This development is particularly relevant in settings that handle sensitive or confidential information, such as governmental buildings or healthcare facilities, where additional layers of security are necessary.

The IEEE 802.11bb standard furnishes professionals in the construction and design

The recent ratification of the IEEE 802.11bb standard heralds a new era in the field of secure, reliable, high-speed wireless communication. Unlike its predecessors, this cutting-edge standard uses infrared light for data transmission (LiFi), moving away from visible light and making it a compelling companion to existing Wi-Fi systems.

Hailed by experts in the industry as a turning point for optical wireless communication, this change in medium offers a series of unprecedented advantages: high data speeds, aesthetic versatility, and the synergistic relationship with existing Wi-Fi networks.

For stakeholders in sensitive environments such as healthcare and financial sectors, the standard's focus on security and bandwidth cannot be overstated. It means that construction, architecture and lighting design are poised for disruption.

Why infrared light is a paradigm shift

The transition to infrared light is a calculated and transformative move. Its

industry with a range of new tools and considerations. It lays out specific guidelines to ensure LiFi's seamless integration with existing Wi-Fi networks, thereby simplifying the installation process and minimising costs. With its high data-transfer capabilities, IR LiFi is suitable for environments such as research laboratories or data centres, which regularly work with large datasets

New applications

The new standard broadens the horizon for diverse and creative applications. For example, in educational institutions, classrooms can become interactive learning environments, where data from smart devices, educational software, and even the internet can be streamed directly via the room's lighting.

In industrial settings, production lines can be monitored and controlled through a secure, high-speed LiFi network, reducing the reliance on potentially vulnerable Wi-Fi networks.

In healthcare settings, real-time patient data can be reliably and securely transmitted to healthcare providers, offering immediate insights into patient conditions and allowing for swift medical intervention when necessary.

Future directions

As more vendors come on board, we can expect to see a decrease in the cost of implementation. Economies of scale could make LiFi a cost-effective solution, even for smaller-scale applications, such as homes and small businesses.

In addition, it opens the door to advancements in device-to-device communication. Smartphones, tablets and other personal devices with integrated LiFi could revolutionise the way we interact with the digital world.

The combination of IR LiFi and Wi-Fi also promises to optimise load distribution in network traffic. Future systems may

“The typically high costs associated with adopting new technologies could be reduced markedly, as built environments can adapt existing infrastructure to meet these new needs”

automatically switch between LiFi and Wi-Fi to ensure the most efficient use of bandwidth, depending on real-time conditions. This feature could be a crucial step in the development of truly intelligent and adaptive smart buildings.

The ratification of the IEEE 802.11bb standard represents a shift in how we conceptualise and implement data communication technologies in built environments. Engineers, architects and lighting designers now have a broader array of resources at their disposal to create intelligent, connected and aesthetically pleasing spaces. Beyond merely being an innovative technology, the standard is a harbinger of the future, where lighting does more than illuminate our spaces – it connects us.

The IEEE 802.11bb standard was ratified by the Institute of Electrical and Electronics Engineers in June 2023. More details at: bit.ly/CJLiFi1st

■ **JEROEN VAN GILS** is the founder and managing director of LiFi.co, which promotes LiFi technology. He also heads Morex, a digital solutions enterprise.

WHAT IS LIFI?

LiFi (light fidelity) is a wireless communication technology. The term was first coined by Professor Harald Haas, of the University of Strathclyde, during a 2011 TEDGlobal talk in Edinburgh.

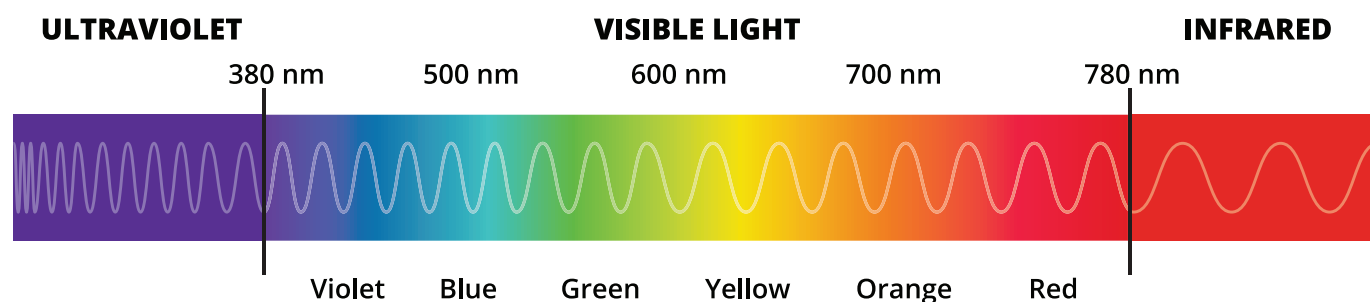
It is similar to Wi-Fi, as both transmit data electromagnetically, but where Wi-Fi uses radio waves, LiFi can transmit data at high speeds over the visible light (VL), ultraviolet and infrared spectra, specifically by modulating light intensity.

LiFi resolves a growing capacity issue with Wi-Fi – the VL spectrum alone is 10,000 times larger than the entire radio frequency spectrum, and offers higher speeds and greater security.

VISIBLE VS INFRARED LIGHT

The introduction of the IEEE infrared standard for LiFi does not imply that visible light will cease to be used for LiFi. Rather, it expands the technology's capabilities. Infrared and visible light have different properties and applications. For instance, infrared can be more suitable in situations where visible light communication might be distracting or not feasible (in darkened environments such as bedrooms or cinemas).

'Visible light still has significant applications and advantages, such as its use in illuminated environments,' says Van Gils. 'The decision to use infrared or visible light – or even a combination of both – depends on the specific application and requirements of the LiFi system.'



LiFi can transmit data at high speeds over the ultraviolet, visible light and infrared light spectra



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Nations pledge to triple renewables use at COP28

World renewable energy capacity could rise to 11,000GW by 2030

More than 120 countries at COP28 pledged to triple their renewable energy use by 2030. This could result in the world's installed renewable energy generation capacity rising to at least 11,000GW by that date.

The Global Renewables and Energy Efficiency Pledge, signed by 123 countries, was among a slew of COP28 announcements aimed at decarbonising the energy sector, which is responsible for around three-quarters of greenhouse gas

emissions. Plans include the expansion of nuclear power, cutting methane emissions, and curbing private finance for coal power.

Signatories have pledged to expand grid connections, accelerate permitting of renewable projects, promote energy demand management, raise public awareness, and support research and development in new technologies.

They have also pledged to strengthen international collaboration on renewables and energy efficiency, including making finance more affordable for emerging markets and developing economies.

Waste heat key to decarbonising district heating in Berlin

Berlin's power and district-heating supply is set to be switched from coal to climate-neutral energy sources.

Vattenfall Wärme Berlin has commissioned Kraftanlagen Energies & Services to construct the combined heat and power (CHP) plant at the Reuter West cogeneration plant in northwest Berlin.

The new CHP plant, scheduled for completion by the end of 2026, incorporates a steam turbine plant and a substantial heat pump. With the capability to provide up to 30MW of electricity, or more than 180MW of heat, the facility will play a pivotal role in meeting the energy demands of west Berlin.

The heat pump will use waste heat from the mechanical cooling circuit to feed up to an additional 2MW of thermal power into Berlin's district heating network. Crucially, the plant will maximise use of waste heat from sewage and incineration.

The steam turbine will harness steam generated from incinerating unavoidable waste in Berliner Stadtreinigung's waste-to-energy plant, while the heat pump will tap into the residual heat from Berliner Wasserbetriebe's sewage treatment plant.

The Reuter West CHP plant in the northwest of Berlin



Heatropolis aims to decarbonise King's Cross heat network

The King's Cross development in London is hoping to save heat network customers up to £35m by 2050, through the use of smart management tool Heatropolis, by UK Power Networks.

Collaborating with energy management firm Passiv and district energy specialists Metropolitan, the project aims to create a blueprint that can be used for nationwide heat network decarbonisation.

Heatropolis will initially look at how design innovation and smarter control strategies can maximise the use of the existing network.

The King's Cross heat network is currently serving more than 40 commercial buildings, which includes both Google's and Nike's UK headquarters.

Supported by Ofgem's Strategic Innovation Fund, Heatropolis is looking to potentially save end users £35m and cut 1,500 tonnes of CO₂ by 2050.

It plans to apply the learnings from King's Cross to other buildings across the UK.



E.ON partners with solar panel innovator Naked Energy

E.ON has joined forces with UK solar innovator Naked Energy to deploy its solar heat and power technology. The collaboration, facilitated through E.ON's Energy Infrastructure Solutions (EIS) business unit, aims to implement Naked Energy's technology across commercial and industrial sites in Europe and the UK.

Naked Energy claims its solar heat and power system can save up to four times the carbon compared with standard solar PV panels. Targeting sectors such as breweries, hotels, and district heat networks, the partnership is part of Naked Energy's global expansion plans. Christophe Williams, CEO and co-founder of Naked Energy, emphasised the urgency of decarbonising urban and industrial heating, and expressed excitement about the partnership with EIS.

The Energy Act 2023 paves the way for the mass rollout of heat networks in the UK, and the mandatory connection of many buildings. Alex Smith speaks to FairHeat's Gareth Jones about government plans to regulate new networks and raise the standard of the 14,000 already in place

NETWORK PROVIDER

Gareth Jones is the founder of FairHeat, which is the technical author of the Heat Networks Technical Assurance Scheme

The Energy Act 2023 and the government's Future Homes and Buildings Standards (FHBS) are paving the way for a significant acceleration in the rollout of heat networks in the UK and the improvement of the approximately 14,000 heat networks already in existence.

Currently, only 2% of the UK's heat is distributed by heat networks, but this figure will need to rise to 18% by 2050 to meet net zero targets, according to the Climate Change Committee.

New homes and non-domestic buildings will be able to meet the FHBS, due in 2025, by connecting to existing and new heat networks that are adding new low carbon technologies or making use of existing, unused, low carbon heat.

The Energy Act 2023 will introduce minimum standards for new and existing networks, and create heat network zones that will mandate the connection of certain buildings to heat networks. This will also come into force from 2025. Ofgem has been appointed as the heat networks regulator to licence developers and provide consumer protection.

A key component of this new regulatory framework will be the introduction of a technical assurance standard and process, to ensure minimal levels of performance and reliability in heat networks. Gareth Jones, managing director and founder of heat network consultant FairHeat, is working with the government to develop the Heat

Networks Technical Assurance Scheme (HNTAS). As technical author appointed by the Department for Net Zero and Energy Security, FairHeat has spent the past year working with industry specialists on the technical specifications that will underpin the scheme.

Jones says six elements of a heat network have to be specified correctly for performance to be optimised: the energy centre; district distribution pipework; communal distribution pipework within the building; substations; consumer connections (heat interface units – HIUs); and consumer heat systems

The assurance scheme, which closely references CIBSE/ADE *CPI Heat Networks Code of Practice (2020)*, will validate designs and verify delivery to ensure the project is on track to meet the network's intended performance. After completion, a third-party assessor will verify the design has met minimum performance standards in operation.

"This is not about a big stick, but about putting in place a support process for developers and housing

associations that gives confidence that the designer is doing what they should be doing,' says Jones.

The assurance process follows closely the safety-regime principles for higher-risk buildings introduced by the Building Safety Act 2022, with similar stage gates and dutyholders who are responsible for the design at different stages. Jones believes the HNTAS process will encourage more collaboration and openness around design decisions.

'We need to have documented decision-making, and move away from an uncontrolled value engineering approach. It's right to make decisions on value, but you need to make them through a risk framework and evaluate their lifetime impact,' says Jones, who believes a more open-book approach will be necessary, where risks are acknowledged and shared.

There is a cost benefit of quality assurance, he adds, because poorly designed systems cost more than well-designed networks. 'Capital expenditure and operation costs will be lower because there will be less oversizing, complexity and equipment, which means fewer failures and less reactive maintenance,' Jones says. (For more on HNTAS, see 'Assuring the technical performance of heat networks', *CIBSE Journal*, April 2023.)

Heat network zoning

Perhaps the most radical element of the Energy Act is the enforcement of heat network 'zoning'. The act empowers 'zone coordinators', most probably local authorities, to identify areas suitable for heat networks. Once a zone is designated, certain types of building will be mandated to connect. These are likely to be new buildings, existing large public sector and non-domestic buildings, and domestic buildings already with communal heating. Jones says there is also a good case for connecting period residential properties (see panel, 'Heat networks: coming to a street near you?').

'Zoning has the potential to be really powerful,' he says. 'Urban areas have a huge resource of free heat from sources such as data centres, but the regulatory landscape provides no incentive to connect. That will change with heat zones.'

In a sign of things to come, the Old Oak and Park Royal Development Corporation announced in October that it was to connect five data centres to the Old Oak West heat network in West London. The network could deliver 95GWh of heat by 2040.

When a heat network zone is established, notifications from the coordinator will be sent to buildings to connect, which may require improvements to buildings. The FHBS consultation states that, as a minimum, the heat required by additional new homes and non-domestic buildings connected to an existing heat network should match the new or unused existing low carbon heat generation capacity of the network. However, there will be an 'option

"Urban areas have a huge resource of free heat, but the regulatory landscape provides no incentive to connect. That will change with heat zones" – Gareth Jones

for the building to connect at a higher temperature initially and drop it over time, when upgrades to the building are scheduled', says Jones. More details on zones will be announced soon and will be informed by a Heat Networks Zoning Pilot in 28 cities, organised by the Department for Energy Security and Net Zero and BEIS. Existing heat networks powered by gas-fired combined heat and power will not be expected to switch to heat pumps as soon as the rules come into force, but heat network extensions will have to be low carbon.

Jones says existing tower blocks can connect to heat networks by replacing individual gas boilers with communal heating, and a recent retrofit by FairHeat – replacing a communal heating system at Waverley Court, in Crewe, for The Guinness Partnership – was proof of concept. It involved dropping new heating pipes through risers, and installing new HIUs and emitters in the homes. A more efficient gas boiler was installed in the energy centre and, with flow and return temperatures reducing to 55°C/40°C, the communal system is now heat pump-ready.

The 14,000 existing heat networks will have a year to register from 2024 and will be deemed to be compliant on day one, says Jones. 'There will be a period of time for people to demonstrate they have metering and monitoring, and we want to be sure that the very worst performing networks are caught quickly and improved quickly,' he adds.

'We don't want to be overly burdensome. Consumers want to see improvements tomorrow, but industry says there are practical difficulties in making these changes from a technical and cost point of view. You also have to consider procurement cycles and budgets.'

The availability of skills should also be taken into account. 'We need to consider who is going to do all the work,' says Jones. 'We don't want boom and bust. If you make the timeframe too short, people will compete for the same resources and costs will go up. We need to build an industry around this.'

There will be teething problems, but Jones says he has seen how a collaborative approach can deliver better outcomes when he bumped into a contractor at an awards ceremony who had just won a prize for improving a heat network. 'He turned around and embraced me. He told me his team was really happy and engaged as they could now see the positive impact of their work,' said Jones.

■ The government has published optimisation guides and videos to help operators improve existing heat networks: bit.ly/CJHNopt23

HEAT NETWORKS: COMING TO A STREET NEAR YOU?

Britain's ageing period terrace housing would benefit from connections to heat networks, says Gareth Jones.

'Heat pumps are often not suitable for Victorian homes, as many are converted into flats, leaving too little space for hot water cylinders and external units. They already have wet systems and installing HIUs is straightforward. In the UK we are very good at digging up roads and pavements, and bringing in services,' he says.

One big benefit is that less work would need to be done improving the fabric of the building than if a heat pump was installed. 'You can run a heat network at much higher temperatures than you can an individual air source heat pump, so the costs associated with improving energy efficiency can be pushed into the future. When work to improve the fabric has been carried out, heat network temperatures can drop,' says Jones.

BRADFORD'S CULTURAL CONNECTION



The first phase of Bradford's new heat network will be able to deliver up to 60GWh of low carbon heat when it comes online in 2026. **Andy Pearson** speaks to engineer FairHeat and 1Energy, the company behind the project, which plans to invest in 10 similar schemes in British cities

Bradford will be the UK Capital of Culture in 2025 and the city council has another ambitious goal for the near future. It wants Bradford to be the UK's leading clean-growth district, with a target for the city to be net zero by 2038, 12 years ahead of the national target. A key element to helping the council realise these ambitions is a privately funded, low carbon district heating network that will help the city's businesses and organisations to decarbonise their heating and hot water.

Bradford Energy Limited (BEL), a joint venture (JV) between 1Energy and sustainable infrastructure investor Asper Investment Management, has been established to construct and operate the Bradford Energy Network (BEN). In its first phase, the scheme will deliver up to 60GW of low carbon heat to existing buildings in and around the city centre, generated by a series of giant air source heat pumps (ASHPs) and distributed via a network of large, insulated underground pipes.

The £55m project is partly funded by a £20m grant from the UK government's Green Heat Network Fund alongside private investment from the 1Energy/Asper Investment Management JV.

'We are, we believe, the first heat network developer to bring private sector investment into the UK market to develop projects at city scale,' says Jeremy Bungey, executive director 1Energy Group. 'In addition to Bradford, we have three other heat networks in development, and several others are in the early stages of going for grant applications to help meet our ambition of 10 city-scale projects over the next few years.'

1Energy's commercial case for developing retrofit heat networks is based on the need for 22 million existing properties to stop burning gas for heating by 2050, when the UK has committed to be carbon net zero. 'Really, there are only a couple of options available to decarbonise buildings: an individual building heat pump or connection to a heat network,' explains Bungey. He says the heat network solution

Left: Bradford will be the UK's City of Culture for 2025



is by far the most economical way to access decarbonised heat, with 'total whole-life costs around 30% cheaper than building-specific air source heat pumps'.

The government has yet to commit to a date for the phase-out of gas, so the challenge currently faced by IEnergy is persuading organisations to connect to the heat network.

The museum, currently closed, will be connected to the heat network when it becomes operational in 2026



'The government has not yet said when gas will be banned or ruled out,' says Bungey. 'Without that clarity, what we're trying to do is convince customers that it's better for the environment, and for them, to connect now, and to be part of this decarbonisation agenda sooner rather than later.'

He believes the situation will improve once the government introduces heat network zoning to towns and cities (see box, 'Heat network zoning').

Bungey will not say how many buildings have so far signed up for connection to the BEN because that information is 'commercially sensitive'. However, IEnergy is talking to all the city's major public sector bodies and colleges, its university, courts, and social housing providers, as well as the council about connecting its buildings and the town hall.

'As part of our Green Heat Network Fund application, we have had letters of intent and we're progressing those contracts now with a lot of public sector bodies,' Bungey says. 'We've also identified a lot of private sector

organisations that are on the route and we are having discussions with those too.'

To engineer the Bradford scheme, IEnergy is working with heat network specialist FairHeat. The biggest engineering and economic challenge with the BEN is the need to develop a district heat network based on electric heat pumps, as opposed to a gas combined heat and power (CHP) engine.

'CHP was very economical for district heating because of the power generation that those systems provide, but decarbonising the Grid has meant we can no longer rely on that technology as a low carbon solution, so we have to look at using large-scale heat pumps,' says Michael Ridge, principal engineer at FairHeat.

Perhaps the most difficult aspect of using heat pumps is pairing existing buildings, with their conventional radiator heating, with a low carbon heat network reliant on heat pump technology. 'Most of the buildings we are dealing with are designed with classic 82°C/71°C radiator systems, whereas heat pumps like to generate low-temperature heat to improve their operating efficiency,' says Ridge.

FairHeat's solution for BEN is a hybrid system of heat pumps paired with gas boilers and a weather-compensated system. In winter, the primary pipework system will deliver heat at 80°C, generated through a combination of ASHPs and the gas boilers. The boilers will add 'a little bit more temperature than the ASHPs for when system demand requires a higher temperature', says Ridge.

Currently, the design is for 25% of the heat to come from the gas boilers, with 75% provided by the heat pumps. To achieve zero carbon, BEN will use green Grid electricity and offset carbon from gas usage.

Adding weather compensation to the system ensures that high flow temperatures will only present when the weather is at its coldest. At higher external temperatures, the system flow temperature is reduced in line with a reduction in heat demand from the buildings.

'We drop flow temperatures on the



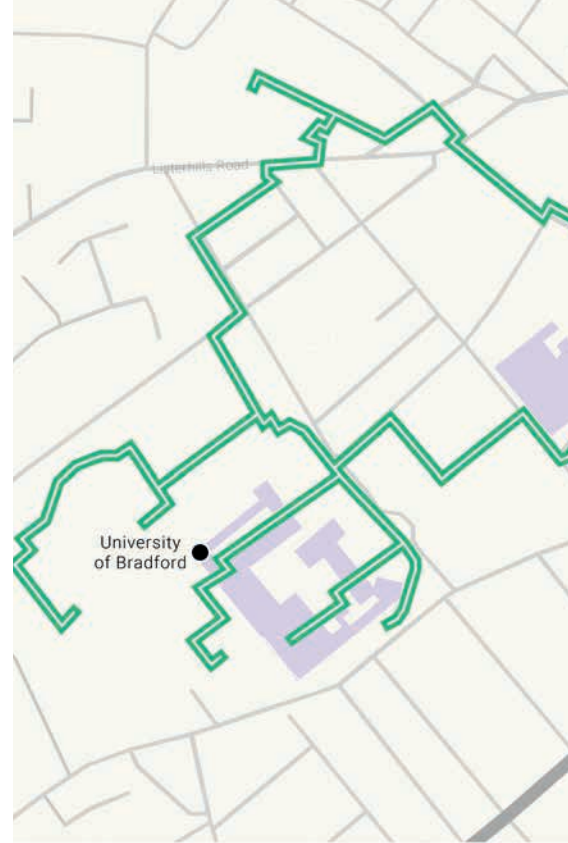
» network in line with what the buildings actually need, down to 65°C in summer, which means we are maximising heat pump efficiency throughout the year,' explains Ridge.

1Energy did look at having a lower system temperature, but the cost to customers of upgrading their heating system and enhancing the fabric of their buildings would have been prohibitively expensive. 'We have had to drop a bit of system efficiency by raising the supply temperature, even with this weather-compensated approach, but it is far more beneficial to do this than to try to get customers to modify their systems, because the capital cost would have been too high to make it worth their while'.

Customers access the heat network through a plate heat exchanger, slotted into their existing plantroom as a replacement for gas boilers. Another major technical challenge is the need for the system to maintain a large temperature differential between system flow and return to further maximise heat pump operating efficiency.

'We have to design the system to provide the flow temperature needed to keep the buildings warm, but a lot of these buildings also have really poor temperature differential control. So while we might have a flow temperature of 80°C, it might only drop to 75°C on the return, when our system would prefer a much lower return temperature,' explains Ridge.

Rather than simply dictate the temperature differential that a customer's system has to deliver, 1Energy is funding FairHeat to undertake surveys of potential customers' buildings and heating systems. These help 1Energy, which will be



Bradford Energy Network Phase 1 Construction

Proposed Network Route

operating the network, and its customers understand the interventions needed to increase the temperature differential, and the potential cost of these works. Armed with building-specific knowledge, 1Energy and FairHeat can support customers with their Public Sector Decarbonisation Scheme grant applications.

'It's been a significant investment in time, but we simply wouldn't have got to where we are in terms of helping building owners figure out the best way to decarbonise and connect to our network,' says Ridge.

For the BEN, the ASHPs will be installed in a purpose-built energy centre. The units will be split, with dry evaporators

HEAT NETWORK ZONING

To support the development of heat network zones in England, the government introduced the Energy Act last October.

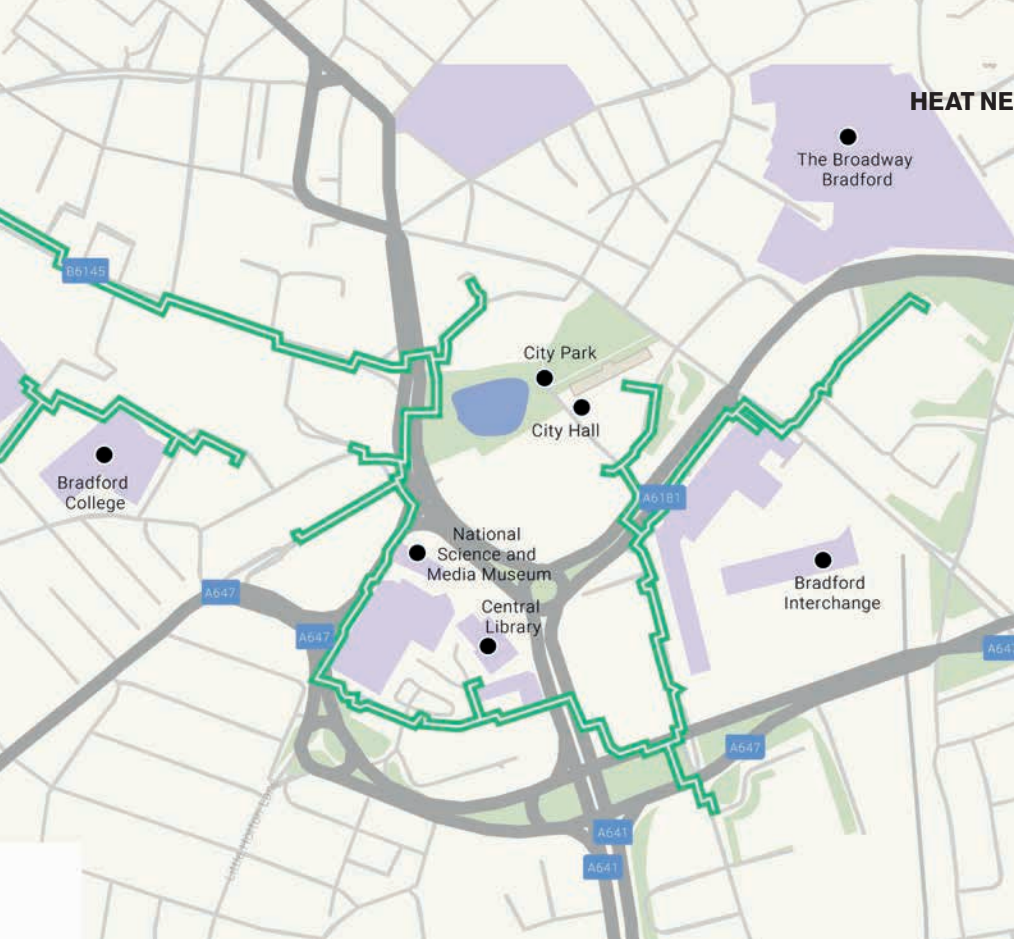
The act provides powers for government to implement heat network zoning in England through regulations, which will include powers to designate city areas as heat network zones. Heat networks developed in these zones must be low carbon. Certain buildings and heat sources will then be required to connect to these heat networks within a specific timeframe.

The government is currently working with 28 cities and towns to develop a methodology for identifying and designating heat network zones. The methodology will consider data such as location and building type, size and existing energy use, among other factors.

The proposed energy centre in Bradford



1energy



Left: Phase One of the heat network is expected to reduce emissions by 8,000 tonnes of CO₂e per year

mounted externally on the building's roof and the decoupled 2MW compressors and condensers housed on the energy centre's ground floor, along with the gas boilers. The compressors are modular so the system can be expanded as demand increases over time, up to 8MW. Refrigerant will be a blend of CO₂ and a hydrocarbon.

Externally, the energy centre is also home to three large thermal storage tanks, of almost 600m³ capacity in total. 'The more thermal storage the better in terms of flexibility,' says Ridge. As well as allowing IEnergy to charge the stores when electricity is cheap, the large thermal store means the heat network can reserve a portion of storage uncharged, so the energy centre can respond to requests from the Grid to take power by running the heat pumps even when customer demand for heat is low. 'The bigger the thermal storage, the more opportunity we have to play to those different market opportunities,' says Ridge.

Grid balancing is not included in IEnergy's business case, says Bungey. 'If we can take advantage of it, that would be great as an extra, but it's not core to what we're doing.'

IEnergy is also looking to take advantage of waste heat sources to top up the system. 'Because we are self-sufficient in heat provision, we can supplement the system with waste heat by paying appropriate prices for it,' Bungey explains.

Being self-sufficient in heat is also key to providing a resilient supply of heat, because customers are used to having a reliable gas supply. 'We are in control of the heat pump



Pipework is being installed beneath the city's streets

heat source and the back-up provided by the gas boilers and thermal stores; these can be supplemented with waste heat as and when opportunities arise,' says Ridge.

He adds that this approach has been adopted successfully in Scandinavia, where a network will start off with a strategy in terms of distance, customers and capacity, but then additional heat sources will feed into that over time, to ensure a lot more flexibility in how heat is provided.

'We can't look at that end goal as our starting point, but we are really excited about that part of the journey where our pipes go past someone's front door and they ask us about the network. It's about getting the initial project off the ground and then seeing it grow from there,' says Ridge.

Currently, the 400mm-diameter flow and

return pipes to deliver low carbon heat from the energy centre to buildings in and around the centre of Bradford are being buried beneath the city. Eventually, a network of pipes will run from the energy centre in the west via two main spines that will deliver heat to where it is required.

A challenge with the installation that IEnergy is working to overcome is the limitations of the supply chain in the UK, which, Bungey says, is populated by a number of mostly small players.

'What we're trying to do is work with those smaller players to help develop the market and the supply chain – which we need to do because we are looking at installing networks in 10 cities at this scale,' he adds.

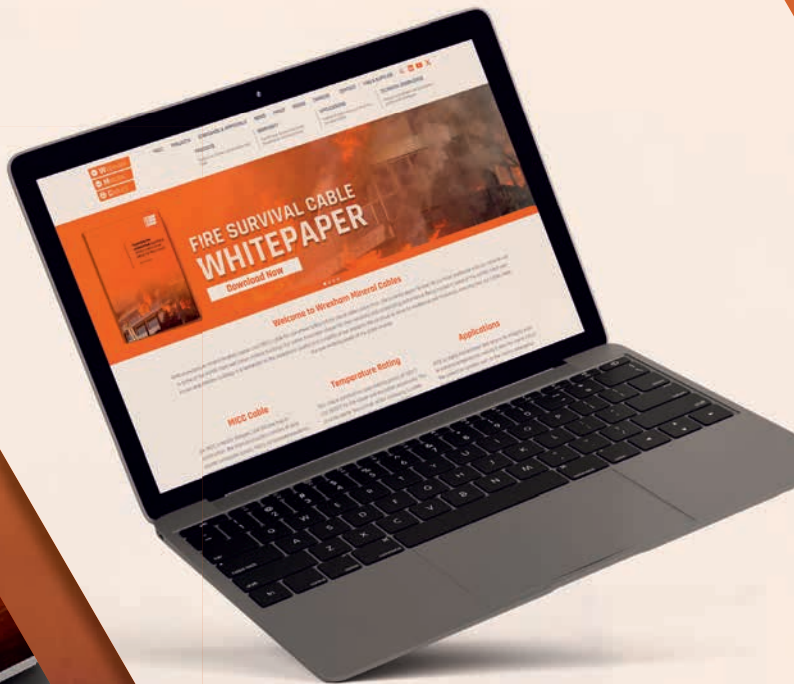
'Each heat network package is worth tens of millions of pounds, which is often larger than the entire turnover of some of these organisations, so we have to work with them to share risk and to help them develop.'

The system is designed to only supply heat; there is no cooling planned for Bradford. 'Very few of the existing buildings we will be connecting to have a significant cooling demand, so the network is all about heating and hot water,' says Ridge. However, Bungey adds that there 'might be an opportunity to do something' in other cities depending on the cooling demand and the business case for investment.

Green electricity will be used to power the heat pumps. This makes the carbon content of heat supplied to customers about 59g CO₂e/kWh, which, Bungey says, is about a '75% carbon saving against a gas boiler'.

Clearly, heat networks have a role to play in helping the UK achieve its net zero targets. The Climate Change Committee has estimated that around 18% of UK heat – including domestic, commercial, industrial and public – could come from heat networks by 2050, a significant increase on the current figure of around 2%. In Bradford, phase one of the heat network is predicted to reduce emissions by approximately 8,000 tonnes of CO₂e per year. IEnergy is aiming to have heat on in April 2026, which will take Bradford a step closer to its net zero goal. **CJ**

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Contributing to fire safety in buildings with suitably specified cables

This module explores the safety issues around fire performance in cables and the implications of the Building Safety Act on installations

The network of power, control, and communication cables that pass through every part of a building provide amazing utility, but if not properly specified and procured, they could equally create a significant hazard and risk to safety in the event of a fire.

This CPD will consider how significant UK fire events have heightened concerns in building safety, discuss some of the principal UK standards that are defining fire performance in cables, and identify some of the potential gaps that might well be filled in the revitalised, responsible culture ushered in by the recently introduced Building Safety Act¹ in England.

As reported in *CIBSE Journal* June 2018, the inquiry in the aftermath of the Grenfell Tower fire that occurred in London on 14 June 2017 determined that all lobbies from level 4 to level 23 became smoke-logged and, repeatedly in the testimonies of the Grenfell survivors, black smoke (Figure 1) had impeded safe escape. The 2009 fire in Lakanal House, Southwark, was reported to the Grenfell enquiry, as there were thought to be similarities in the response to the fire and the rapid spread of the fire to other floors, as well as the devastating impact from smoke. Within 30 minutes of the fire starting, smoke had spread to involve floors 6 to 12 (of the 14 storeys) and smoke-logging affected large parts of the building, including the communal staircase, corridors and many of the flats. However, some 22 years prior to that, the King's Cross Underground station fire in London (Figure 2) had already heightened concerns around fire safety procedures and protocols, and the devastating impact of smoke on safe egress from a fire. In addition to loss of life, the fire destroyed much of the station equipment and fixtures, including the cabling systems. However, the predominant cause of death resulted from the dense black smoke.² Witness statements in the subsequent public inquiry² noted that as survivors 'reached the steps up to St Pancras Station, the smoke quickly turned from brown to dense black, which smelt to them like a burning plastic cable'. The coroner

reported that it was impossible to ascertain the source of toxic fire fumes, and so it was not possible to determine the source of toxic materials found in the bodies of those who had died.²

In these tragic fires, electrical wiring was not directly implicated in the cause of the fire, or in specifically creating the smoke that prevented the safe escape of many occupants. At King's Cross, for instance, a fire-damaged cable had disrupted the automatic operation of the Victoria line, but this was not explicitly associated with the main incident.

In all three fires, multiple factors coincided to produce the catastrophic outcomes. Many of these shortcomings were undoubtedly identified in the respective inquiries, and there has been significant work undertaken in the intervening years by London Underground/Transport for London, the London Fire Brigade, and, most recently, through the designation of responsibility and competence (and the aspiration of 'cultural change') in the Fire Safety Bill 2021³ and the Building Safety Act 2022. A key objective of the acts is to remedy the systemic issues identified by the Independent Review of Building Regulations and Fire Safety⁴ by strengthening the whole regulatory system for building safety. Many of the new requirements apply not just to 'high-risk





Figure 1: Grenfell Tower at 4.45am on 14 June 2017
(Source: Nathalie Oxford - bit.ly/CJJan24CPD5)

» buildings' but to all non-domestic premises, such as where people work, visit or stay, including workplaces, and the non-domestic parts of multi-occupied residential buildings (for example, communal corridors, stairways and plantrooms). The requirements do not apply within individual domestic premises.

As seen in the fires discussed above, large, complex, and high-rise built environments that are more likely to be densely populated will have extended evacuation times. Smoke from inappropriately specified or inadequately manufactured cables will reduce the opportunities for successful escape from a fire. Circuits of safety-critical services need to function for extended periods, and fire plans are likely to rely on critical circuits continuing to perform to prevent potentially disastrous events, such as: fire alarm cable failure; sprinkler system not activating; smoke extract fans and smoke louvre power supply failure; and emergency lighting and signage failing to remain illuminated.

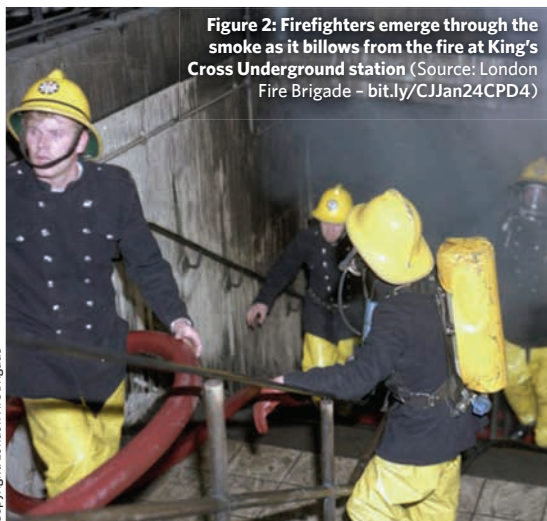


Figure 2: Firefighters emerge through the smoke as it billows from the fire at King's Cross Underground station (Source: London Fire Brigade - bit.ly/CJJan24CPD4)



Figure 3: A simplified sketch of an example fire-resistant polymeric cable. There are many variants of such cables that are designed to meet specific fire-resistance requirements

Fire-resistant cables provide extended periods of circuit integrity where uninterrupted functionality is crucial during a fire. They are designed to maintain their functionality and structural integrity for a specified period of time during a fire, and are constructed using materials that can withstand high temperatures when exposed to tested levels of flame, water and shock. They remain intact in harsh conditions, although they are not necessarily fireproof. The insulation and sheathing are made from materials that do not propagate flames or produce excessive smoke, and so are able to provide protection against fire. Performance will vary depending on the specific type and design of the cable. The two principal types of fire-resistant cables are polymeric cables and mineral insulated copper cables (MICC).

Polymeric cables use synthetic materials such as polyethylene (PE), polyvinyl chloride (PVC), cross-linked polyethylene (XLPE), mica tapes and other polymers for insulation and sheathing, such as in the simplified sketch in Figure 3.

The flexibility of these cables makes them relatively easier to handle and install. Polymeric cables can be designed with various material layers to ensure that they maintain circuit integrity for a specified duration during a fire under defined conditions. The temperature rating of polymeric cables varies based on the specific polymers used. The Institution of Engineering and Technology (IET) notes⁵ that there are many acronyms employed to represent the emissions performance of polymeric cable, and it is important not to confuse 'low smoke halogen free' (LSHF) and 'low smoke and fume' (LSF). PVC compounds are used during the manufacture of LSF cables, and while additional additives reduce the smoke emissions, they are not eliminated. There are no standards governing LSF cables, unlike LSHF, which are manufactured and tested to BS EN 61034,⁶ which considers the measurement of smoke density from burning cables, and BS EN 60754,⁷ which provides guidance on corrosive and acid gas emissions.

In MICC, the conductors are surrounded by mineral insulation, commonly magnesium oxide (MgO), and the principal outer sheath is typically made of metal, such as copper (Cu) or an alloy, as illustrated in Figure 4 and Figure 5. They are rigid and less flexible compared with polymeric cables; however, the rigid construction, resulting from the highly compressed powdered mineral insulation, provides excellent mechanical strength.

MICC are inherently fire-resistant because of the mineral insulation, and can withstand high temperatures and maintain circuit integrity during intense fires. This type of cable can typically safely carry an electrical load at temperatures in excess of 1,000°C.

Most cables installed as part of a permanent installation within domestic, residential and commercial buildings are subject to the Construction Products Regulation⁸ (CPR) that requires relevant cables to be CE-marked. Cable conformance includes reaction to fire and release of dangerous substances in normal operation, dismantling and recycling. All UK countries will accept⁹ the EU's CE mark as appropriate for cables until at least 2025. The supporting standard BS EN 50575¹⁰ covers the reaction to fire of cables in construction works on a scale of A_{ca} (non-combustible, such as bare MICC) to F_{ca} (no performance determined and likely to burn uncontrollably in a fire). In addition, there are classifications for smoke (s), flaming droplets (d), and acidity (a) as described in BS EN 13501-6,¹¹ with each classification graded from 0 or 1 to 3. The BCA provides guidance¹² on appropriate CPR ratings – for example, a cable designated as C_{ca} - sl, d2, a1 is likely to be suitable for installations where 'improved' (as opposed to 'low-risk') fire performance of cable is required.

CPR covers both reaction to fire and resistance to fire, but only the harmonised



Figure 4: Examples of MICC (Source: Wrexham Mineral Cables)

standard BS EN 50575, which considers reaction to fire, is currently available. Therefore, fire-resistant cables cannot be certified under the CPR, so it is not possible to CE-mark and issue a declaration of performance (DoP) for them.

In the various UK Building Regulations, to be classed as fire-resistant cable, a cable's construction must meet the British Standard appropriate to the cable type and application. There are many cable fire-performance standards – code of practice BS 8519¹³ provides a useful table that lists the appropriate cable categories and standards for specific applications. Each standard has a variant of time and flame temperature, with some incorporating physical shock and water spray, in order to test cables under simulated fire conditions – these can provide a bewildering array of 'standardisation'. These can range from a 15- to 120-minute rated cable tested at 842°C – designated as PH 15 to PH 120 cable under BS 50200¹⁴ (which considers unprotected cables less than 20mm diameter for use in emergency circuits) – to a three-hour fire-rated cable tested at 950°C to BS 6387¹⁵ (designated 'category C').

Code of practice BS 5839-1,¹⁶ which considers fire detection and fire alarm systems for buildings, makes recommendations for two levels of fire resistance – 'standard' (PH 30 with water spray) and 'enhanced' (PH 120, also meeting BS 8434-2¹⁷) for unprotected cable. BS 8434-2 is a 120-minute test that includes direct flame, mechanical shock and a water spray, all conducted on the same cable sample in the same period at a temperature of 930°C. Cables with standard fire resistance are deemed suitable for the majority of applications. However, cables of enhanced fire resistance are recommended where prolonged circuit integrity is necessary, such as in un-sprinklered high-rise buildings with phased evacuation arrangements, and premises that are likely to be part-occupied for a prolonged duration during a fire that might damage cables serving parts of the fire alarm system in occupied areas. Monitoring of circuits and protection of cables against damage are complementary requirement precautions, rather than alternatives. Similarly, code of practice BS 5266-1¹⁸ recommends (for unprotected cable) 'standard' (PH 60 plus 30-minute water spray) cables for normal use in emergency lighting systems and 'enhanced' (PH 120, also meeting BS 8434-2) cables for use in certain large and complex buildings where circuits are required to operate for longer periods to aid evacuation.

The well-established BS 6387¹⁵ *Test method for resistance to fire of cables required to maintain circuit integrity under fire conditions* is widely applied internationally. The method is broken down into three separate tests – referred to as C, W, and

Z – that are undertaken on a sample of cable. C considers fire at 950°C; W, at 650°C, additionally includes a water spray with 15 minutes fire and 15 minutes sprinkler; and Z is carried out with the cable sample 'rigidly' mounted for 15 minutes at 950°C with a metal bar hitting the metal mounting frame every 30 seconds. Successfully passing the C, W, and Z tests outlined in BS 6387¹⁵ suggests to specifiers and contractors that a cable is capable of surviving all three scenarios of fire, water and shock. However, there are features of the three tests that have been highlighted by manufacturers as potentially not being sufficiently stringent. These include the fact that the three tests do not have to be carried out on the same cable sample; the volume flow of water in test W is a minimum of 0.3 litres of water per minute – which compares with a real-life scenario fire hose discharge in excess of 500 litres per minute; and in test Z there is no direct impact on the cable sample – in a fire, debris is likely to impinge directly on cables.

In his recent review,¹⁹ cable fire safety expert Richard Hosier emphasises the global prevalence of the BS cable flame test methods for certifying fire-resistant electrical cables. He highlights the standard 500mm-long gas ribbon burner test rig, expressing concerns that the set flame temperature in 'open air' tests may not consistently match the full cable temperature. Hosier compares UK standards with international practices, noting that furnace testing – exposing the full cable specimen to furnace temperatures – is adopted in other 'developed' countries, aligning with fire-resistance testing requirements for various building elements.

The Building Safety Act is establishing a fresh regulatory framework, placing accountability on those involved in procuring, designing, creating and maintaining buildings to ensure safety for occupants. Moreover, it grants consumers the authority to pursue legal action against manufacturers and suppliers for breaching the CPR or providing misleading information during product marketing or supply.

Building Regulations requirements should be considered as a minimum standard. The selection of an appropriately tested and independently certified cable requires that the manufacturer, supplier, designer, and installer have a robust understanding not only of the application, but also the practical fire performance that might be expected from the cable based on the necessary limitations of the standardised testing procedures.

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Turn to page 46 for references.

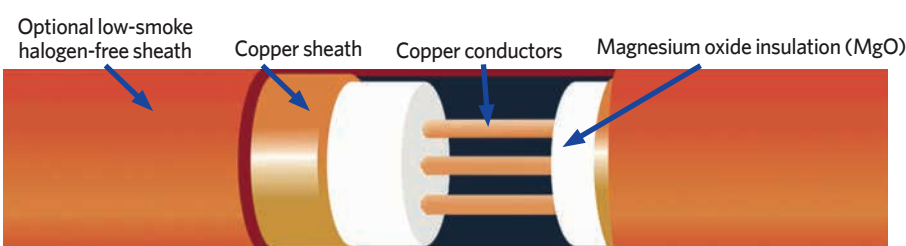


Figure 5: The components of a typical MICC

»



Module 228

January 2024

» 1. How long ago (from when this article was published) was the King's Cross Underground station fire in London?

- A Less than five years ago
- B Around five to 10 years ago
- C More than 10 but less than 15 years ago
- D Approximately 20 years ago
- E More than 35 years ago

2. Which of these was not referred to in the article as providing a safety-critical service?

- A Emergency lighting
- B Fire alarm cable
- C Passenger lift
- D Smoke extract fans
- E Sprinkler system

3. In MICC, what is typically employed as the insulating material?

- A Magnesium citrate
- B Magnesium glycinate
- C Magnesium hydroxide
- D Magnesium oxide
- E Magnesium sulphate

4. Which of these standards describes a test procedure with direct flame, mechanical shock and water spray, all on the same cable sample in the same period at a temperature of 930°C?

- A BS 50200
- B BS 5266-1
- C BS 5839-1
- D BS 6387
- E BS 8434-2

5. What does the article describe as 'establishing a fresh regulatory framework'?

- A Building Regulations
- B Building Safety Act 2022
- C Construction Products Regulation
- D Fire Safety Bill 2021
- E King's Cross coroner's report

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References:

- 1 Building Safety Act 2022.
- 2 Fennel, D, *Investigation into the King's Cross Underground Fire*, UK Department of Transport, 21 October 1988.
- 3 Fire Safety Bill 2021.
- 4 Independent Review of Building Regulations and Fire Safety.
- 5 bit.ly/CJJan24CPD1 - accessed 26 November 2023.
- 6 BS EN 61034-2:2005+A2:2020 *Measurement of smoke density of cables burning under defined conditions - Test procedure and requirements*, BSI 2020.
- 7 BS EN 60754-1:2014+A1:2020 *Test on gases evolved during combustion of materials from cables - Determination of the halogen acid gas content*, BSI 2020.
- 8 *Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC.*
- 9 bit.ly/CJJan24CPD2 - accessed 26 November 2023.
- 10 BS EN 50575:2014+A1:2016 *Power, control and communication cables. Cables for general applications in construction works subject to reaction to fire requirements*, BSI 2016.
- 11 BS EN 13501-6:2018+A1:2022 *Fire classification of construction products and building elements Part 6: Classification using data from reaction to fire tests on power, control and communication cables*, BSI 2022.
- 12 *Recommendations for the Selection of Cables under the Construction Products Regulation (CPR)*, British Cables Association 2019.
- 13 BS 8519:2010 *Code of practice for the selection and installation of fire-resistant power and control cable systems for life safety and fire-fighting applications*, BSI 2010.
- 14 BS EN 50200:2015 *Method of test for resistance to fire of unprotected small cables for use in emergency circuits*, BSI 2015.
- 15 BS 6387:2013 *Test method for resistance to fire of cables required to maintain circuit integrity under fire conditions*, BSI 2013.
- 16 BS 5839-1:2017 *Fire detection and fire alarm systems for buildings Part 1: Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises*, BSI 2018.
- 17 BS 8434-2:2003+A2:2009 *Methods of test for assessment of the fire integrity of electric cables - Test for unprotected small cables for use in emergency circuits. BS EN 50200 with a 930° flame and with water spray*, BSI 2009.
- 18 BS 5266-1:2016 *Emergency lighting - Code of practice for the emergency lighting of premises*, BSI 2016.
- 19 bit.ly/CJJan24CPD3.

Product of the month

Will European economies embrace a transition to hydrogen?

Repurposing gas networks in Spain, Germany and Italy will pave the way for hydrogen use on the continent

As the global community intensifies efforts to combat climate change, European economies are taking steps to phase out fossil fuels. In a notable shift, Spain, Germany and Italy are repurposing their domestic gas networks and distribution systems to accommodate alternative fuels, including hydrogen. Rinnai operations director Chris Goggin explores the transformative initiatives undertaken to align with ambitious decarbonisation targets.

Natural gas remains a primary source for heating buildings and providing hot water across Europe. The UK, Spain, Germany and Italy are among the largest consumers, all relying heavily on natural gas and oil. Working towards ambitious decarbonisation goals, the question emerges of what happens to existing domestic gas infrastructure after the phasing out of natural gas.

In Spain, there are 25 million residential properties, hosting a population of just less than 50 million. The gas transmission network spans 13,361km and is operated by Enagás, the country's largest privatised natural gas distributor. While Spain benefits from diverse energy supply routes, including a key one from Algeria, its substantial natural gas consumption and reliance on imports must be reduced.

Italy, with a population of nearly 60 million and 26.2 million residential properties, relies on an independent company, Snam, for approximately 95% of its natural gas supply, through a 32,000km nationwide network of pipelines. Snam's recent acquisition of a stake in gas pipeline infrastructure positions the company strategically for future hydrogen dispersal across Europe, northern Africa, and the Mediterranean.

Germany's natural gas transmission network, stretching 511,000km, faces uncertainty over its ownership. Discussions are ongoing about potentially nationalising gas supply through state-owned entities such as Uniper. German energy suppliers, while actively reducing their reliance on Russian gas, still grapple with the challenge of transitioning away from imports.

The surplus of underground pipelines becomes a crucial consideration for these countries. What will they do with thousands of kilometres of unused infrastructure once



Rinnai operations director Chris Goggin

natural gas is phased out? Evidence suggests that major businesses and European Union (EU) member states are eyeing these pipelines, anticipating their repurposing for widespread hydrogen use.

Snam's stake in gas pipeline infrastructure connecting to Algeria and the Tunisian coast positions the company to play a pivotal role in future solar-produced green hydrogen production. Similarly, the German federal government is in discussions with the EU about the viability of purchasing Wiga, a gas network operator, with the aim of repurposing existing pipelines for a national hydrogen network.

Wiga is valued at around €3bn to €4bn. It is already 50% owned by state-owned organisation SEFE (Securing Energy for Europe) and operates a pipeline network of more than 4,000km. The updated German National

Hydrogen Strategy could be achieved through the repurposing of all of Wiga's current pipework to transport hydrogen. This may enable the establishment of a national hydrogen network that is connected for both commercial and domestic use.

In Spain, Enagás has acquired 130km of gas pipeline from Reganosa, connecting to Portugal. This strategic move enables Enagás to fully integrate renewable hydrogen production and distribution within the region by 2030.

The UK, however – with its extensive 7,630km of gas pipelines – has yet to outline a clear policy regarding the repurposing of natural gas infrastructure for future power distribution. While continental economies forge ahead with plans for hydrogen distribution using adapted gas infrastructure, the UK's stance remains uncertain.

As European nations chart their individual paths toward decarbonisation, the geographical positioning, production capabilities, and energy requirements of each country will influence the decarbonising solutions they adopt.

Rinnai remains committed to keeping customers, installers, specifiers and system designers informed about evolving domestic and international energy policies that may impact current and future purchasing options.

■ [Email engineer@rinnaiuk.com](mailto:Email.engineer@rinnaiuk.com) or visit www.rinnai-uk.co.uk

Zumtobel illuminates Fitzrovia refurbishment

Arthur Stanley House in Fitzrovia, London, has been transformed by a new state-of-the-art lighting system from Zumtobel and its sister brand Thorn.

The lighting manufacturer partnered with Allford Hall Monaghan Morris architects and Thornton Reynolds building service on a project that aimed to seamlessly blend 1960s' aesthetics with cutting-edge, post-Covid technology. The result is a world-class office building that prioritises sustainability and flexibility.

Using Zumtobel's Tecton C and various other lighting solutions, the project overcame challenges to meet stringent requirements, creating an ambience that enhances productivity and wellbeing

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Nuaire Launches iSense-plus dMEV fan

Nuaire has introduced its iSense-Plus dMEV fan, a solution to provide Building Regulations-compliant, continuous background extract ventilation in new residential builds.

Offering a cost-effective alternative to whole-house MEV systems, these compact fans are discreetly installed in key areas with an adjustable humidistat and intelligent run-on timer. Designed for easy installation, the iSense-Plus ensures a comfortable, mould-free home environment with quiet operation, filterless design, and energy-efficient performance. Backed by a five-year warranty, it meets Part F and L Building Regulations, listed on SAP10, ensuring peace of mind.

Visit www.nuaire.co.uk



Pump Technology campaign preserves 3,000 acres of Brazilian Amazon rainforest

In a huge environmental effort, Pump Technology has successfully conserved 3,000 acres of the Brazilian Amazon rainforest.

The company pledged to make a £5 donation to the Rainforest Trust for each Jung Pumpen DrainMinor and DrainMajor wastewater pumping system specified and sold.

To make the campaign even more eco-conscious, the collecting tanks in these pumps are made from recyclable polyethylene.

Thanks to all the public health engineers who have specified DrainMinor and DrainMajor wastewater products.

Call David Johnson at 07984 520515

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made a donation which will protect 3,145 acres of the Brazilian Amazon, the world's largest tropical rainforest.

This donation will help Rainforest Trust and our local partners to permanently safeguard 30 villages across the Brazilian Amazon across multiple projects. This vital work will provide a safe haven for at least 10 threatened species and secure the traditions of 150,000 indigenous people. By doing so, we will help the Amazon lock from the tapping point and safely lock up more than 6 billion metric tonnes of CO₂ equivalents, to diminish the global impact of climate change.

Issued November 2013
Find out more at www.RainforestTrust.org



Ideal Heating's Evomod boilers transform UK landmark

Beetham Tower in Manchester, one of the UK's tallest buildings outside London, has had its energy efficiency enhanced by the installation of Ideal Heating's Evomod boilers.

The modular boilers, along with plate heat exchangers, have replaced ageing units and now efficiently heat the 47-storey tower, which is home to the Hilton Hotel and residential apartments.

Four Evomod 100kW output boilers were selected for their small footprint in what is a compact plantroom. Also available in 250kW, 500kW and 750kW outputs, the boiler will achieve an output of up to 1MW from a single unit solution.

Visit idealcommercialboilers.com



The blue Discovery Building is due for completion in 2025

David Brand

Beyond boundaries

What does it take to build a state-of-the-art science and operations facility during the Antarctic winter? David Brand delves into the challenges of construction in one of the world's harshest climates

The Discovery Building, a new science and operations facility at Rothera Research Station in Antarctica, is currently under construction. David Brand, Rothera modernisation senior project manager, discusses the challenges that the mechanical and electrical engineers will face as they work through winter for the first time, in 24-hour darkness and harsh polar weather.

Describe the Discovery Building

It is a cutting-edge scientific support and operations facility at Rothera Research Station, the UK's largest Antarctic research station. It will replace the operational functions of six existing buildings on the site.

With a focus on sustainable design, the project includes a suite of site-wide services, such as a distribution network of hot water, seawater and fuel pipework, data and power cables, bridge crossings, pedestrian walkways, and stairs.

It will enable the British Antarctic Survey (BAS) to reduce its building footprint while improving resilience and enhancing sustainable methods of delivering its operation. Works began in 2019 as part of the wider Rothera Modernisation project and is expected to be completed in 2025.

Why is the team working during the winter?

Completing internal work over winter with a smaller team enables us to prioritise other critical activity during the summer season, in less extreme weather conditions. It will be the first time M&E engineers from the Antarctic Infrastructure Modernisation Programme (AIMP) Major Projects Team will be deployed during winter. Three electrical engineers will complete the final fix and testing of electrical systems, including the building management system and switchboards. BAS regularly deploys its M&E engineers over winter to maintain current infrastructure.

How big is the M&E team?

There are 35 members assisting with the internal fit-out of the 4,500m² Discovery Building, including the pipework and cabling across the whole station. This rises to a total construction workforce of 70 by the end of the season.

The station is operated permanently. In summer, the population peaks to more than 100 people and, in winter, a 22-strong team continues the science work and maintains Rothera's infrastructure.

Teams on the station include marine and terrestrial biologists, meteorologists, engineers, a dive officer and a boating officer, a chef, a doctor, mechanics, electricians, plumbers and builders.

During downtime, the team often occupy themselves with reading, knitting, watching films, and playing board games. As Rothera is such a unique environment in which to live and work, the team also pass the time by skiing, snowboarding and hiking.

What are the challenges of working in such extreme conditions?

The Antarctic summer season provides a very short window in which to complete external construction. Extreme weather and limited available light throughout the year is a huge constraint, so modern methods of construction have been considered to reduce build time.

Designs that feature modular builds and standardisation of components enable us to reduce time on site. The AIMP has taken a 'build it before you build it' approach, encompassing trial builds in the UK of complex sections, and uses digital modelling to complete clash detection and avoid lost time on the station.

How will the team cope with no sunlight?

There are only two months without sunlight, and teams receive winter training before deployment. Construction teams will also receive training on self-sustainment and maintaining wellbeing, to prepare them for the challenges. There is also a well-supported community on the station, with appointed leaders to manage the team's wellbeing.

How do you access the island during winter?

Rothera is accessed by ship and aircraft, as it is the main BAS station, from where those working in the Antarctic are mobilised. Sea ice and extreme weather during the winter season, however, limits its accessibility.

Most project materials are sent to Rothera via polar-class commercial shipping. The AIMP strategically plans the timing of shipments and considers interdependencies between projects to minimise the number of voyages, reducing capital carbon, financial cost and logistical burdens.

EVENTS AND TRAINING



NATIONAL EVENTS AND CONFERENCES

CIBSE Building Performance Awards 2024

29 February 2024, Park Plaza Westminster Bridge, London

Booking is now open for the Building Performance Awards, the only industry awards that focus on actual measured performance outcomes, and not just design intent or performance specifications. Entries are open to any organisation or individual, within the UK or internationally, that is responsible for the design, commissioning, construction, installation or operation of low-energy buildings, and manufacturers whose products enable efficient energy consumption. Book your place to celebrate with the industry at www.cibse.org/bpa



CIBSE Technical Symposium

11-12 April 2024, Cardiff University

With the theme of Fit for 2050 – Delivering buildings and defining performance for a net zero built environment, the 2024 symposium will present a range of peer-reviewed papers and presentations outlining the latest developments in practice, technology and policy, and highlight the latest guidance for building services engineers.

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Check the website for up-to-date information on regions and groups meetings, webinars and podcasts. Visit www.cibse.org/events

East Midlands: Legionella risk assessments and BS8580-1:2019 – do your risk assessments comply?

9 January

This online briefing will reiterate the need for legionella risk assessments and how they are required under the regulations and guidance documents.

SFE West Hub: Everton FC stadium tour

25 January

Tour of the Premier League team's new stadium on the famous Bramley-Moore Dock in Liverpool.

CIBSE Yorkshire: Escalators – Engineering the ups and downs

28 February, Leeds

CPD session with CIBSE vice-president Dave Cooper, who will guide attendees through the applicable standards and potential issues with escalator design, covering aspects such as location, specification, passenger input, and component failure.



TRAINING COURSES

CIBSE's courses are run as in-person or live online training. Corporate delivery is also available in-house face to face, or remotely online. For more information see www.cibse.org/training

Mechanical services explained

30 Jan-1 Feb, remote
20 February, London

Low carbon consultant building operations

31 Jan-1 February, London

Low and zero carbon energy technologies

6 February, remote

Fire safety Building Regulations: Part B

18 January, London
27 February, remote

Design of ductwork systems

27 March, remote

Heat Networks Code of Practice

6-7 February, remote

Building services explained

23-25 January, remote
27 February, London
26 March, remote

ISO 50001:2018 Energy management system/ Low Carbon Consultant

16-17 January, remote
19-20 March, remote

Above-ground building drainage

30 January, London

Energy Savings Opportunity Scheme

13 February, remote
24 April, remote

Building Regulations Part O: Overheating

14 February, London
23 April, remote

Electrical services explained

20-22 February, remote
19-21 March, London

Low carbon consultant building design

7 February, London

Introduction to the Building Safety Act

16 January, remote
14 February, remote
13 March, remote

Energy surveys

8 February, remote

Commissioning Code M: Commissioning management

13 February, London

Electrical services explained

20-22 February, remote
19-21 March, London

Introduction to heat networks and Code of Practice

28 February, remote
16 May, London

Energy strategy reports

29 February, remote

Designing water-efficient hot and cold supplies

5 March, London

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The latest *CIBSE Journal* webinar, sponsored by Daikin, is now available on demand. This webinar, titled 'Our sustainability journey', explores how the HVAC market needs to adapt to meet the UK's ambitious environmental targets, and how Daikin is working to lead the way.

All previous *Journal* webinars are also available on demand at: www.cibsejournal.com/webinars



MEMBERSHIP WEBINARS

CIBSE Membership hosts free, two-part webinar series to support members with applications for the Associate and Member grades and registration with the Engineering Council at Incorporated Engineer and Chartered Engineer level. To register for the upcoming dates, visit: bit.ly/CJMar23memweb

Upcoming webinar dates: 9 and 16 January; 13 and 20 February; 12 and 26 March



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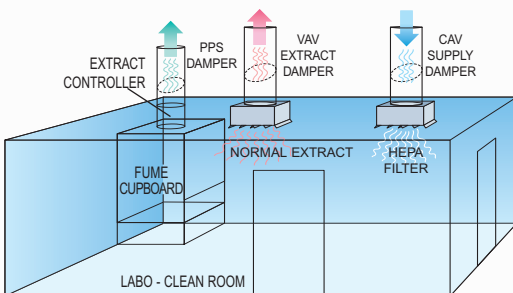


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