

CIBSE JOURNAL



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February 2023

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MAX FORDHAM TARGETS
5.5 NABERS UK RATING
EFFICIENT FA ADES AT
PADDINGTON SQUARE
AHMM S NET ZERO GUIDE
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MOVING FORWARD

CIBSE announces plans to leave Balham as it sets sights on new head office in central London

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The end of an era



CIBSE's intention to move out of Balham, to a new head office in the centre of London, will be a great opportunity to galvanise the skills and knowledge of CIBSE Members to create a new home that showcases the best in building services engineering.

One of the key deliverables of the project is that the new building must align with the goals of decarbonisation and building safety, key areas of concerns for today's chartered engineer. This month, we have plenty of examples of engineering ingenuity and rigour that will help create the net zero buildings of the future.

Max Fordham's building services design at 11 Belgrave Road in Pimlico has helped the building achieve a 5.5 star Nabers UK Design for Performance target rating. It was not without difficulty. To save embodied carbon, the designer, Eric Parry Architects, retained a large part of the structure, but this restricted floor to ceiling heights, meaning Max Fordham could not use the preferred four pipe fan coil unit solution. Instead, it specified an innovative hybrid ambient loop/variable refrigerant flow system. This enabled it to save operational energy by balancing heating and cooling while cutting embodied energy through minimising the refrigerant required.

Another consultant helping clients develop net zero buildings is architect AHMM. On page 26, Dr Craig Robertson, a CIBSE judge and AHMM's head of sustainability, describes the firm's Net Zero Carbon Guide. It looks at the principles of net zero and shares a case study of a mixed use scheme on which the principles are put into practice. A key lesson was the need to integrate iterative performance based modelling across the design team, which meant architects becoming more numerate and engineers being comfortable with iterative design.

CIBSE's reigning Engineer of the Year, Mike Burton FCIBSE, is used to seeing buildings from the perspective of others (page 22). An experienced building services engineer, he has led the services design team for Aecom on landmark projects such as BBC Broadcasting House. He has also been a judge for the British Council for Offices and RIBA, and written and contributed to books for both organisations.

Burton is keen for engineers to develop their communication skills and emotional intelligence so they can be comfortable engaging with contractors and architects. He believes mentoring is one way of developing engineers emotionally, and has been a mentor for many years. CIBSE Members can take advantage of a new mentoring service and potential mentors or mentees can register at www.cibse.org/cibse-mentoring-news

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Hywel Davies

Another set of regulations relating to the new regime for building safety have been laid before parliament



Ruth Carter

Why now is the time for CIBSE to return to central London and raise its profile among Members and the building community



Robert Dwyer

Asbestos is still a threat to the health of workers and occupants 50 years after it was last used in buildings



Tim Dwyer

This CPD module looks at the transition towards low-GWP refrigerants and the impact on design

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CONTENTS

22

News

7 News

12 CIBSE news

Voices

16 Need to know

Hywel Davies gives insight into the newly published building regulations

69 Q&A: Lethal presence

Robert Dwyer reports on the dangers of asbestos exposed in refurbishment and demolition

Features

18 London's calling

CIBSE is moving its head office into central London. **Alex Smith** finds out about the plans

22 Mike's on a mission

CIBSE's current Building Performance Engineer of the Year, **Mike Burton**, talks about opportunities available to engineers

26 Net zero carbon: lessons from practice

AHMM's **Dr Craig Robertson** and **Dr Simon Hatherley** share lessons learned from an ambitious net zero building project

30 Framing finesse

The Paddington Square façade was designed for enhanced energy efficiency and performance. **Mace's Ovi Mazareanu** and **WSP's Michelle Sauchelli** and **Serena Gugliotta** describe their approach

39 Step change

Calls for the inclusion of a second

staircase in high-risk buildings raises questions. **Phil Lattimore** reports

Technical

Commercial/Industrial heating, cooling and ventilation

46 Rating winner

The Belgrave Road office development in London is the first to receive a Nabers UK 5.5 target rating. **Andy Pearson** reports

53 Switching to propane

The L150 initiative in Germany is aiming to reduce the charge in a propane refrigerant circuit

57 Pros and cons: primary circuit vs boiler shunt pumps

Opting for primary circuit pumps or boiler shunt pumps in a commercial heating system depends on several factors, as **Hamworthy's Ian Roe** discusses

CPD

61 Transitioning towards low GWP refrigerants

This module examines the drive for refrigerants with low GWP for building services applications

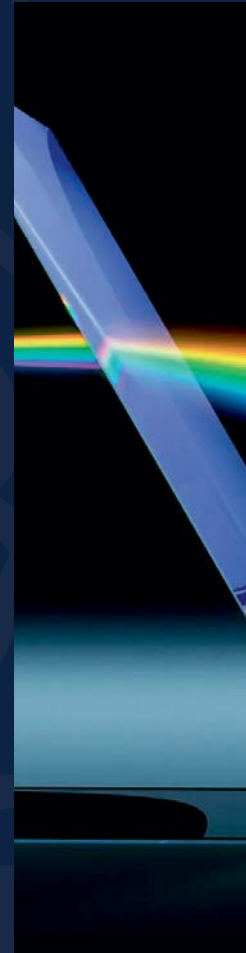
Classified

66 Products

Events

70 Looking ahead

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BRENT CROSS SUBSTATION LIGHTS WAY TO ELECTRIC FUTURE

A new electrical substation for Brent Cross Town has been wrapped in a public artwork by artist Lakwena and architects IF.DO. Arup, which led the construction and design of the structure, specified structural steel salvaged from unused oil pipelines and cement-free concrete to minimise embodied carbon emissions. The new 21m landmark is lit by Michael Grubb Studio. The mixed-use Brent Cross Town scheme will include 6,700 new homes and is a JV between Related Argent and Barnet Council. It designed to be net zero by 2030.



IN BRIEF

Bristol set for £424m green infrastructure boost

Bristol Council has signed a joint venture with international company Ameresco to set up an energy partnership for the city, with energy company Vattenfall as essential subcontractor. Bristol City Leap is expected to deliver at least £424m for a range of large, green infrastructure projects designed to reduce the city's carbon footprint by 140,000 tonnes. These include a major expansion of Bristol's heat network, the installation of solar panels and low carbon heating systems at local schools, and energy efficiency improvements to council housing. Bristol City Leap is expected to install more than 182MW of low carbon energy generation across the city during the first five years of operation.

Deloitte turns down thermostats by two degrees

Deloitte has reduced the temperature in its UK offices in a bid to cut costs and carbon emissions. The thermostat is being lowered by 2°C across 22 sites, including those temporarily closed over Christmas, to reduce energy consumption. Deloitte has told its 23,000 UK staff that its offices will now be heated to between 19°C and 22°C higher than the 16°C minimum recommended by the Health and Safety Executive as part of its energy saving plans. The temperature cut was expected to result in savings of about £75,000 during December, which will be donated to disability charity Scope.

Shareholders cash in on Grid shares

National Grid plc has paid £8.9bn through dividends and buyback schemes to its international shareholders over the past five years, according to analysis carried out by a left-wing think tank. The figures from Common Wealth show that the privatised grid operator's payouts included a £3.2bn special dividend following the sale of a majority stake in its gas business in 2017. The National Grid's operating profit margins in 2021/22 were 36% for gas and 19% for its electricity transmission and system operator business, according to the analysis.

Net zero review proposes phasing out gas boilers by 2033

Minimum EPC rating of C for all homes also recommended by former minister

The government should bring forward its proposed date for phasing out gas boilers by two years to 2033, and ensure that all homes meet at least Energy Performance Certificate (EPC) band C, a former energy minister's review of net zero has recommended.

The *Independent review of net zero*, carried out by Conservative Chris Skidmore and published on 13 January, has a wide-ranging set of recommendations, including phasing out gas boilers and appliances by 2033, two years ahead of the government's proposed target date of 2035. This legislation should be passed by next year to provide 'certainty' and boost industry and investor confidence, according to the review.

It also recommends that the government should legislate that all homes sold by 2033 should have an EPC rating of C or above, with exclusions for certain types of properties, such as listed buildings. The review adds that EPCs should be updated on a regular basis to better reflect cutting emissions to net zero.

In addition, it recommends that the government support the establishment of retrofit hubs by 2025, which could enable installers to seek training and impartial advice while connecting households with suitable

tradespeople to carry out works. Landlords should also be mandated to include an 'average bill cost' alongside an EPC rating when letting out their properties, to put a bigger premium on energy-efficient homes.

Industry was broadly supportive of the review. Julie Hirigoyen, chief executive at the UK Green Building Council, welcomed the recommendations but thought the government could go further. 'Many of our members would support going further in several areas, including legislating for net zero alignment through the Levelling Up and Regeneration Bill, requiring solar power on new homes, and an end date for new fossil fuel boilers in homes by 2028,' she said.

Other key recommendations in the Skidmore review include:

- Setting up the new Future System Operator as 'quickly as possible'
- Updating Ofgem's remit to incorporate the government's net zero target
- Reform of the local planning system and the National Planning Policy Framework 'as soon as possible' to align with the statutory 2050 net zero target
- Introduction of a test for all developments to be net zero compliant
- Increasing solar panel generation to 70GW - four times current levels - by 2035

IN BRIEF

Honours for CIBSE stalwart and air quality campaigner

Janet Wigglesworth has been made an OBE in the King's New Year Honours for her services to business. CIBSE's former personal assistant to the chief executive retired recently, after 30 years of service at the Institution.

Rosamund Adoo Kissi Debrah, a campaigner for air quality, was made a CBE for her services to public health. She began her campaign, Ella's Law for improved ventilation standards in buildings, after the death of her nine-year-old daughter Ella, who was the first person in the UK to have air pollution written on her death certificate.

Regulation defines responsibilities for buildings safety

The Higher Risk Buildings (Key Building Information etc.) (England) Regulations 2023 have been laid before parliament.

The regulations set out the key building information that the principal accountable person (PAP) will have to provide to the Building Safety Regulator. The PAP is responsible for the repair of the structure and exterior of the building.

The regulations also clarify the parts of a higher risk building for which accountable persons are responsible when there are multiple accountable persons.

For more on the regulations, see Hywel Davies on page 16.



CIBSE seeks net zero head office in London's Zone 1

Institution is looking to return to central London after 44 years in Balham

CIBSE has announced that it plans to leave its current Balham home and is seeking to move its head office to a central London address.

The Institution has set up a Premises Advisory Committee (PAC) to find a suitable property that aligns with its goals of decarbonisation and building safety.

Ruth Carter CEO said: 'CIBSE needs a head office that is modern, highly functional, easily accessible for our members and our staff, and, most importantly, lives our CIBSE standards – not least our net zero ambitions.'

The PAC has identified the fringes of the City of London as an ideal location. Accessibility to Members, particularly from overseas, was a key factor in the selection, said Carter.

'The Circle Line is perfect for accessibility and, in terms of affordability, you get really good bang for your buck,' she added.

CIBSE president-elect Adrian Catchpole FCIBSE said any building being considered will be assessed to evaluate the role it can play in the Institution's aspiration for net zero and in demonstrating best practice. 'It's up to us to demonstrate pragmatic ways to achieve the best [performance] from our buildings, for a modest amount of money,' he said.

Although Carter would like to be 'in before Christmas', there is no timeframe.

CIBSE paid £180,000 for 222 Balham High Road in 1978, after moving from Cadogan Square. Explaining the CIBSE Board's decision to move, Carter said: 'Balham head office no longer reflects CIBSE's values and credentials, and is not the 'shop window' for one of the most influential and impactful global Institutions.'

CIBSE President Kevin Mitchell FCIBSE said: 'A new facility presents an opportunity to show what we are and what we want to be. This is the biggest project we have done in a generation and we are really excited about it.'

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Octopus Energy to offer solar panels in Zero Bills tariff

Customers guaranteed zero bills if they meet technical requirements

Octopus Energy has announced plans to extend its Zero Bills tariff by offering solar photovoltaic (PV) panels to customers.

The tariff offers a guarantee that no energy bills will be paid for five years if specific technical requirements are met, along with the use of smart controls and low carbon systems. The energy supplier will initially roll out the model in new-build properties.

It will be trialled in 22 properties in Essex by Ilke Homes, on what the housebuilder claims is the UK's biggest zero carbon development.

Octopus announced on 11 January that it will also be extending the Zero Bills tariff to existing homes as well.

The company's energy service arm has set a target to install 5,000 PVs this year. The initial

focus of installation will be in the Midlands and the south of England, with a view to rolling out the programme nationwide before the end of the first year.

The company will offer the PVs alongside heat pumps and batteries, which will enable customers to export any surplus electricity generated to the Grid.

Octopus hopes that 10,000 homes could be eligible for the Zero Bills tariff by 2030.

John Szymik, chief executive officer of Octopus Energy Services, said: 'Given the success we have had in scaling and installing huge swathes of smart, green home-energy tech, we are championing at the bit to begin installing the last piece of the puzzle: solar photovoltaic.'

'If more homes in the UK produce clean, green solar energy, we will be able to accelerate the energy transition and bring down system prices for everybody by lowering system costs.'

UK Infrastructure Bank only offering green deals that are low risk

A new report by the House of Commons Public Accounts Committee (PAC) says the UK Infrastructure Bank (UKIB) was set up in a rush at ministers' insistence and has so far only funded projects that are already 'relatively common'.

The UKIB was established 18 months ago to invest private sector finance into projects that will help the government meet its net zero climate targets and levelling up commitments, and to plug holes resulting from the loss of UK access to the European Investment Bank post-Brexit.

The PAC report, published on 25 January, says the new institution operated with weak financial governance for the first year after its launch in June 2021. This led to its early deals, which had to be approved through Treasury processes, being 'low risk'. The £1bn of loans greenlighted so far have been for 10 'relatively common' solar and broadband projects, leading the PAC to question the government's claim that the UKIB is filling gaps in private sector investment.

PAC chair, Dame Meg Hillier, said: 'It's really not clear what the UKIB is doing that the market wasn't already, or would be doing with better functioning tax incentives - as just one example.'

'The Treasury didn't need to reinvent this particular wheel, with all the attendant risk to benefit, value and taxpayers' money. We need more assurance from government that lessons learned are being implemented and the catalogue of policy and spending errors we've seen will not be repeated.'

IN BRIEF

Bellway pilots heat pump on roof

Housebuilder Bellway has installed the country's first roof-mounted air source heat pump (ASHP). The heat pump will be tested in Bellway's experimental eco house, The Future Home, at the University of Salford.

Where installed in new homes, ASHPs are usually fitted on, or adjacent to, an exterior wall, which means they tend to dominate the external appearance and take up valuable outdoor space.

Bellway has engineered the house to support the 200kg ASHP within the roof space. A second unit will be fitted to an external wall to enable comparisons to be drawn.

Patents for hydrogen heating in decline

The number of patents for home heating hydrogen technology decreased in the 2010s, according to a new report by the International Energy Agency. The report says that hydrogen patenting continues to grow in the automotive sector, which has long been the focus of innovation. However similar momentum is not yet visible in other end use applications, such as heating, despite concerted policy and media attention. The report also shows that the EU has become the leading global region for hydrogen patents.

CPW's new Nottingham home boasts VR office

Sustainability and M&E firm CPW has relocated to a new city centre office in Nottingham. It has moved from the Lace Market area of the city, where it has been located since 2008, to a 3,500ft² space in the Imperial Building on Victoria Street, which leads off the city's central square. CPW said rising staff levels, flexible ways of working and the resurgence of client-facing activity were key drivers in the decision to relocate the Nottingham team. Features in the new office include larger screens for BIM capability, a bigger boardroom, a dedicated virtual reality room, and air source heat pumps.

Government to study hard to treat homes

University College London's Bartlett School of Architecture has teamed up with consultancy DG Cities on a government-commissioned study into hard-to-decarbonise housing.

The study is seeking input from practitioners and experts across industry to help map solutions for the estimated 10 million British homes that are difficult to insulate or improve. Initiated by the Department for Business, Energy and Industrial Strategy, it aims to identify these homes, define what makes them hard to treat, and develop a framework to inform policy and guidance.

Ed Houghton, head of research and service design at DG Cities, said: 'This isn't just about buildings; it's about people. Hard-to-treat doesn't just mean the properties, but also the diversity of ownership, needs and uses, as well as the time and budget residents can spend. The project is about understanding how government and industry can ensure nobody is left behind when it comes to decarbonisation.'

EU quality assurance scheme targets retrofit

outPHit concept complies with Passivhaus EnerPHit standard

An EU-funded retrofit project has developed a series of concepts for quality assurance in renovation projects.

The energy efficiency of refurbishments is typically only independently certified upon completion of projects, according to the EU-supported outPHit project. However, the success of projects can only be assured with quality checks that begin at the design and planning phases, it says.

For retrofits to reliably achieve a high level of energy efficiency, outPHit has made available the three concepts that cover the entire refurbishment process, from planning to post-completion verification of energy consumption.

The first Design Stage Approval (DSA) concept offers all parties certainty that targeted efficiency can be achieved. DSA is already being

trialled in outPHit's pilot projects. The second concept establishes a whole-house certification for renovation systems, which facilitates compliance with the EnerPHit standard developed by the Passive House Institute.

The third concept, of verifying the energy efficiency of the building post-construction, will enable actual energy consumption to be certified when occupied, and building services settings to be adjusted as needed.

'We want to ensure that the refurbished buildings meet the high energy targets set once completed and offer their occupants the corresponding level of comfort,' said Jan Steiger, outPHit project coordinator, at the Passive House Institute. 'Lack of feedback on energy consumption is a missed opportunity to optimise the construction industry. Verifying building performance will change that.'

The concepts were presented by outPHit at a webinar on 19 January.

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Heat network customers consider legal claim

Commercial status means no energy price cap for users

A law firm is investigating whether to mount a group legal claim on behalf of heat network customers, who do not enjoy the same level of protection as others from spiralling energy bills.

Customers who receive their heating via communal networks are not protected by the energy price cap, which is set by Ofgem. The energy regulator classifies supply to heat networks as a commercial, not domestic, arrangement, so customers do not benefit from the energy bills price cap.

In 2017-18, the Competition and Markets Authority recommended that protection available to consumers with their own domestic heating, such as gas boilers, should be extended to heat network users.

Operators of heat networks will benefit from some support for business energy bills, announced in the autumn by the government. However, this does not deliver the same protection as that given to consumers in the

conventional gas market, or address the huge energy price rises that heat network customers have already suffered. The recent energy price shock has resulted in some heat network customers being hit by rises as high as 700%.

Legal firm Leigh Day is undertaking research to establish the extent of excessively high charges. It is also looking into the quality and efficiency of heat networks where excessive heat losses and other problems mean customers claim they have to pay much more than they should for the service they receive.

Grounds for a legal action include competition law, given that heat network customers are not typically allowed to change their provider, as in the conventional heating market.

Leonardo Gonzalez, a solicitor at Leigh Day, said: 'It is concerning to read reports of enormous price increases hitting heat network consumers, often already overstretched by the cost-of-living crisis. I believe there are legal avenues that could be explored to offer some means of redress to these consumers, who feel unprotected and powerless in this unregulated sector.'

Commercial energy bills support ends

Chancellor of the Exchequer Jeremy Hunt has announced that energy bills support for all businesses will be cut from March onwards, although heavy power users will receive a top up.

He unveiled a new Energy Bills Discount Scheme for UK businesses, charities and public sector bodies, which will operate until the end of March 2024. This replaces the Energy Bill Relief Scheme (EBRS), which is channelling £18bn of support to non-domestic customers this winter.

The cost of the replacement scheme will be capped at £5.5bn, with part of the reduction in support down to the recent drop in wholesale gas prices to pre-Ukraine invasion levels.

Non-domestic customers will see unit discounts of up to £6.97/MWh and £19.61/MWh automatically applied to their gas and electricity bills respectively. Non-domestic customers with energy costs below £107/MWh for gas and £302/MWh for electricity will not receive support.

This wholesale price threshold, set with reference to the support provided for domestic consumers, is higher than the £75/MWh for gas and £211/MWh for electricity currently available under the EBRS.

The government announced a more generous level of support in the new scheme for energy-intensive industries, with the price threshold set at £99/MWh for gas and £185/MWh for electricity. This discount will only apply to 70% of customers' energy volumes and will be subject to a 'maximum discount' of £40/MWh for gas and £89.1/MWh for electricity. The additional discount will also be available for key social facilities such as libraries, museums, zoos and historic attractions.

IN BRIEF

Grade III listing proposal to boost retrofits

Grand Designs presenter Kevin McCloud has backed calls for the introduction of a new Grade III listing category. Under a proposal, set out by structural engineer Will Arnold, in an article in *The Times*, the new status would apply automatically to every building, and demolition would only be allowed if the property is structurally unsafe or special dispensation is given by the local planning authority. The proposal is designed to reduce carbon emissions by making retrofitting buildings the norm.

Baxi parent buys Dutch heat network firm

Baxi's parent company, BDR Thermea Group, is strengthening its footprint in the European heat network market with the acquisition of Fortes Energy Systems. The Dutch-based company's portfolio includes heat interface units, delivery stations for heat and cold distribution systems, and distributors for underfloor heating and cooling. Fortes, which will continue to operate under its own name, has 68 employees and specialises in collective heat and cold networks for residential, utility and industrial settings.

Construction output stalls

Construction output flatlined in November, according to the Office for National Statistics (ONS). The latest monthly data, published by the ONS on 13 January, shows that November's flat growth was a result of a 0.4% decrease in new work, which was offset by a 0.6% increase in repair and maintenance. Over the three months to November, construction output increased by 0.3% as October's growth was revised down to 0.4%. The overall level of construction output volume in November 2022 was 3.1% (£452m) above the February 2020 pre-Covid-19 pandemic level.

IN BRIEF

CIBSE launches mentoring opportunity for members

To help members with their professional development CIBSE has launched a new benefit this year CIBSE Mentoring.

This online platform is designed to match members who are mentors and mentees, based on their expertise and skills.

CIBSE would like to invite CIBSE Fellows and Members who can volunteer their time to register as mentors on the platform.

When you sign up as a mentor you help others develop and give back to the profession.

Find out more at go.cibse.org/cibse-mentoring-news

Putting forward CIBSE members for gold, silver and bronze

Proposals for CIBSE's gold, silver and bronze medals are now open.

Help celebrate the engineers, colleagues and mentors whose service has marked the profession.

You can put forward individuals who have made an outstanding contribution to the industry or the Institution and its charitable objectives.

Find out more at www.cibse.org/proposals

The deadline for the submission of proposals is 31 March 2023.

CIBSE PAST PRESIDENTS ANNUAL EVENT RETURNS



The CIBSE Past Presidents' Luncheon took place for the first time in three years last month. The event at London's Army & Navy Club was hosted by immediate past President Kevin Kelly. From left: Honorary Treasurer Vince Arnold, Stephen Lisk, Mike Simpson, David Hughes, David Fisk, President Kevin Mitchell, President-elect Adrian Catchpole, Andy Ford, Kevin Kelly, Ruth Carter, Alex Moir, and Doug Oughton.

Scott Kluger wins SLL Young Lighter of the Year

Presentation on daylighting scoops £1,000 first prize

Scott Kluger, from Hoare Lea, has been named Society of Light and Lighting (SLL) Young Lighter 2022.

Scott won a prize of £1,000 for his online presentation *Daylight Harvester: A tool to enhance lighting operational performance*.

Scott's passion for lighting began during his final year at architecture school, where he explored how light could be used as a form of therapy for people affected by dementia.

Since then, he has worked on a broad range of lighting projects across the UK and abroad and is continuously seeking to

improve the balance between human-centric and planet-conscious lighting design.

Recently, Scott has shifted his focus towards daylight and is helping to improve the integration of daylight within lighting design practice, driving a more sustainable and holistic approach towards light within a net zero future.

Now in its 28th year, the annual SLL Young Lighter competition is open to anyone with an interest in light and lighting.

The competition is designed to test the finalists' ability to develop a project, together with their presentation skills, allowing them to illustrate their knowledge and research on a lighting subject and raise their profile.

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The University of Strathclyde will host the 2023 CIBSE Technical Symposium

Technical Symposium tackles safe buildings and drive for net zero

Annual event for academia and industry takes place on 20 and 21 April

The 2023 CIBSE Technical Symposium is taking place on 20-21 April at the University of Strathclyde, Glasgow, with the theme *Delivering sustainable, safe and healthy buildings for a net zero future*.

The Symposium, supported by ASHRAE, will feature a range of peer-reviewed papers and presentations outlining the latest developments in practice, technology and policy, and showcase the latest guidance for building services engineers.

It will provide practitioners with up-

to-date information about the latest developments in meeting the net zero carbon imperatives and also on the newest building safety-related reforms in the UK industry.

While the full programme and reviewed papers are yet to be confirmed, topics likely to be covered are: overheating; net zero and building performance; digital engineering; drainage ventilation; district heating; heat networks and smart heat networks; and embodied carbon.

● A programme will be available in March. Book your place www.cibse.org/symposium

Angela Barnes to host Building Performance Awards

Comedian Angela Barnes has been confirmed as the host of the 2023 CIBSE Building Performance Awards.

Angela is a regular on BBC's *Mock the Week*, and has also appeared on *Live at the Apollo* and *Russell Howard's Good News*. She is the host of BBC Radio 4's *The News Quiz*, and has featured on *The One Show* reporting on women and ADHD.

The Building Performance Awards will take place on 1 March at Park Plaza, Westminster Bridge, London.

The awards recognise the people, products and projects that demonstrate engineering excellence in the built environment.

The shortlist has been announced, so book your tickets to celebrate with the very best in the industry.

● To see the full shortlist visit and to book your place visit www.cibse.org/bpa

Angela Barnes



IN BRIEF

Reminder to renew your membership

The membership renewal season is in full swing, and we'd like to thank those who have already renewed.

You can renew CIBSE membership today and keep access to the member benefits for another year. Stay connected to the community and enhance your expertise with your access to the Knowledge Portal or a 20% discount on CIBSE training.

CIBSE is also busy preparing to launch a mentoring service, where members can connect and work together on professional goals.

Log in to your MyCIBSE account at bit.ly/CJFeb23CN2 to view your invoice. The membership team is at membership@cibse.org

Face to face training returns

CIBSE Training is pleased to announce that face to face training has recommenced in Balham for 2023. Live online training will continue as well.

For the full 2023 training programme and to book, visit www.cibse.org/training

My CIBSE Learning portal

MyCIBSE Learning is the new host platform for CIBSE's on demand training. It has an improved, modern user experience where you can now access both your modules and courses via desktop and mobile devices.

By downloading the Absorb Learning mobile app, you can access your modules and courses both online and offline, giving you more flexibility with your study.

Explore the new platform at www.cibse.org/ondemand

Clarification

In the overview of the Build2Perform Live Countdown to zero in the January issue of CIBSE Journal, Kristina Allison MSL MCIBSE, senior lighting designer at Atkins, should have been credited as co-author of CIBSE's *TM66 Creating a circular economy in the lighting industry*.

Allison is the vice president of the Society of Light & Lighting and chair of its Education Committee.

IN BRIEF

SLL signs up to night lighting manifesto

The Society of Light and Lighting has signed the Responsible Outdoor Lighting at Night (ROLAN) manifesto for lighting professionals.

Other founding partners include: the International Association of Lighting Designers (IALD); International Dark Sky Association (IDA); Illuminating Engineering Society (IES); illume; Institution of Lighting Professionals; and the Lighting Industry Association (LIA).

Because the UN Sustainable Development Goals do not explicitly refer to external illumination and its multiple impacts, the founding partners of the ROLAN movement, are keen to address this in support of the SDG Goals.

By following the principles outlined in the ROLAN manifesto, governments, businesses, and individuals can support the implementation of the SDG.

Read the ROLAN manifesto at bit.ly/CJFeb23CN1

Guide to office lighting keeps pace with changes

LG7 includes focus on lighting in the home office and embodied energy

An office lighting guide has been updated to consider hybrid working, use of portable devices and advice on lighting for a home office.

Lighting Guide 7 (LG7): Offices, published by the Society of Light and Lighting (SLL), also addresses uncertainty around how office space will be used in the future.

Simon Robinson, of WSP, author of LG7, said: 'The look, feel and layout of office environments will always change to reflect the ways our lives change.'

'The Covid-19 pandemic, however, is likely to be the catalyst for change on a scale hitherto unseen, which makes it a great time to be a lighting designer.'

For the first time, the guidance includes a chapter focused on embodied and

operational energy. This considers the amount of energy used by an office lighting installation, and the energy and carbon used in the manufacture and distribution of luminaires and the raw materials that are used to produce them.

The guidance encourages the re-use of equipment where possible. Where luminaires are not suitable for reuse as complete units, it may be possible to have new control gear fitted into existing luminaire bodies, thereby avoiding the embodied energy used in the manufacture of new components.

The SLL's *TM66: Creating a circular economy in the lighting industry*, provides more detailed information on reusing existing equipment.

● LG7 and TM66 are available at www.cibse.org/knowledge

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Alison, Technical Co-ordinator



In memory of Terry Wyatt

CIBSE Past President Terry Wyatt inspired thousands of engineers with his pioneering thinking on sustainable engineering. CIBSE remembers the impact of his impassioned Presidential address 'Adapt or Die', while past colleagues pay tribute to one of building services engineering's most brilliant minds

CIBSE is saddened to hear of the death of Professor Terry Wyatt, CIBSE past president (2003-04). A member of CIBSE since 1960, Terry is remembered for his passionate commitment to building services. His life and career have left a legacy that inspires many in the construction industry and beyond.

Always at the forefront of engineering for sustainability, Terry was a man ahead of his time, a pioneer of innovative design for buildings. He spent years researching technologies that aimed to cut carbon emissions and energy consumption while performing to the best possible standard.

'Adapt quickly and our future is only limited to the horizons we set. Fail to adapt and we, with 150 years of heritage, will fast fade into obscurity.' This was Terry's impassioned call to action in his inaugural address as CIBSE President in 2003. His speech drew attention to the enormous challenges that the industry would face as the threat of climate change grew greater.

Terry had a long and distinguished career, spending his last 24 years of employment as a partner at Hoare Lea, and was heavily involved in landmark building projects around the world. He consistently focused his research on reducing carbon emissions, both in new designs for buildings and in refurbishing existing buildings.

In 2001, he set up, and subsequently led,

the CIBSE Carbon Task Force. This was the first serious initiative from CIBSE to address climate change, and focused on prompting colleagues to consider how the industry would respond to the emerging evidence of the impact that anthropogenic carbon emissions were having on global climate.

An advocate of the benefits of technology, Terry delivered a much-needed wake-up call to building services professionals to look to the future and increase the use of computers to improve the sustainability and performance of buildings. 'Very rapid change is under way, and we need to respond quickly, creatively and with focus,' he said.

Throughout his career, he united people from different specialisms, collating academic and empirical data from a network he established in Sweden and the US that illustrated how indoor climate qualities affected people's wellbeing and productivity.

Terry was one of the first to postulate how investment in effective climate systems could be returned through business output – a line of reasoning that was accepted by Hoare Lea's client on the MOD Procurement Executive HQ, a project that won the European Office of the Year Award.

Terry's outstanding contribution to the engineering industry was recognised when he was awarded a CIBSE Silver Medal in 1995 and the CIBSE Gold Medal in 2007.

In 2004, he was made a special professor of building services engineering for the School of the Built Environment at the University of Nottingham, which said 'his long life experience in the building services industry will be most valuable to our staff and students'.

Terry was an incredibly valued member of the building services profession and his influence has had, and will continue to have, significant impacts on the industry.

PERSONAL TRIBUTES

Kevin Mitchell FCIBSE, CIBSE President

Terry's genius was the ability to link creativity and science, and communicate this to the audience. He had a very clear and relevant message that has inspired hundreds, if not thousands, of engineers. This is an absolutely phenomenal legacy.

Rod Bunn, building performance and Soft Landings consultant

Many years ago, as editor of *CIBSE Journal*, I invited Terry to write a spoof technical article for an April edition. He did it so well and so convincingly that the article was cited in research, even though it defied fundamental laws of thermodynamics. Terry was inventive, kind, thoughtful, supportive, with a great sense of humour.

Andrew Bullmore, director at Hoare Lea

Terry was a true visionary, way ahead of his time in his thinking. More than that, he was simply a fantastic, lovely person, always willing to provide support and advice with a smile. He was an inspiration to me when I joined Hoare Lea more than 30 years ago, and has remained an inspiration ever since.

Jude Harris, architect and director at Jestico + Whiles

One of the great influential figures that sparked my early interest in the integration of architecture and building services. A sad loss to the industry.

David Marshall, director at Currie & Brown

I remember Terry setting the direction for Hoare Lea on sustainability and Breeam back in 1989. It appears many in the construction industry are still catching up with his thinking.

Susan Roof, director at Ecohouse Initiative

He was a real climate change champion for the industry. I was honoured and pleased to know him as a thinker, a person and a supporter of our work. Thank you, Terry.

Nathan Surendan, transition engineer/consultant

My recollection of a quote from him at a conference: 'I pity anyone who isn't an engineer. The world must be an incomprehensible and terrifying place. Terry was a kind and deeply thoughtful leader.'

Need to know

Since Dame Judith Hackitt first called for higher-risk buildings to have a 'golden thread' of information, industry has wanted to know what this will need to include. New regulations tell us more, says Hywel Davies

On 24 January, government laid the Higher risk Buildings (Key Building Information etc.) Regulations 2023 in parliament. Although they must be debated and approved by both houses of parliament before becoming law, they give us a clear idea of what is to be required.

The regulations set out the high level key building information that the principal accountable person (PAP) responsible for the repair of the structure and exterior of a building will have to give the Building Safety Regulator (BSR). They also clarify the individual responsibilities of multiple accountable persons for the different parts of a higher risk building (HRB).

The key building information required includes the high level information needed by the BSR to enable them to fulfil several roles set out in the Building Safety Act. It will allow analysis of trends and risks in high rise residential buildings, and prioritisation of assessment of the fire and structural safety in existing high rise residential buildings. This will assist the regulator in deciding when to call in and assess the safety case report for that building.

The regulations describe the key building information as being: information about the principal use of the building and any subsidiary uses (which will identify mixed use buildings); details of any ancillary building that is attached to the HRB, but not a part of it; and details of outbuildings and basements.

It also includes the number of staircases and storeys in the building, materials used in the external walls and roof, and any fixtures attached to the walls. In addition, it will require details of the structure, energy supplied to the building, and any energy storage system. Finally, details of the evacuation strategy and fire and smoke control equipment will be needed.

The key building information will have to be supplied to the regulator as part of the PAP's application for registration of their HRB, although they will have 28 days from submitting the application to supply the key information. The PAP has a statutory duty to provide this information. It is worth noting that registration is due to open in April, with a six month window for



Information will have to be submitted digitally, in a format or by a specific mechanism to be set out by the regulator

existing HRBs to apply for registration. So, all existing HRBs will need to have this information before October this year.

Information will have to be submitted digitally, in a format or by a specific mechanism to be set out by the regulator. The regulations expressly enable the regulator to specify a website address.

These regulations do not fully describe everything that will be required in the golden thread, but are a start and give a clear steer to PAPs about what they will have to register in buildings as accountable persons.

Where more than one accountable person is involved in ownership or operation of a higher risk building, it is vital to clarify which accountable person is responsible for each part of the building. Ownership of residential buildings is not always simple and clear, leading to multiple accountable persons, with complex lease arrangements dictating complicated repairing responsibilities for different parts of the building.

The regulations will enable all of those involved in managing building safety in a higher risk building to identify which accountable person is responsible for a particular part of a building in relation to their responsibilities under the Building

Safety Act. They also allow the new Building Safety Regulator to identify who is responsible for the different parts of a building.

These are the second set of regulations after those that set the scope of higher risk buildings in December that relate to the new regime for building safety, with further regulations to follow. We can now clearly see the details coming into place to implement the biggest changes to regulation of residential buildings since World War II. Anyone responsible for a higher risk building has eight months to collate and submit this information. It is now time to act on building safety.

Further reading

- 1 Higher-risk Buildings (Key Building Information etc.) (England) Regulations 2023, [bit.ly/CJFeb23HD1](https://www.gov.uk/government/consultations/higher-risk-buildings-key-building-information-etc-2023)
- 2 Explanatory memorandum to the Higher-risk Buildings (Key Building Information etc.) (England) Regulations 2023 [bit.ly/3je2EEV](https://www.gov.uk/government/consultations/higher-risk-buildings-key-building-information-etc-2023)
- 3 Consultation on the new safety regime for occupied higher-risk buildings, DLUHC, [bit.ly/3XDiojH](https://www.gov.uk/government/consultations/new-safety-regime-for-occupied-higher-risk-buildings)

Be realistic about net zero

In the 1980s, I provided energy-saving advice on numerous building types. When considering whole life-cycles of cost and energy usage, thermal insulation improvements and clever controls were by far the most beneficial options. A Net Zero Carbon Buildings Standard is a step in the right direction.

However, I'm concerned that the current aspirations for net zero carbon emissions by 2050, as legislated by Mrs May in 2019, was actioned with no cost or feasibility considerations. To date, there is no clear strategy for how this can be achieved.

It is clear to any thinking engineer that the changes required to achieve this so-called 'net zero' will entail a marked short-term increase in energy usage (and thus carbon emissions) for extraction, manufacture and implementation.

This will be accentuated for products manufactured in places such as China, using inefficient coal-fired energy sources. Recent circumstances have clearly demonstrated that a measured, considered approach is required, which I believe will include using energy such as shale gas.

When there is no wind blowing, no sunshine, snow laying on solar panels and heat pumps using almost 100% electric power, we need an alternative option. The only sensible one is to use gas for the interim until nuclear is up and running. It's time that environmental engineers push for a considered and proportionate approach to reducing the world's carbon emissions based on realities.

Stephen Peliza MCIBSE

Heat pumps have limitations

I have recently installed about 5.0MW of new gas boiler plant in premises where it would be impossible to install heat pumps, regardless of cost. I have first-hand experience of dealing with local electrical grids, which are already overloaded in many parts of London because of the evolution of shops into restaurants needing huge supplies.

Virtually all new boilers are deemed 'hydrogen-ready', but nobody has yet explained how the process of charging the gas mains will work and, most importantly, whether the mains - old and new, steel and MDPE - will contain the more fluid admixture of 20% hydrogen.

Proposals are being drawn up to cover the roofs of listed buildings with heat pumps that are presently incapable of delivering low pressure hot water at, or even near, the traditional design flow temperature. A case in point is a project-in-hand in Portland Place, requiring about 350kW of new boiler plant, for which I did a study into the application of heat pumps using commercially available kit. The roof would not take the weight without major restructuring and alterations to demised areas for the works and access.

The impression given is that all we need to do is change boilers for heat pumps, but some thought must go into the logistical difficulties that engineers have to address. Can we please see more balanced dialogue on the subject?

Robert C. Dwyer MCIBSE, Dwyer Consulting

CIBSE Journal welcomes readers' letters, opinions, news stories, events listings, and proposals for articles.

Please send all material for possible publication to: editor@cibsejournal.com

or write to: Alex Smith, editor, CIBSE Journal, CPL, 1 Cambridge Technopark, Newmarket Road, Cambridge CB5 8PB, UK.

We reserve the right to edit all letters.

Preventative medicine

Hospital budgets may be increasingly stretched, but it's critical that fire safety systems are maintained and up to date to ensure NHS Trusts meet the latest requirements in legislation, says Exyte's **David Fitzpatrick**

When a hospital trust chief executive is looking at their budgets, what is their priority? When faced with reducing the waiting time for patient operations and a host of other issues, how high up the list is making sure the fire safety system is up to date and functioning?



From our experience, smoke control systems and fire dampers don't even make it to their in-tray, let alone fight for priority spending.

We have seen some NHS trusts where the fire safety system records are unavailable. In such cases, understanding what the system does is difficult to say the least.

Over the years, hospitals often have building extensions added, but the original fire safety systems become neglected or new additions are added in a piecemeal fashion. As a result, what was fit for purpose 10 years ago isn't today.

I appreciate updating fire safety systems in hospitals, or even maintaining them, is extremely problematic because a hospital is a live environment, with a lot of ill and vulnerable people. Whatever work you do must go on around them in the least disruptive way.

What we have learned is that there has to be an understanding of the process. You need to collaborate with health trusts and main contractors to make sure the project is completed as effectively and efficiently as possible. Site supervisors are absolutely key, because their communication with all parties allows flexibility.

If the process is planned and communicated properly, it makes a difference to the overall attitude to getting things done.

Let's return to the chief executive's dilemma of whether to spend £500,000 on five or 10 operations or on making sure the fire safety system meets the requirements of the latest legislation.

The installation and maintenance of a trusted fire safety system is an insurance policy. You never know when you might need it. It might be a bitter pill for healthcare providers to swallow, but fire safety systems are a priority governed by legislation.

Unfortunately, it only becomes a critical issue when a hospital is the subject of a major fire and the money hasn't been spent on the safety system. The chief executive also has to take responsibility for that decision, but should we be doing more, as an industry, to highlight the issue?

● **DAVID FITZPATRICK** is director at Sfs business unit, Exyte Hargreaves and an elected CIBSE Board member



From left to right: CIBSE President Kevin Mitchell, chief executive officer Ruth Carter and CIBSE President-elect Adrian Catchpole

LONDON CALLING

CIBSE has announced it is seeking to leave Balham and buy a new head office in central London. **Alex Smith** finds out how the Institution intends to harness Members' skills and experience to create an exemplar retrofit that will inspire others on the path to net zero

CIBSE is on the move. After 44 years in Balham, the Institution is looking to leave London's Zone 3 for a new head office close to the city centre. Years of discussion over potential locations have concluded, and CIBSE has decided to sell the Balham site and move to a new office.

Chief executive Ruth Carter says Members she has spoken to have been positive about the potential move. When Members visit Balham, they look at it with affection and give a wry smile – but while they may reminisce about their interviews, their reaction is great, when are you going, she says.

The CIBSE Board did consider redeveloping the existing site, but the cost of turning it into a modern, sustainable facility would have been prohibitive and left the Institution with a seven-figure overdraft, says Carter.

President Kevin Mitchell says talks about leaving Balham have been going on since he joined the Board six years ago. Every time we've had those discussions, everyone agrees that what we currently have doesn't meet the Institution's aspirations, he says. It doesn't really represent what CIBSE is and what it wants to be.

Every time we have stepped through how to develop the existing site into something we all feel proud of, we come up with many challenges in terms of practicality, programme and price.

Of course, being good engineers, we solve these challenges and end up with a solution – but then we always come back to the question: is Balham really right for us? Is this the right location?

Carter is more direct: We looked at what we needed as a world class, world leading institution. We wanted somewhere that was flexible, and where people want to work. The answer isn't Balham.

To oversee the move, CIBSE has set up a Premises Advisory Committee (PAC), chaired by Paddy Conaghan FCIBSE (see panel). Sub-groups will look at different aspects of the project, such as building performance and finance, and represent CIBSE's regions, Societies and groups. There are clever and smart people at CIBSE, so let's use them, says Carter.



MEMBERS OF THE PREMISES
ADVISORY COMMITTEE

Paddy Conaghan FCIBSE (chair)
Kevin Mitchell FCIBSE
 CIBSE President-elect **Adrian Catchpole** FCIBSE
Vince Arnold, CIBSE treasurer
Desiree Blamey, CIBSE Director of Finance and Operations
Ruth Carter, chief executive officer
 CIBSE vice-president **Les Copeland** FCIBSE
Hywel Davies, chief technical officer

We are in a growth phase in terms of membership, reach, impact, turnover, voice, and the money we make. We want to keep on that path and be at the centre of the building services sector

Seven project deliverables have been laid out by the Board. The top three objectives are that the new head office is tailored to CIBSE's requirements, has a central location for staff, and aligns with the goals of decarbonisation and building safety.

The others are that the office: suits CIBSE Members and partners; is affordable; supports modern, global working practices; and acts as a net zero demonstration project.

One of the first tasks of the board was to assess possible locations, which included a site outside London, in Oxbridge, and on the edge of the city centre (see panel, Location, location). After looking at the options, the PAC decided that a property on the fringes of the city, close to the Tube, was most suitable.

The Circle Line is perfect for accessibility and, in terms of affordability, you get really good bang for your buck, says Carter.

We are in a growth phase in terms of membership, reach, impact, turnover, voice, and the money we make. We want to keep on that growth path and be at the centre of the building services sector.

One of the key considerations for a move to central London is accessibility for the growing international membership of CIBSE, which now makes up 29% of the total.

Collaborative approach

CIBSE is keen to be transparent about the move and wants to engage the wider CIBSE community to create an exemplar building that inspires others on the path to net zero.

We want to make sure, in this move, that everyone has had an opportunity to get involved, says Mitchell. We have so many experts within CIBSE, from all aspects of the built environment, that it would be a big miss if we didn't involve that community.

Communication is very important, he adds: We've got to go through that process of listening, understanding and processing, and then feed back information to the PAC.

The new head office must be modern, inviting and technically very good, with an excellent internal environment and great sustainability criteria, says Mitchell. Retrofitting a building to a high standard in London can be challenging, however, because of the age and variety of building stock. It is the lessons learned in this process that will be so valuable to other building occupiers looking to decarbonise, he says.

We are going to deliver on those objectives in the real world, and provide an exemplar project that others can follow and learn from. The new office won't be a laboratory, so we are looking at purchasing a real life building.

CIBSE President-elect Adrian Catchpole FCIBSE says any building being considered will be assessed to evaluate the role it can play in CIBSE's aspiration for net zero and in demonstrating best practice. When you buy, sell or rent a property, you get an Energy Performance Certificate, which is a rating of the asset. As a professional engineering institution, we need to go much further than this, in the same way that our members are doing every day



The Balham office has served CIBSE for 44 years

The PAC will report to CIBSE as soon as suitable premises become available. At that point, it will be looking to the CIBSE community to turn the building into a head office fit for the Institution



The Building Services Engineering Centre in Balham

» with clients, he says. We're taking a lead in showing what can be done in terms of actual operational performance and what responsible people ought to be doing.

The assessment will look at the potential for upgrading measures to ensure that the building truly performs for us. We may not be able to do everything at once, but we need to have a clear plan, as to what can be achieved and over what period of time.

CIBSE wants to change the way people think about a building purchase, says Catchpole. Clients that can afford to invest heavily in a building from day one are able to produce something wonderful, but that's not the reality of most businesses, or often of our Members and their clients. It's up to us to demonstrate pragmatic ways to achieve the best [performance] from all our buildings, for a modest amount of money.

The retention of CIBSE's history will be at the heart of any move, says Carter. We're proud of our heritage, and a new building is about building on that. The PAC will work with the CIBSE Heritage group to ensure that important artefacts, books or records are retained.

The PAC is currently assessing available property in London and will report to CIBSE as soon as suitable premises have become available. At that point, it will be looking to the CIBSE community to turn the building into a head office fit for the Institution.

The CIBSE tentacles work really hard. We are looking forward to working with the chairs of the Societies, regions and groups. They have been put on standby and are ready to help, says Carter.

Mitchell adds: A new facility presents an opportunity to show what we are and what we want to be. This is the biggest project we have done in a generation and the Board, executive and staff are really excited about it. **C**

LOCATION, LOCATION

The Premises Advisory Committee carried out four feasibility studies looking at potential locations for CIBSE's new head office. These were:

Project Droitwich A move outside London to 'relocate and level up' was considered, but was not considered as an option because it would result in the loss of London-based staff. 'If we are growing, we want to retain staff,' says Carter.

Split premises A small head office in central London with a back office in Peterborough, Colchester or Croydon was dismissed because CIBSE wasn't deemed large enough, and because the main functions - membership, training and events, and governance - work best from a central location.

Project Oxbridge An office in Cambridge or Oxford was deemed unsuitable because it would be as expensive as London and because CIBSE is not an academic-run organisation, according to Carter.

Project Moorgate As well as affordability, one of the key benefits of a City fringe site, close to the Circle Underground line, was proximity to other professional engineering institutions, industry bodies and Whitehall. 'Project Moorgate survived the interrogation,' says Carter.

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MIKE SON A MISSION

CIBSE's current Building Performance Engineer of the Year, Mike Burton, wants to ensure everyone has the opportunity to fulfil their potential as a building services engineer, whatever their background. Alex Smith reports



Mike Burton FCIBSE, CIBSE's Building Performance Engineer of the Year, has set a high bar for those seeking to win the crown at next month's awards.

As well as leading project teams on significant buildings such as the White Collar Factory, BBC Broadcasting House and the Institute of Physics HQ, Aecom's director of building engineering has authored industry publications, and fostered equality and career support for engineers.

Burton joined the CIBSE Council in 2022 and will be sitting on the CIBSE Board from this May. He is also director at the British Council for Offices (BCO) Board of Management, chair of the National BCO Awards, and a RIBA Regional Awards juror.

CIBSE judges commended Burton for his knowledge and experience and, during the interview process, remarked on his determination to inspire early career engineers with the attainments and successes of his predecessors. He spoke so passionately of his work with new entrants into the industry and how he can instil in them a sense of purpose and understanding, noted the judges. They also praised his outreach work with primary and secondary schools, where he promotes building services through creative engineering exercises and mock work experience sessions.

No STEM ambassadors visited the schools Burton attended in Purley, South London, and he was unaware of the building services profession as he was growing up. Like lots of people, I didn't really

It's good to be mentored by those who are not exactly in your profession, because it gives you a different perspective

know building services engineering existed. However, I loved art, design and technology, and architecture, and I was pretty good at maths and physics, says Burton.

It was in his sixth form, when he was studying maths, physics, art and graphical communication, that a teacher first suggested he look at building engineering. I decided that structural and civil engineering wasn't for me, but I found this degree at Leeds called architectural engineering, which had the attraction of one year's study at Penn State University in Pennsylvania.

Soon after Burton started the degree, he knew he'd made the right decision. There were a lot of like-minded people there interested in art and architecture, he says. Peers included Buro Happold group director Tanya Ross, Arup sustainable development lead Nigel Tonks and Eckersley O Callaghan associate director Mitsu Edwards.

The year at Penn was an eye opener, says Burton. You were lectured by experts in their field. They were designing the tallest building in Chicago, lighting the Guggenheim Museum, and putting huge ventilation plant in the largest hospital in the world.

Burton saw developments in engineering and lighting that were unheard of in the UK at the time, and it made a lasting impression. When I came back to the UK, I knew I wanted to do something in holistic building design, he remembers.

His first graduate position was at Oscar Faber, which eventually morphed into Aecom after the engineering giant bought Oscar Faber to become Faber Maunsell in 2002. Burton says he found a very supportive culture. I was very lucky that I grew up in a really good training organisation though, of course, you don't realise this at the time. It was part of the culture of Oscar Faber to mentor and train young engineers, apprentices and graduates, and Burton says senior engineers such as

CIBSE Past President Doug Oughton FCIBSE and Ant Wilson MBE were among those who gave their time to supporting young engineers.

This has always been part of my own culture, and that's why the teams I have worked with really support young engineers, says Burton, who recalls that Oughton encouraged him to contribute to *Faber and Kell's heating and air conditioning of buildings*. Now Burton is looking to do the same for the next edition, and will be asking young engineers to help with research.

The supportive culture was very important during the Covid pandemic, says Burton: We had people start that had only met people on Teams or Zoom, so recreating a support network and the culture of training and developing was really important. There is now a UK wide young engineers network within Aecom.

Burton believes teaching communication skills and developing engineers' emotional intelligence is as important as technical education. The emphasis now is a lot more on understanding the wider context of what you are doing and how it influences other people. Understanding the perspective of the architecture or contractor, for example.

Training includes net skills, collaboration skills, site visits, manufacturer talks, specialist presentations, and softer skills around presenting, negotiating and report writing.

Burton is keen that engineers develop their personal profile, and encourages them to join young engineer networks, not just with CIBSE, but in other sectors or areas of interest. He is a BCO NextGen Mentor and is mentoring an interior designer, architect and project manager. It's good to be mentored by those who are not exactly in your profession, because it gives you both a different perspective, he says.

The new CIBSE Fellows Network links experienced professionals with young engineers who may not have access to in-house mentoring, and Burton believes it is important for older engineers and mentors to keep themselves relevant to young professionals. It's about being culturally

aware of the difference between our age groups and what's formed their opinions. I ask a lot of questions, trying to understand their perspective and what is important to them, he says.

Burton's work mentoring women in engineering was recognised at the 2022 European Women in Construction and Engineering Awards. As well as supporting more females to join the profession, he says there should be mentoring for women to take up leadership positions. Statistics show that a lot of females leave our profession and it's in part because there are not enough female role models in leadership roles. I believe the skills you learn having and bringing up children are as important as the skills you learn as an engineer. Women need to know that it's OK to work part time and look after their family, and that they can get promoted on maternity leave.

At CIBSE, Burton has been contributing to workshops aimed at encouraging more engineers into the profession. He believes STEM subjects need to be made more interesting and engaging, particularly for older primary school children, and that outreach work should be linked to real building services careers.

We need to make it known that these are career paths for people, and link that to support for colleges and universities that offer related courses, he says, adding that CIBSE could follow the Institute of Physics and engage with children at summer festivals, using fun experiments and demonstrations. It makes science really interesting and that's what science is. **C**



Mike Burton at the Building Performance Awards

SHARING KNOWLEDGE

Mike Burton has authored or peer reviewed a number of significant books on building services in recent years.

He is hoping to embark on the latest edition of *Faber and Kell's heating and air conditioning of buildings* having worked with on the previous edition in 2015.

Burton has also peer reviewed the new *BCO Guide to Specification*, and is working on the next *BCO Guide to Fit-Out*.

He says the office has changed in the post-Covid world, and this is reflected in the guide. 'Embodied carbon and operational energy levels are far more important now,

and sustainability targets have changed. There needs to be holistic integrated design, construction and operation with better quality of air, more fresh air and openable windows - and there's better understanding of healthy buildings and a focus on sustainable materials.'

Burton also contributed to *Future office: next-generation workplace design* by Nicola Gillen and is working on another book by the same author that also focuses on healthy buildings and the desire for natural ventilation, good air quality and generous daylighting.



The 2023 Building Performance Awards take place on March 1. Book your place at www.cibse.org/BPA

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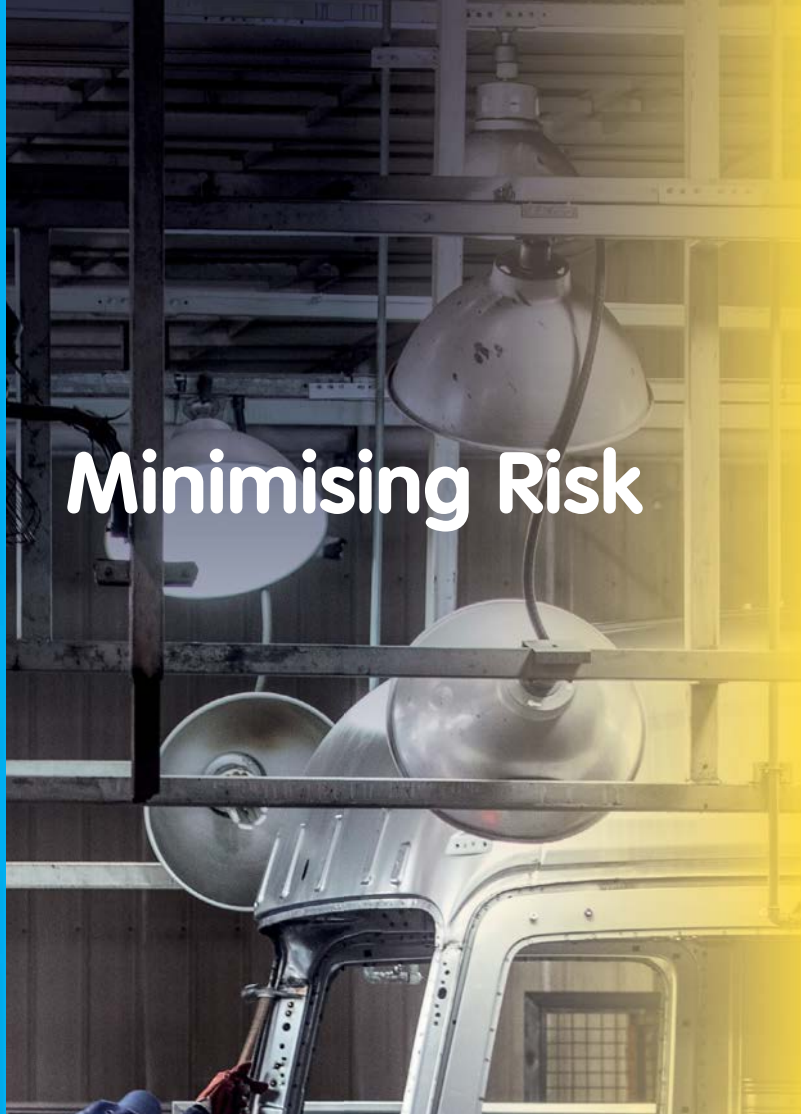
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NET ZERO CARBON: LESSONS FROM PRACTICE

A deep dive study on net zero carbon by architect AHMM is being put into practice at an ambitious mixed use project featuring two towers in London. AHMM's **Dr Craig Robertson** and **Dr Simon Hatherley** share lessons learned

Architects often feel like the captain of the ship in a design team coordinating the geometry, structure and services of a building is complex, and requires input from everyone in the project team. This can feel particularly challenging when approaches, remits, scope and ways of thinking are different in various disciplines across the design team.

The reframing of building performance to focus on carbon over the past few years has, we think, given teams a renewed common purpose; a single factor by which to measure the effectiveness of collective decisions.

Institutional and collaborative industry efforts to codify this focus have helped create impetus: the RIBA 2030 Challenge and LETI's Climate Emergency Design Guide in particular. Upcoming industry wide collaborations such as the Net Zero Carbon Buildings Standard will, hopefully, refine the upper limits of our building carbon budgets.

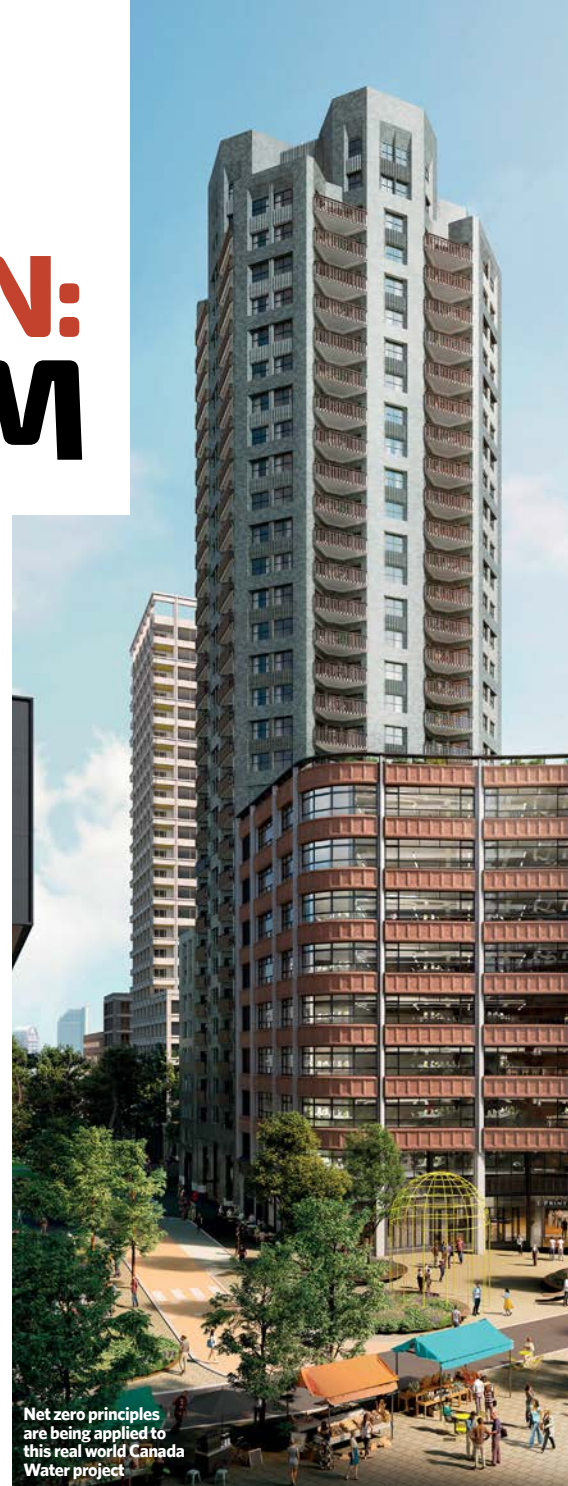
While having international clients across a wide range of sectors, the majority of Allford Hall Monaghan Morris's (AHMM's) work is in London. It is often mixed use, on tight urban sites, large scale and commercially driven. The practice has a history of collaborative working at projects such as at the White Collar Factory, where the building works as a holistic system thanks to the close partnership with the structural and MEP engineers.

In 2018 and 2019, when much of the above guidance was beginning to emerge, it became clear that it was not really reflective of the

kind and scale of project on which we work. It did reflect the constraints and opportunities in our projects. We decided to do something about that, and set up a collaboration with University College London's (UCL's) Institute of Environmental Engineering.

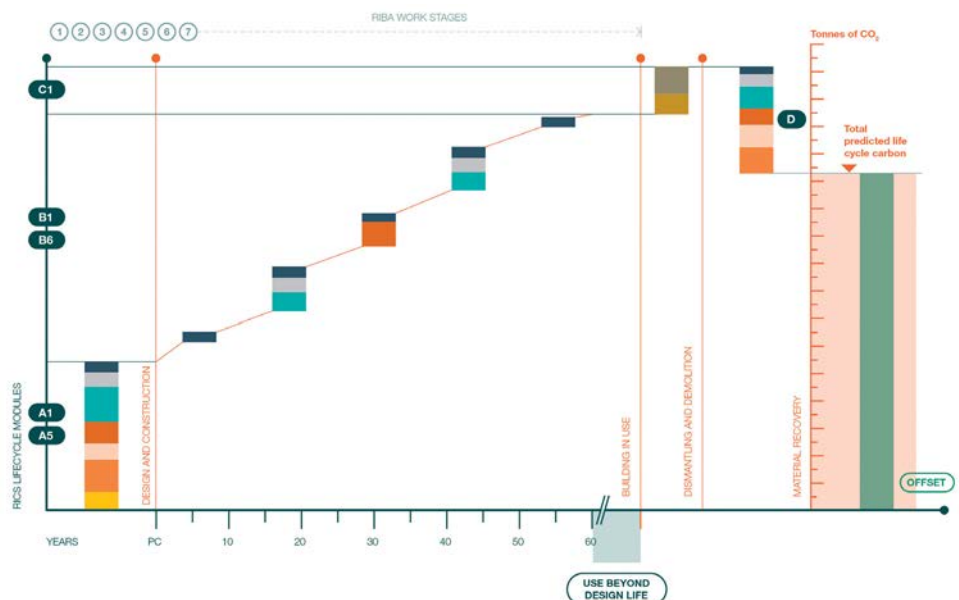
We have collaborated with UCL in the past on post occupancy evaluation, which won the CIBSE Barker Silver Medal [bit.ly/CJFeb23AHMM1](https://www.cibse.org/~/media/2023/02/23/23AHMM1), but this was a bigger commitment two years to take a deep dive into the most pressing issue facing our industry and to propose new ways of working.

The project, which included workshops featuring industry consultants and AHMM architects, took the form of a Knowledge Transfer Partnership, designed to benefit research institutions, businesses and researchers. The output of the research, funded by AHMM and Innovate UK, seeks to understand the opportunities and challenges



Net zero principles are being applied to this real world Canada Water project

Understanding net zero whole life carbon



- Key
- Services
 - Stairs
 - Internal construction
 - External walls
 - Roof
 - Superstructure
 - Substructure
 - Operational energy



of designing, building, occupying and maintaining large scale, urban, mixed use developments. A series of workshops was held to ascertain the obstacles and opportunities to achieving net zero carbon developments.

Net Zero Carbon Guide

The guide works in four parts. It is structured to take the reader from a carbon zero to low emissions hero. It is also set up as an interactive digital document that can be dipped into at any given point.

The guidance defines the criteria we and the wider industry use to assess the journey to net zero, drawing upon existing industry guidance and methodologies such as RICS *Whole life carbon assessment for the built environment*. This is taken further to examine specific parts of the definition of net zero carbon, looking into the component parts up front, operational and lifetime carbon, as well as offsets.

We understand the influence architects have over each part and how, with wider collaboration in the design team, they can be optimised as a system. We then assemble these components into a life cycle visualisation that we believe will help design teams to interrogate decisions and understand lifetime implications of materiality, construction and systems management.

Part Two outlines the key considerations and changing context that teams must review continuously. We have identified the risk of an embodied carbon performance gap, much like the long understood operational gap. We contextualise the building life cycle calculation in wider energy systems, including decarbonisation of the Grid. The guide describes two strategies for delivering net zero carbon net zero now and the

planned pathways approach drawing out the implications of each, and describing where they might be appropriate. We then propose a new way of thinking about projects, by changing the cost, quality, programme triangle to a square, including carbon as an equal driver of decision making.

The third section reviews and links to key resources to tool up a team, including international standards and other organisations guidance.

The final section offers a case study Plot F at Canada Water in south London. This high density, mixed use development was designed for British Land and received planning permission in summer of 2022. The client established net zero as an aspiration, and the design process and collaborative effort of the team including Sweco as MEP engineers and AKT II as structural consultants have provided an excellent opportunity to explore what adopting net zero carbon principles means in practice and forms the basis of our guidance for future projects.

Key lessons

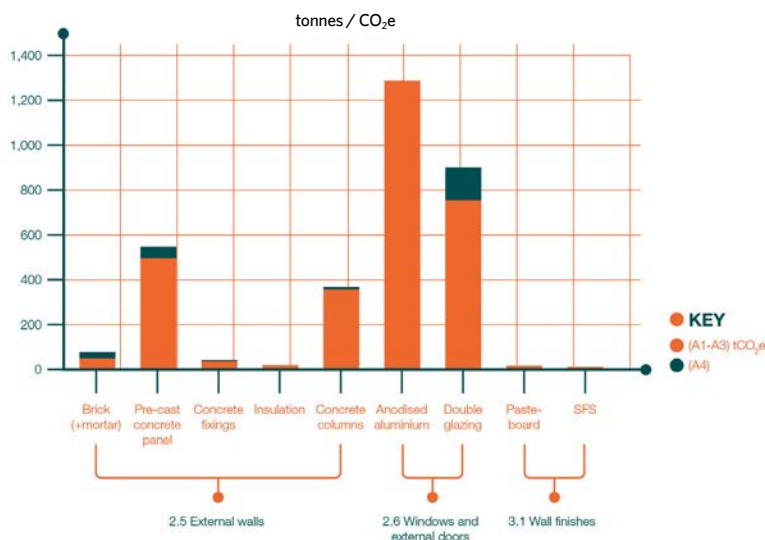
The key lessons from the case study set guidelines for future projects. The first is the need to integrate iterative performance based modelling across the design team. This means architects becoming more numerate and evidence based in their decision making and engineers becoming more comfortable with an iterative design process.

Second, project teams need to set clear and ambitious targets. In the case study, these were broken down into primary and secondary values for the whole building and individual components. This approach allowed for discrete studies to be carried out by individual consultants before these were pulled together in a combined, whole building model. Third, consultant appointments must recognise the significant shift in working practice that zero carbon buildings need. This should be reflected in scope, time and, ultimately, fees.

Fourth, clear communication of ambition is essential from the outset of a project. Continued communication of targets and assimilation of analytical outcomes are needed to track the journey to zero carbon. Fifth, early contractor engagement can bring new options to the design process and opportunities for subcontractor engagement. Sixth, team coordination is more important than ever.

It was necessary for each consultant to bring their own analysis skills to the embodied carbon calculations. It was also important that this analysis could be brought together in

Façade embodied carbon analysis and life-cycle analysis



» the whole life model to chart progress of the design against carbon reduction targets.

Seventh, and finally, the capability of the design team to support the client aspiration was essential for delivering carbon reductions on this project. This may require wider upskilling of the industry to deliver zero carbon buildings as a matter of course.

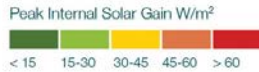
The AHMM/UCL IEDE guide is available to download at bit.ly/CJFeb23AHMM2 and is intended as a live guidance document. It will be subject to ongoing critical review, and the next release will feature a calculation spreadsheet to help others in industry deliver net zero carbon buildings. [CJ](#)

DR CRAIG ROBERTSON is head of sustainability and building performance and **DR SIMON HATHERLEY** is senior building performance architect at AHMM

Parametric solar gain analysis at Canada Water

The solar radiation analysis shows the peak internal gains for the base case façade of the commercial development (without the second tower). The areas with the highest gains require additional shading strategies to reach comfortable levels. These could be solar shading, window recesses, and the use of glass with lower G-values, which would reduce heat gain. All areas in green appear to meet the target solar gain.

	L02	L05	L08/9
E1	25.6	29.7	
E2	32.5	41.4	59.4
SE Corner	55.2	69.6	115.3
S	25.1	26.4	45.7
SW Corner	69.4	92.5	161.8
W1	21.3	26.5	32.7
W2	18.4	30.4	40.6
W3	39.9	40.5	54.7
NW Corner		55.5	63.0
NW	8.3	8.3	10.0
N Corner			17.1
N	16.7	16.9	19.9

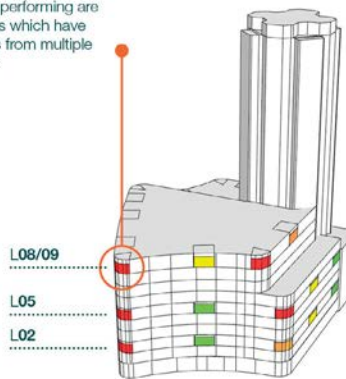


In general the higher floors have high solar gains due to proportionally higher glazing ratios. 400mm recesses has been applied to these areas in the optimisation section.

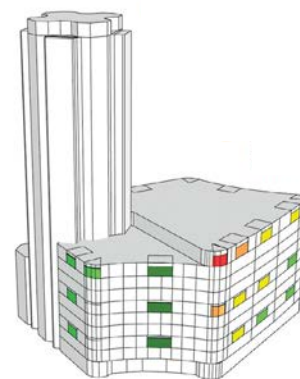
These areas are well below the target solar gain so current shading could reduce.

SE VIEW

The worst performing are the corners which have solar gains from multiple directions.



NW VIEW



CANADA WATER NET ZERO CARBON CASE STUDY

Canada Water Plot F includes a significant office building of 38,925m² and 410 residential units in two towers. The towers are positioned at 45 degrees to one another, to respond to the street pattern.

The client's ambition to be net zero in use was developed into primary numerical targets based on industry benchmarks for achieving the aspirations of the scheme, and included specific embodied energy and operational targets. In this case, 90kWh-m⁻² per year operational energy (aligned with the UK Green Building Council's targets, and recognising the likely landlord-tenant split of 55kWh-m⁻² per year base build and 35kWh-m⁻² per year tenant use) and 500kgCO₂/m² embodied carbon for the office; secondary targets supporting the delivery of the primary targets were then informed by team experience and other industry benchmarks, notably LETI proportional breakdowns of total embodied carbon numbers. For example, 16% of the overall carbon number allocated to façades gave the architectural team a component-specific embodied carbon target to inform design development.

Façade development

The façade of the buildings represented a key intersection between architecture, structure and MEP engineering. The design of the skin of the building, therefore, illustrates the iterative and collaborative nature of delivering zero carbon buildings.

To achieve very low operational energy levels, the MEP engineer set very low upper limits for perimeter solar gains entering the office spaces. This set a challenge for the architects to balance daylight, gains, architectural expression and embodied carbon. So, the first piece of analysis was a simple headline exploration of the gains on the office façades (see figure above). This developed into more detailed and iterative explorations of the façade geometry: parametric analysis of the façades (that also allowed embodied carbon to be assessed simultaneously with operational energy) and CIBSE TM59 assessments of the residential façade proposals.

The parametric analysis (above) enabled conversations between architects, engineers, the client and planners, while using carbon and energy performance as the driving metric to assess design development.

The whole life carbon assessments for the project revealed that upfront embodied carbon emissions would be as important as operational energy emissions over the life of the building. Simultaneous to the parametric development of the façade geometry, the design team was working on optimising embodied carbon. The structural engineer examined various structural options, providing data to compare each option against the secondary carbon targets while the architect visualised the formal and aesthetic implications.

As the architecture evolved, the team developed a hybrid ventilation approach to the perimeter zones of the office building. This reinforced the need for low solar gains and introduced opening vents. The team examined the façade from an upfront embodied carbon point of view, as well as whole life emissions. This dual analysis provided an elemental breakdown of the carbon intensity of a façade bay and informed the design for repair, maintenance and replacement throughout the life of the building.

The results highlighted that, for example, the commercial building's façade had embodied carbon of 88.5kgCO₂e/m² based on RICS A1-A3. This value was almost double the LETI benchmarks for the RIBA 2030 target, which is estimated to be 46.8kgCO₂e/m². Putting this value into a cumulative whole building value allowed the team to use the low structural value to 'compensate' for a higher façade value.

The case study takes the reader from first principles to examining more nuanced decision-making, identifying some of the trade-offs required to drive down whole life carbon on a live commercial project.

The lessons point to a way of working that is much more collaborative and a process that is more iterative in all disciplines – particularly engineering, where consultants are perhaps not as accustomed to the trial and error of a design development process that is not always linear.



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FRAMING FINESSE

The façade at Paddington Square in West London is anything but straightforward. Mace's **Ovi Mazareanu**, and WSP's **Michele Sauchelli** and **Serena Gugliotta**, describe how the client's demand for energy efficiency and performance led to the design team taking a collaborative and innovative approach

FAÇADE PROJECT TEAM

Client: Sellar
Lead designer: Renzo Piano Building Workshop
Executive architect: Adamson Associates International
Main contractor: Mace
Façade engineer: WSP
Cladding subcontractor: Focchi Ltd.

A highly transparent façade has been fundamental in realising the architectural concept for the Paddington Square mixed office development in West London. Joost Moolhuijzen, of the architect Renzo Piano Building Workshop, describes the design as a clear cube floating above the ground with a crystalline façade, like a fine lace of steel and glass that echoes the arches and skylights of Brunel's nearby railway station.

The 14 storey building is the centrepiece of the regeneration zone around Paddington Station. Its design has an emphasis on wellbeing and sustainability, and there is 350,000ft² of light filled workspace across, plus 80,000ft² of shops, restaurants and cafes, and a 1.35 acre public piazza. The building is also integrated with a new Bakerloo line underground entrance and ticket hall. It features West London's highest rooftop restaurant, a retail street with alfresco dining, and an elegant, standalone pavilion spanning three levels that includes a rooftop terrace overlooking the piazza.

A transparent façade was essential to make the architect's vision of maximising daylight into shops and offices a reality, enhancing the wellbeing of those working in the building.

Façade overview

The façade comprises three main cladding types: bespoke unitised curtain wall; bespoke stick curtain wall; and travertine rainscreen. In total, there are 30 variations. A bespoke unitised curtain wall is used for the main façade, while the bespoke stick



Internal doors in the inner skin of the façade allow for cavity cleaning and maintenance

curtain wall features in the retail spaces, rooftop restaurant, pavilion building and glazed canopies. The travertine rainscreen has been used at a number of locations to overclad solid walls.

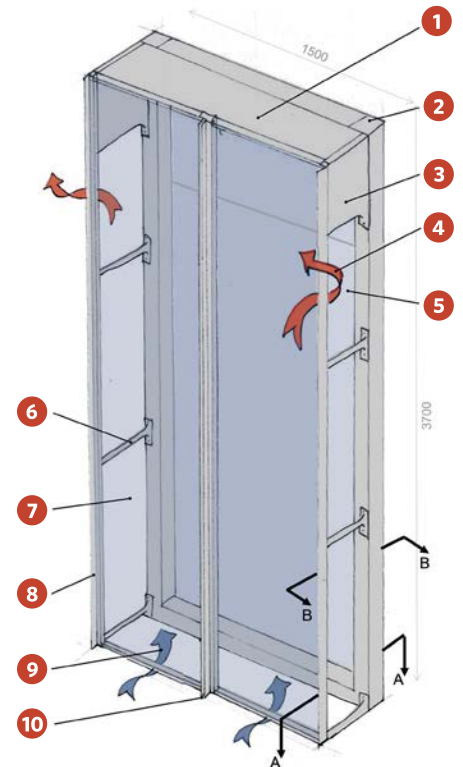
There are several ancillary items, including balconies, wind screens, glazed balustrades, plant enclosures, fully glazed scenic passenger lifts to the rooftop restaurant, and a viewing platform with glazed floor at the Level 17 rooftop restaurant terrace.

The transparency of the façade has been achieved by a combination of low iron glass and ultra clear interlayers, and by replacing solar coating with alternative solar control options on the main office façade.

Aligned to the sleek architectural vision, typically bulky façade frames were reduced through the introduction of Vierendeel type mullions and transoms. A Vierendeel truss is characterised by having only vertical members between the top and bottom chords. The use of this enables structures/mullions to span larger distances and presents

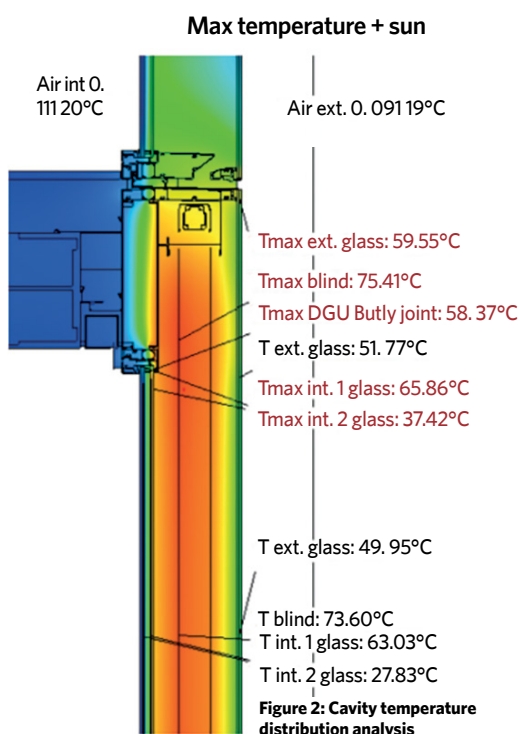


Visualisation of Paddington Square image courtesy of RPBW



1 Closed transom to connect inner and outer skin frames 2 Split mullion of the inner skin 3 Vierendeel web element 4 Outlet airflow through gaskets at vertical joints 5 Double-glazed unit 6 Vierendeel web element 7 Laminated Single Glazed Unit 8 Mullion of the outer skin 9 Open transom for airflow 10 Intermediate mullion

Figure 1: Sketch showing double-skin principle of the main glazed façade (courtesy of WSP)



an attractive and transparent appearance.

A series of innovations was developed for the project that the construction team aims to introduce on other schemes. These include: remote camera monitoring; 3D printing; prefabrication; and large scale installation.

Unitised curtain wall façade

The main office façade consists of double skin curtain wall units with a cavity vented towards the external environment. This type of construction, plus integrated blinds combined with external brise soleil, limits the amount of sunlight penetrating the façade, thereby reducing the building cooling loads.

The outer skin of the double skin façade comprises an external single glazed screen structurally bonded to the outer aluminium extrusion and an internal, thermally broken profile. The inner skin is openable towards the office space to allow for blinds maintenance and cleaning (see Figure 1).

Vierendeel mullions allow for slender profile while increasing the façade

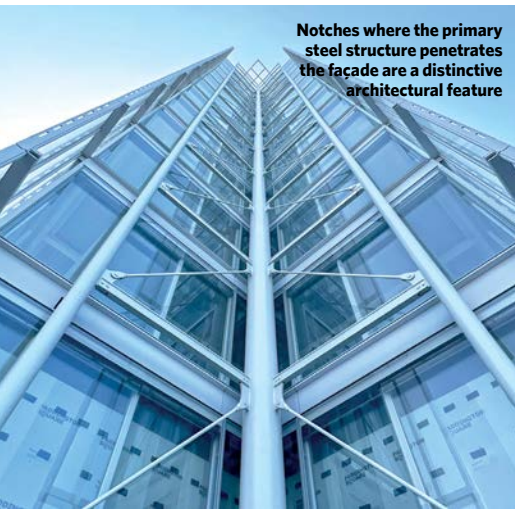
transparency. Air intake is via the horizontal stack joint and air outlet is via a bespoke gasket between the units vertical joints.

The cavity façade performance in moderating the office environment was evaluated via computational fluid dynamics (CFD) analysis, which considered extreme conditions during different seasons.

The gaskets between cladding units are designed to finely balance the amount of cavity ventilation thereby maintaining the systems watertightness and thermal insulation. The heat buildup within the cavity is managed to maintain the temperature range within allowable thermal stress limits for annealed glass, which was specified for flatness and aesthetic considerations (see Figure 2 for temperature distribution analysis).

The solar gain control is managed with perforated aluminium venetian blinds located within the cavity; these allow visibility and light through when lowered. The blinds are motorised and linked to the main





Notches where the primary steel structure penetrates the façade are a distinctive architectural feature

» building management system (BMS) for their operation, with an override option for occupiers. The external brise soleil provide additional solar shading.

Notches located at the corners of the building, where the primary steel structure penetrates the façade and becomes apparent, are a distinctive architectural feature. This detail introduced concerns about weathertightness and cold bridges that were dealt with within the design.

The external penetrating steel is either thermally broken with low thermal conductivity and high compressive strength Ferrat structural thermal breaks or externally insulated to maintain thermal performance and prevent internal

condensation. The steel's cladding including penetrations was established using Centre for Window and Cladding Technology Standard Sequence B a dynamic test.

Slender façade profiles are achieved with Vierendeel mullions, while the cantilevered wing wall is created by using reinforced aluminium extrusions and structurally bonded glass.

The unitised façade was designed so that it wraps around the penetrating steel, with most components manufactured offsite to keep site operations to a minimum and to enhance weather performance.

The three storey stick façade comprises slender Vierendeel mullions with 4.6m tall insulated, low iron glass units for increased transparency into the retail space. The mullions are designed to work mostly under tension. By carefully selecting the mullions support either hung or dead loaded to vary the load paths the façade accommodates significant structural movements.

Overclad with CNC machined travertine to create a striking feature, the façade of the standalone pavilion comprises two storey Vierendeel mullions projecting forward from the façade line. This façade comprises an insulated rainscreen construction. »



Stick façade at Level 17 restaurant (courtesy of Hufton+Crow)

PROJECT INNOVATIONS

RealWear technology

Working with several international teams during the global pandemic brought significant challenges for construction and product reviews, as international travel was prohibited. Advancements in technology were critical to keeping the project on track. RealWear camera technology was used to relay images during real-time visual mock-up inspections.

Using this technology had multiple benefits, including reducing the carbon emissions of this phase of the project significantly by minimising the need for travel and transportation of mock-ups and samples. It enabled more people from the whole stakeholder group to attend reviews, which accelerated decision-making.

Cruciform 3D printing

The 3D printing and cruciform assembly allowed the design team and subcontractor to fine-tune the design and improve buildability long before the actual aluminium extrusions were produced, thereby cutting risk to the programme. It was possible for the cruciform to be finished to the specified colour and incorporate the selected glass buildup and coatings, providing a true appearance for more accurate reviews that resulted in accelerated decision-making.

Extended table for launching 5 linear metre units

Some of the façade elements are larger than typical unitised façade sizes and required bespoke installation machinery that was developed specifically for the project.

Prefabrication

Prefabrication was pursued wherever possible to minimise work at height, reduce site activity durations, and increase efficiency and overall quality. For example, the scenic lift pulley-room enclosures, which weigh approximately 1.5 tonnes, were preassembled offsite onto a metal skeleton that incorporated the cladding, roofing and abseilers' lifting eyes before being transported to site and erected as complete units.

A number of balconies are preassembled and lifted into place as complete elements to reduce site activities and external access.



A 3D-printed cruciform sample



Launch table for unitised façade installation



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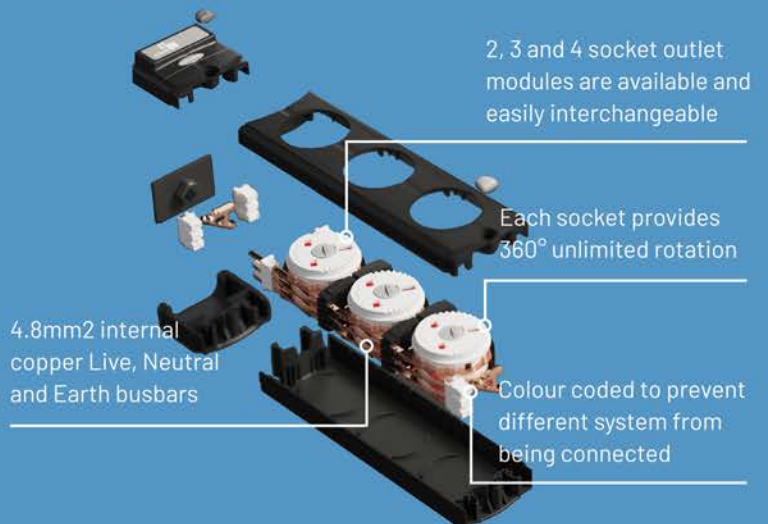
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EXPLODED VIEW

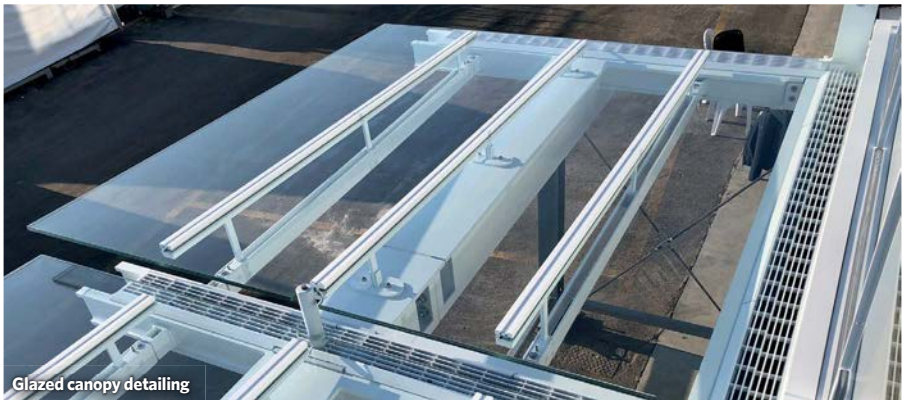




Pavilion building façade visual mock-up and CNC travertine fin prior to surface filling



General view, with glazed canopies and scenic lift



Glazed canopy detailing

A multidisciplinary and integrated approach led the project to deliver the architectural intent and building's high performance standards

» The travertine was visually selected for compliance with the approved lower and upper limits, and consistency, including surface irregularities. The travertine slabs were sized to accommodate the wind loads, and tested to withstand impact loads and freeze-thaw cycles.

A number of glazed canopies provide shelter to users below. They typically consist of a saw-tooth glass panel arrangement supported onto the primary steel structure. A complex network of gutters and drainage channels discharges rainwater via downpipes located within the external columns.

Two scenic lifts are situated at street level, taking visitors directly to the rooftop restaurant and terrace on Levels 17 and 18.

The scenic lift is a 70m high glazed structure, consisting of exposed steelwork

erected to very tight tolerances and double height glazing panels 2.4m wide and 5.2m high. These are fitted into bespoke minimalistic mullions restrained back to the primary steel structure.

Minimising embodied carbon

A multidisciplinary and integrated approach from early design stages led the project to deliver the architectural intent and building's high performance standards in the most sustainable and efficient way possible.

The ventilated cavity façade construction with integrated BMS controlled blinds, combined with external brise-soleil, limit the amount of solar energy penetrating the façade, thereby reducing the building's cooling loads. The adaptive façade meant lower levels of coatings could be applied.

By carrying out dynamic analysis of the cavity façade, the cavity temperature is

maintained within thermal stress limits of annealed glass. As a result, the team was able to avoid the use of heat-treated glass, which minimised embodied carbon, achieving a flat glass appearance and enabling greater transparency and colour neutrality.

The use of a slender Vierendeel type aluminium frame to achieve a transparent and light façade has led to a high performing framing system from an operational energy and embodied carbon perspective.

Thanks to the innovative design and specification Paddington Square outperforms average office buildings with double-skin facades both in terms of operation and embodied energy. **CJ**

■ **OVI MAZAREANU** is associate director – project management (construction) at Mace, **MICHELE SAUCHELLI** is technical director at WSP and **SERENA GUGLIOTTA** is senior façade engineer at WSP

Carbon & economic comparison for hot water systems using heat pumps, direct electric and hydrogen blends.

Rinnai compare three low carbon systems using electric, Heat pump, and hydrogen blends. This comparison guides the selection process and can be used to learn about existing and emerging technologies. The complete study is shown in the Rinnai H3 accredited CPD presentation.

Introduction

This CPD will show the savings achieved using three lowcarbon systems. The first system is a gas combustion continuous flow water heater that can run on hydrogen blends up to 20 %, as shown in figure 2. The second system is defined as a hybrid and consists of a heat pump and gas water heater 20% hydrogen blend ready, as shown in figure 3. The third system is the all electric and consists of a heat pump

and direct electric cylinder, as shown in figure 4. The study uses notions of buildings from previous real life projects to compare each system. The notion establishes the buildings peak loading conditions, temperature, and recovery times. In this article, a gym health centre is used as a notion. The comparison focuses on detailed schematics, carbon emissions and capital & operation costs of each system.

Low Carbon technology

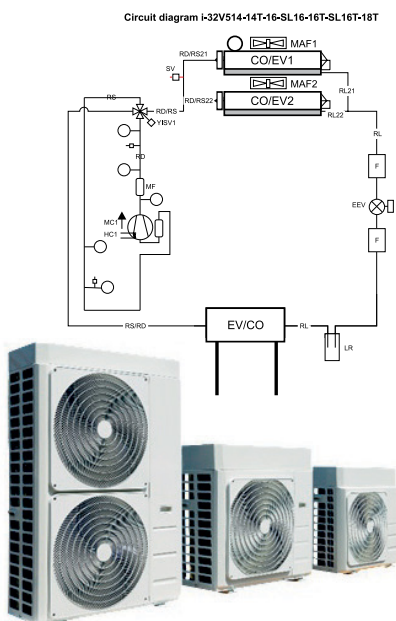
The primary technology used in the three systems are: Heat pumps, considered low carbon technology because they use electricity to move heat from one location to another. The fundamental idea is to move heat from one place to another using a refrigerant fluid. The refrigerant evaporates at one location, absorbing heat, then

condenses at the location where the heat is delivered. Figure 1 shows the working schematic of the air to water heat pump. The 4 way valve can reverse the cycle and switch to cooling mode. The air to water heat pump was a key technology in the Heat and Building Strategy (1).

Direct electric heating has no emission at the point of use. However, this type of system plays a minor role in the Heating and Building Strategy because it puts a lot of pressure on the electric infrastructure (2) (3).

Hydrogen could replace natural gas over the coming years. Critical decisions on the role of hydrogen in heating are coming in the next 2-3 years (2). Hydrogen has a solid potential to become a zero carbon energy source because it does not produce carbon at the point of use. Green hydrogen is still considered expensive, but current developments are decreasing the costs (4) (5). To facilitate the transition and development of the gas network, the UK government will continue to work with the Health and Safety Executive to enable up to 20 % hydrogen blending on the network by 2024, subject to the success of testing and trials.

Figure 1; heat pump working principle



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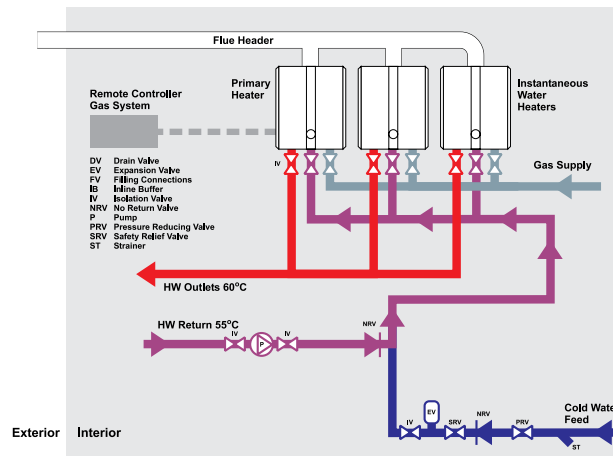
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Type 2 buildings- Gym health centre

This notion has 12 showers, and 4 wash hand sinks. The three low carbon systems were sized accordingly to the specific requirement of the notion. The cost of the heat pump was also considered during the selection process. Three designs were generated as follows.

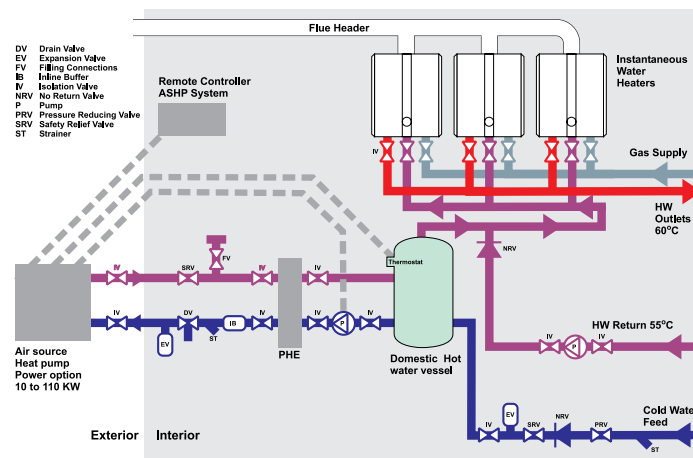
- Combustion – 3 x instantaneous water heater 56kW, as shown in figure 2
- Hybrid – 28 kW heat pump and 3 x instantaneous water heater 56kW, as shown in figure 3
- Fully Electric– 28 heat pump kW and 2 x 48 kW direct electric heater, as shown in figure 4.

Figure 2: Combustion System



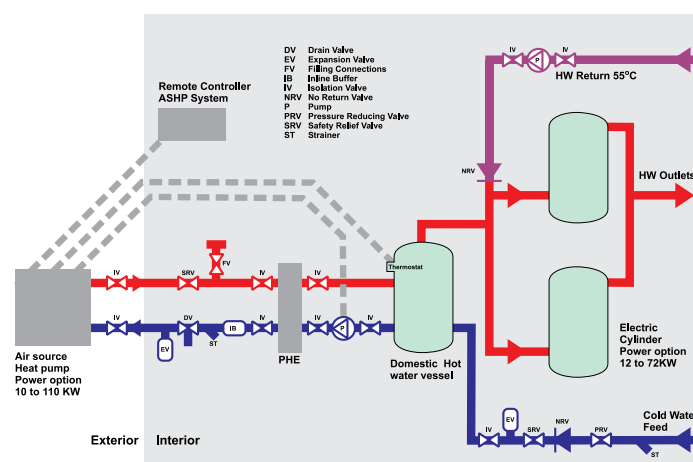
The heating load is met by using three appliances. Coldwater goes into the water heater and exits at 60, and water returns at 55 C.

Figure 3: Hybrid System



The heating water from the heat pump goes through the plate heat exchanger, which separates heating water from domestic water. The gas water heater provides the power for peak loading conditions.

Figure 4: All Electric system

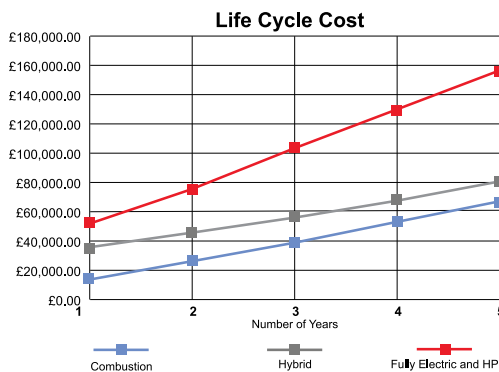
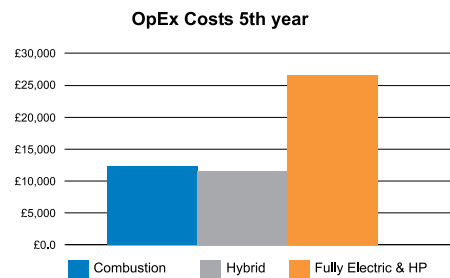
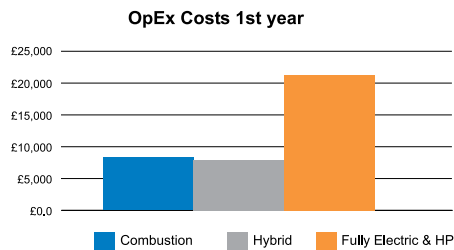
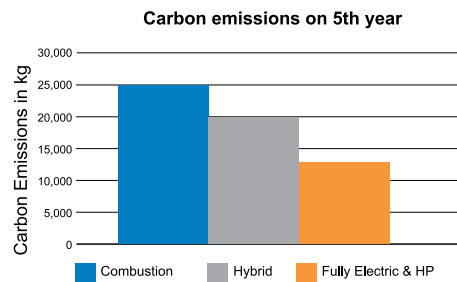
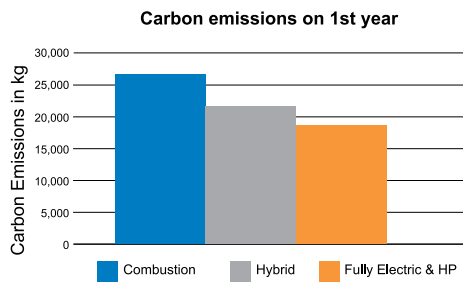


The left side of the schematic is similar to the hybrid setup; it consists of a Heat pump and plate heat exchanger. Direct electric heating provides the additional power required for peak loading conditions.

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Carbon & Cost Comparison



The carbon & price factors were taken from the UK Gov publication (6) (7). Inflation was applied for the next five years. For more info, the CPD presentation shows the complete calculations and assumptions.

Life cycle costs (see left) of the three systems, including capital and cumulative operational costs.

Discussion and conclusion

The electric system is still the most expensive system to run. Heat pumps can decrease the running cost but have a massive impact on capital costs. The life cycle chart shows the capital and the cumulative operational costs. This graph evaluates the total investment of each system.

The combustion system is the cheapest option in a life cycle of 5 years, as shown above.

The hybrid system was considered the best option for running costs; hybrid is also an excellent compromise to achieve carbon savings when mindful of costs and operational performance. The electric option produces less carbon, with more savings coming in the next five years thanks to the planned grid improvement. The gas network might also become greener through a mix of hydrogen and biomethane; however, long term development is not included in 5 years, and only a 20 % hydrogen blend was considered from 2025. It is important when considering these options that economic, practical and technological considerations are made and that multiple decarbonisation pathways are evaluated relative to system performance needs.

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A government consultation calling for two staircases in high risk residential buildings of more than 30m has raised questions about how this and the amended BS 9991:2021 will impact fire safety design and developments. Phil Lattimore reports

STEP CHANGE

Two days before Christmas 2022, the government published proposals for a series of amendments to Approved Document B (AD B), which included introducing a threshold whereby new residential buildings of more than 30m in height in England should be designed and built with two staircases.

The announcement of the consultation, which runs until 17 March 2023, raised concerns among some in the industry about the costs and viability of implementing a mandatory two staircase design, the implications for buildings already in the design stage, and even whether such a change was necessary.

Functional requirement B1 of the Building Regulations already requires appropriate means of escape, says CIBSE chief technical officer Hywel Davies. If the designer doesn't think a single stair is appropriate then the legal requirement is already to provide a second stair. The problem is that there is absolutely no consensus or clarity around what is appropriate, says Hywel Davies.

Currently, AD B does not suggest a threshold above which more than one staircase must be considered, and this issue has provoked concerns and criticism from safety campaigners and fire authorities following the Grenfell Tower tragedy in 2017.

In December, *Construction News* reported that around 60% of planning applications for high rise buildings in the first 10 months of 2022 were flagged by the Building Safety Regulator¹. The majority of these were single staircase designs that featured access to car parks or basements, or that had inadequate access for fire services.

Attempting to address the issue of staircases, the consultation cites concerns that some tall residential buildings are being designed with a single staircase without due consideration by the designers on the

level of safety provided and the necessary resilience. It is therefore looking at options to introduce clear guidance in AD B that recommends the provision of a second staircase above a certain height, to ensure residential buildings achieve an appropriate level of safety.

Existing buildings will not be affected by any change, with the consultation paper acknowledging that there is no evidence that suggests existing buildings with a single stair above the proposed threshold pose a life safety risk. An improved safety regime for existing high rise residential buildings will, however, be covered under the provisions of the new Building Safety Regulator regime.

Another key document on fire safety guidance, *BS 9991: 2021 Fire safety in the design, management and use of residential buildings – Code of practice*, is still to be published, 16 months after the initial consultation. It's not yet certain what the final document will look like or whether it will need to be adapted to align with any amendments made to AD B on threshold heights for when two staircases must be considered. In the draft of proposed changes, however, the recommended focus on smoke ventilation systems suggests an expectation of a pressurisation system to protect single stairs in buildings of more than 18m in height.

Implications

These proposed changes are already causing developers to pause projects due to the lack of clarity. However, Judith Schulz, director at Arup and a fire safety engineer, explains that the route of performance based designs



» that deviate from guidance remains available, provided they are substantiated properly.

The consultation seeks to amend statutory guidance in AD B to reduce some of the uncertainty that exists around what is a common building, says Schulz, with AD B providing fire safety guidance on this. There is no change to Building Regulations or a legal ban on single staircases above 30m proposed, she adds.

That this [performance based designs] route remains available is important, as not every site will be able to accommodate a two stair solution and as the consultation document hints, it is possible to arrive at a bad two stair arrangement that has numerous single points of failure, despite, on paper, having two stairs.

However, Schulz approves of the proposed changes to AD B. We support the clarity that the changes will bring around when a second stair is expected to be provided in new residential buildings, as significant uncertainty exists at present, she says.

Stephen Jeffery, chief technical officer at Mace, agrees that any unambiguous, clear guidance on fire safety is welcome. However, he says the proposal needs to be coordinated with design codes such as BS 9991, so that code compliant designs become the norm and there is less reliance on fire engineering solutions, which are often required to overcome poor design decisions made in earlier works stages.

Jeffrey points out that some developers are already seeking to apply the forthcoming proposed standards regarding single staircases and fire safety: We have raised the issue of single staircase buildings with a number of our clients, and were pleased to see them take the decision to apply the principles outlined in the draft version of BS 9991:2021 and instruct redesign to provide a second staircase and evacuation lift provision in advance of the publication of the new standard.

AD B already includes guidance on the provision of more than one common stair in buildings taller than 11m, says Jeffrey. Since the HSE [Health and Safety Executive] has become a statutory consultee in planning gateway one, designers have to address fire safety before planning permission is granted, he adds.

A trigger height of 30m also aligns with enhanced requirements for fire resistance of the superstructure, which already exist within the guidance.

Ben Cooper, director of independent firm Orion Fire Engineering, is equivocal about the consultation. On the one hand, he believes single stair residential towers can be designed and constructed in a safe and robust manner. This has been demonstrated with some recent fires in new builds that were contained properly within the compartment of



origin through correctly constructed compartmentation, sprinkler protection and other life safety measures recommended under guidance issued from 2015 onwards, he says.

On the other hand, Cooper says many residential towers are not built to the appropriate standard. He cites reviews of fire protection measures that have revealed that subcontractors have substituted products specified in the technical designs without ensuring they adhere to the fire safety strategy, or even recording such substitutions.

With that in mind, perhaps we do need tighter legislation to add an additional layer of resilience, he says. It's an unfortunate fact that things will go wrong, and things will be missed, irrespective of any claims of competence, accreditation or certification. This legislation addresses the weakest links in our industry and will undoubtedly create safer homes.

Design steps

The number of stairs provided in a building is a fundamental design decision that shapes not only fire safety design, but also architectural arrangements,



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Pressurisation to protect stairs isn't a new solution, and is already recommended in BS 9991, but it has yet to be commonly adopted in the UK

services distribution, and structural design, so it is important to get it right from the start, says Schulz.

Several factors come into play when deciding how many stairs a building should have, with height being one – so there will be buildings under 18m that would benefit from two stairs, and buildings that fall over the proposed threshold [of 30m] where a single stair arrangement could still be appropriate, says Schulz.

Cooper concurs: I do believe tall buildings can be made safe with only a single staircase. Building safety is achieved through a combination of systems working in parallel to avoid a single point of failure. There are more ways to achieve this than introducing a second stair. He also believes this proposal won't have a significant impact on the fire safety design of tall buildings. All the fire mitigation measures currently required in tall, single stair buildings will still be required in tall multi stair buildings. This will simply be an additional layer of resilience.

Medium rise questions

Will the proposed change have an impact on whether two stair designs or pressurisation systems are more likely to be adopted in buildings over 18m but under 30m? Schulz says: Many projects that I am aware of have considered how many stairs are appropriate for a development for several years already, with some proceeding with a single stair with enhanced protection features, and some with two stairs.

She stresses the importance of also considering people with impairments: Designers should have an answer to the question – how would I get out of this building if I was unable to use stairs? .

Mace's Jeffery says single staircases can be used over 18m and under 30m under current guidance. There is already guidance in AD B on when second staircases should be provided in buildings over 11m, and the provision of additional mitigation measures and internal planning arrangements allows the use of single staircases. Similarly, the draft BS 9991 permits single stair buildings over 18m if certain other criteria are met, and this would need to be amended at the same time to prevent different compliance routes from being available to designers. We don't believe there would be a benefit in having an additional trigger height at 18m [as well as 11m, 30m and 50 storeys].

Cooper sees pressurisation as an important – and cost effective – solution for developers: The majority of developments we are working on that are between 18m and 30m are planning to retain a single stair and adopt a pressurisation system. The cost is offset by the additional apartment area that can be retained on each floor.

While pressurisation to protect stairs in residential buildings isn't a new solution, and is already recommended in BS 9991, Schulz acknowledges that it has yet to be commonly adopted in the UK. Alternative approaches that are also recommended in the standard such as natural ventilation and mechanical extract – are perceived to be simpler to design, commission and maintain.

However, Schulz says the proposed changes to BS 9991 introduce an expectation for pressurisation to be provided to any evacuation or firefighting lifts, as well as to a protected lobby that provides a refuge for anyone who is unable to evacuate using the stairs. This will require additional space for risers and associated plant, which will need to be accommodated by designers proposing this kind of system, she says.

As currently drafted, the proposed approach to smoke ventilation in single stair buildings in BS 9991 will change how stair and lift cores need to be designed, says Cooper, who adds: It will also make single stair designs that incorporate long residential corridors more complex.

The draft standard currently shows that stairs and lifts in single stair buildings of more than 18m should be accessed through a protected lobby, which – along with the stair and lift – should be a pressurised space, explains Cooper. It recommends that air relief paths be provided in the corridors serving the apartments. If those corridors are in excess of 15m, the standard recommends that they be provided with a separate mechanical extract system, he says.

Depending on the height of the building, up to five smoke shafts may be required for this type of smoke ventilation strategy compared with the current approach, which would only require two.

Jeffery, at Mace, believes designers will continue to adopt the single stair approach with pressurisation systems at the planning stage, as it is outlined in the draft of BS 9991:2021, but notes that it is possible that clients and developers may be warier with the risk of having stranded assets should guidance/legislation change in the future. The consultation document released in December acknowledges that, as a new threshold is being developed, there is a need to review the evidence base and more fully understand the risks.

Schulz says a lot of research is under way, commissioned by the Department for Levelling Up, Housing and Communities, to inform future updates to approved documents. This includes research into the means of escape for disabled people and means of escape from blocks of flats. There may be more changes down the line that impact on stairs and lifts, she says. **CJ**

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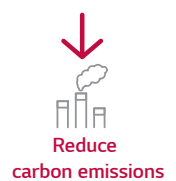


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AHEAD OF THE EXPECTED

The UK's ambitious net-zero targets mean there is a real need to decarbonise both commercial and residential buildings across the UK. So, as heat pump technology has advanced over the years, it has become clear that they will play a major role in providing a stepping stone to full decarbonisation.

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Integrate technology to decarbonise heat, says BRE

Government should do more to support transition to clean heat

The BRE has outlined three steps that it believes must be taken to achieve the decarbonisation of buildings. In its report *Decarbonising heat in Britain's buildings*, it states that: energy efficiency of buildings must be improved; low carbon heating systems should be installed in homes and business premises; and smart, flexible heating technologies should be integrated.

The report provides an analysis of current policy and makes several recommendations for delivering decarbonisation more effectively. At present, heating buildings accounts for almost a quarter (23%) of the UK's greenhouse gas emissions. This must be reduced to achieve net zero by 2050, while ensuring long-term security for our energy system.

Detailed recommendations for the



UK government are made in the report. These include accelerating the rollout of insulation across the UK's housing stock, addressing large gaps in energy efficiency, and confirming a strengthened regulatory plan for energy efficiency in domestic and non-domestic buildings.

The report urges a major policy push if targets are to be reached, with stronger advice, information and standards behind it.

Daikin commits to propane

Daikin is to offer a new range of heat pumps using refrigerant R454C and propane (R290), in light of REPowerEU and the combined phasedown of hydrofluorocarbons in Europe. The Daikin Altherma series is set to be launched in 2024, after its preview at the forthcoming ISH exhibition in Frankfurt, from 13 to 17 March.

'R454C and propane are both low-GWP [global warming potential] refrigerants that offer a wide range of installation possibilities, making it suitable for the different types of housing structures throughout Europe,' Daikin said.

Specific safety measures have been taken, considering the total life-cycle of the equipment, said Daikin. 'Where the complete refrigerant circuit is installed outside, and where feasible from safety aspects, certain product ranges will be provided with R290.'

The refrigerants have been selected that will best fit the application and customer need, weighing up safety, cost-effectiveness, energy efficiency and environmental impact.

Thermocold heat pumps use low GWP refrigerants

New rooftop air source heat pumps have been released by Thermocold, featuring low global warming potential (GWP) R-454B refrigerant and variable speed compressors.

Thermocold introduced the new Airtop rooftop range for small to medium commercial and process applications. R-454B is among the most sustainable refrigerants available for scroll compressor technology, at a low GWP level of 467. This offers a 76% reduction in direct GWP impact against R-410A and a 34% reduction against R-32 refrigerant.

'The compact design and multifunctional capabilities of the rooftops make them particularly suitable for urban buildings, where space is usually a constraint,' said Gianni Renna, general manager of Thermocold.

Waterloo by Swegon launched

Swegon has announced it will combine its portfolio of room unit brands, Waterloo, NACO and Air Diffusion, under one identity, 'Waterloo by Swegon'. The move will reflect the company's position as the UK's largest manufacturer of air terminal devices.

Swegon will further invest in technical innovation, sustainability, and digitalisation initiatives. 'Customers will have access to more products, with added benefits such as Environmental Product Declarations, BIM and cloud selection tools designed to make their lives easier,' said Daniel Jones, UK&I room unit product manager.



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On a mission



Chris Skidmore's net zero review addresses the big issues around decarbonisation and urges industry to act now, says Baxi's Jeff House

Mission zero: Independent review of net zero was published on 13 January 2023, commissioned by the Department for Business, Energy and Industrial Strategy (BEIS) to consider how net zero targets could be reached while continuing to increase energy security and affordability.

The review has been billed as the largest national engagement on net zero, with more than 1,800 written submissions and 52 roundtable evidence sessions. Over six chapters, the report covers a lot of ground and concludes that the decisions we don't take now will only become more expensive. Seizing the current momentum could unlock a trillion pounds of international inward investment.

For building services engineers, the content on decarbonising heat is of most interest. There is a pressing need to address energy efficiency

while transitioning to low carbon forms of heat generation. In this regard, the review does not offer new insight, but does bring together several recommendations that have been part of general policy discourse for some time.

Energy efficiency and the need to address poor fabric performance in existing buildings is rightly a focus area. The need to reduce heat loads represents not only an imperative for consumer energy savings, but also a systemic issue. At present, the natural gas grid delivers four times more energy than the electricity grid in winter. This means that peak heat loads will, perhaps, be one of the more challenging issues to address in terms of infrastructure capacity, supply resilience and cost-effectiveness.

Regarding building-level technology, the review concludes that solar is the cheapest form of renewable energy to take forward, which also benefits the energy system with decentralised generation. In terms of heat, electrification – and particularly heat pumps – is billed as a central technology.

The potential for decarbonisation of the gas network with green gas, including hydrogen, is discussed, as is the need for large-scale demonstration projects. Finally, district heat is recognised as a means of local demand consolidation and efficient delivery of heat.

Building on the ambition in the BEIS Heat and Buildings Strategy, this review proposes a ban on the sale of natural gas-fired appliances two years earlier than planned, by 2033. The need for change is clear and leading manufacturers are investing heavily in low carbon alternatives. Policy certainty, rather than stated ambition, will help drive change and focus efforts.

JEFF HOUSE is external affairs and policy director at Baxi

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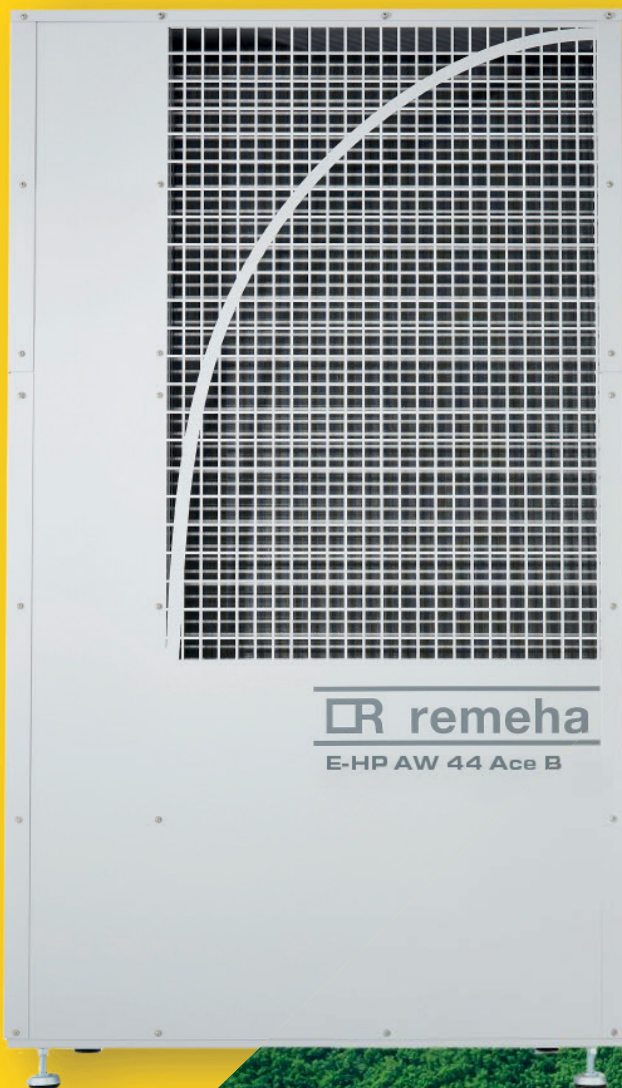


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RATINGS WINNER

The Belgrave Road office development in London is the first to receive a Nabers UK 5.5 target rating for its carefully considered design. Andy Pearson finds out how the rating scheme's independent design review process drove down operational energy use on the hybrid ambient loop/variable refrigerant flow scheme



The new offices at 11 Belgrave Road are due for completion in late 2023

The property agents tasked with marketing new office premises at 11 Belgrave Road, London, have some potent marketing collateral at their disposal. The scheme is pre-certified WELL Platinum for health and wellbeing; has achieved WiredScore Platinum certification for digital infrastructure; is aiming for SmartScore Platinum for connectedness; and is targeting Breeam Outstanding.

Arguably, the most impressive of all the sustainable accolades is that the scheme has achieved a 5.5 star Nabers UK Design for Performance target rating for building energy efficiency.

It is the first office building in the UK to achieve this level of performance and one of only three buildings to be pre-certified in the UK. More impressive still, this was achieved despite deciding to target Nabers only once the design was under way.

Due for completion in late 2023, this retrofit office project is set to transform a tired, six-storey, 1950s, concrete-framed building into a modern, state-of-the-art, eight-storey workplace that will set a new benchmark as one of London's most sustainable office buildings.

Designed by engineers Max Fordham, working alongside Eric Parry Architects, the scheme has aspirations to be net zero carbon in both construction and operation, surpassing the RIBA 2030 Climate Challenge for embodied carbon by 38%.

Nabers UK is an energy performance rating scheme for offices, which has been adopted from Australia. It provides a rating from one star (worst performing) to six stars (best performing). There are two sets of ratings: Nabers UK *Design for Performance*, which is given for new office development designs before completion, and Nabers UK *Energy for Offices*, which measures and rates the actual energy consumed in supplying building services to the base building when

it is in use. This simple system will help the owners of 11 Belgrave Road, Quadrum Global, to see how it performs against other similar buildings. What makes Nabers so good is that it is a way of benchmarking the HVAC energy use, over which the landlord has control, says Dean Irvine, senior engineer and partner at Max Fordham.

To determine what HVAC energy is the responsibility of the landlord, rather than tenants, Nabers requires a thorough metering strategy, though Irvine says it's not much more onerous than current requirements in the Building Regulations (see panel, *Why metering is key*).

What stepped up the challenge for Max Fordham was the decision to go for a Nabers UK rating once the project design was under way; in fact, the design was at RIBA Stage 4 – Technical Design, the final step before heading into the construction process. Ideally, you'd commit to Nabers at Stage 1 or Stage 2, says Irvine.

A big difference with Nabers, he adds, is that, as part of the design, you have to do a quite intensive energy modelling process for the heating and cooling systems, which is far beyond that required to meet the requirements of CIBSE TM54 Evaluating Operation Performance at the Design Stage.

Heating and cooling

Heating and cooling for the building is provided by three basement air source heat pumps providing 80kW of cooling and 95kW heating. Max Fordham's initial intention was for heating and cooling produced by the heat pumps to be employed on the tenant floors using a four-pipe fan coil unit (FCU) system. However, the 2.8m floor-to-ceiling heights determined by the retained structure proved too low to accommodate the FCUs and distribution pipework.

Max Fordham's solution was to adopt a hybrid ambient loop/variable refrigerant flow (VRF) system. We wanted to be able to balance the heating and cooling loads and minimise refrigerants in the building, which was why we went for an ambient loop coupled to a VRF system, says Irvine.

The heat pumps inject or reject heat to the ambient loop, which rises up the building, and is maintained between 20°C and 23°C all year round. Water-cooled condensers located on each floor of the building allow energy to be transferred from the ambient loop into a VRF system.

By using the smaller VRF fan coil units and pipework, we were able to make the floor plates work despite the limited height, says Irvine. Tenants will have to fit out VRF condensers and fan coil units as detailed in the performance spec set out in the tenant fit-out guide.

The downside of using refrigerants is that leakage can have a massive impact on embodied carbon. We did a lot of embodied carbon work and came to the conclusion that about a third of the MEP [mechanical, electrical and plumbing] embodied carbon is life cycle refrigerant leakage, even though the VRF only runs from the riser to the fan coil units, says Irvine (see panel, *Minimising embodied carbon*).

The ambient loop will also provide heat to the





The retained concrete frame facing onto Belgrave Road

Getting your homework checked by another consultant is a really important step with Nabers, because they go through your modelling and give you detailed feedback on the design

landlord's domestic hot water system via a water source heat pump.

In summer, we're going to get free cooling and hot water production because all the rejected heat [from the offices] will be used to heat the domestic hot water, explains Irvine. Electric immersion heaters provide backup heat to the calorifier.

Ventilation to all the office floors is from a variable air volume (VAV) system, with control based on CO₂ levels. Air is provided by a central air handling unit (AHU) and local mechanical ventilation with heat recovery units. They serve different zones of the office floorplate, which is designed to be sub-divided into three tenancies. MVHR units serve two zones and the AHU serves one.

To achieve WELL certification, outside air ventilation rates were increased from 10l/s to 12l/s per person for the offices. Design occupancy density was 1 person per 8m². To further improve air quality for the building users, the air is cleaned using carbon filters.

Openable windows are on both the Belgrave Road and Guildhouse Street façades. Openings are manually operated, with the buildings BMS and smart buildings platform advising occupiers the best time to open/close windows from an energy and air quality perspective.

Once the MEP design had progressed sufficiently to enable energy use to be modelled, Max Fordham had to submit its modelling report

for independent review. In this instance, the reviewer was Delta Q in Australia. Getting your homework checked by another consultant is a really important step with Nabers, because they go through your modelling and give you detailed feedback on the design, says Irvine.

One downside of adopting Nabers late in the project was that Max Fordham's energy modelling was undertaken relatively late in design development, which meant it was too late to take on board all of Delta Q's recommendations. Irvine explains: They were commenting on the architectural form of the building and the potential to add external shading, but, at RIBA Stage 4, the project was too far down the line to do anything about shading.

Another recommendation that could not be implemented, but which highlights the level of detail required under Nabers, was the reviewer's recommendation to refine the controls on the VAV system. This is because, in the UK, a VAV system is typically controlled to maintain a fixed pressure in the ductwork, with the VAV dampers opening and closing independently of the fan speed.

To save energy, Delta Q recommended changing the controls to keep the damper in the VAV unit on the



MINIMISING EMBODIED CARBON

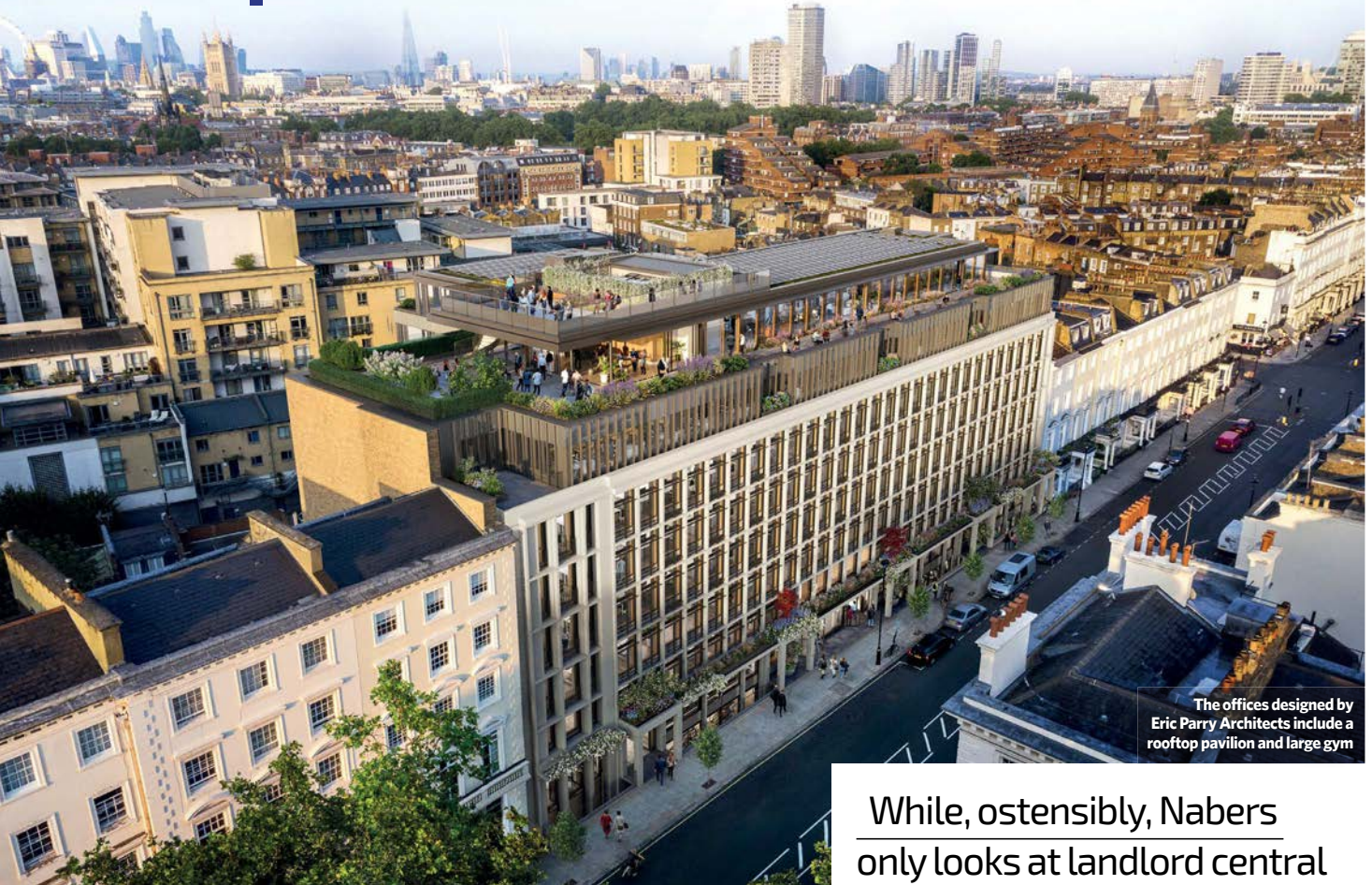
As well as minimising operational carbon, Eric Parry Architects' design for the renewed building retains a significant proportion of the existing 1950s concrete structure and foundations, as part of an overall strategy to reduce the embodied carbon of the development.

This has reduced the scheme's embodied carbon for the refurbished areas to 324kgCO₂/m², below the LETI target of 350kgCO₂/m² for commercial buildings, with the project's overall embodied carbon emissions predicted to be 466kgCO₂/m².

The retained structure supports the addition of two new office floors on the roof, which are stepped back from the existing façade in order to be hidden from the road. The entire structure is enclosed by a new curtain wall.



Partial reuse of the 1950s concrete frame significantly reduced embodied carbon



The offices designed by Eric Parry Architects include a rooftop pavilion and large gym

While, ostensibly, Nabers only looks at landlord central energy use, if you produce a poor tenant guide it could end up impacting your rating

» system with the highest air demand fully open at all times, while controlling the AHU fan speed to regulate the supply air volume accordingly. It means that you're not adding extra pressure to the system by over closing dampers, explains Irvine.

Unfortunately, because the design review was happening while the job was being tendered, Irvine says the budget didn't stretch to the additional cost of more expensive VAV dampers and the additional controls wiring.

He adds that there was a bit of back and forth between reviewer and designer to discuss what recommendations could be implemented. Based on the initial modelling submission, Delta Q was going to recommend a Nabers score of 5 for the scheme. However, the reviewer explained that if Max Fordham modelled additional scenarios, including reducing the cooling set point from 24°C to 23°C, the increased design granularity would enable the scheme to achieve the additional half point, taking its score to 5.5.

WHY METERING IS KEY

There is an incentive to meter properly. All centrally supplied heat and power has to be metered under Nabers, and if the metering cannot exclude a service for a tenant, then it must be included in the landlord's energy use assessment.

Irvine says the metering requirement for Nabers is not particularly onerous. 'What you need to do for Nabers isn't a huge step up from what you're doing already in a lot of commercial jobs, because most tenants want accurate Measuring Instruments Directive 2004/22/EC compliant meters to monitor their energy use in any case.'

However, he does say that Nabers requires the designer to be 'a bit more thorough' on exclusions. For example, there is a central hot-water system that feeds the 'end of trip' basement showers, café, retail units and gym – but in the energy use assessment, the landlord only has to include the hot-water energy for the basement showers. It can exclude the energy for the other areas, as they will be sublet.

Nabers also excludes small power and lighting to tenanted areas, over which the landlord has no control.

In addition to the modelling, the reviewer asked Max Fordham to produce a tenant fit out guide to explain to tenants how to complete their Category B fit out to best integrate with the landlord's systems. This is what we've modelled in Nabers, so that you, as a tenant, have to install something in line with the landlord's intention, with this level of performance or better, says Irvine. It's about tying down the performance spec of the fit out.

While, ostensibly, Nabers only looks at landlord central energy use, if you produce a poor tenant guide it could end up impacting your landlord rating, which is why achieving Nabers in use needs to be a collaboration between the tenant and the landlord, says Irvine.

Even with the additional work, he adds, getting the Nabers UK Design for Performance rating of 5.5 was the easy bit. The scheme is currently under construction, with completion anticipated for the end of 2023. Up to this point, everything is theoretical; now we have to wait at least a year, post completion, and the building has to be at least 70% occupied before we can submit meter readings to [system administrator] BRE for it to give the scheme its Nabers UK Energy for Offices rating.

Even then, the rating will only be valid for one year; after that, meter readings have to be resubmitted on an annual basis to enable BRE to issue new ratings based on current performance – which should keep the facilities management team occupied for many years to come. **CJ**

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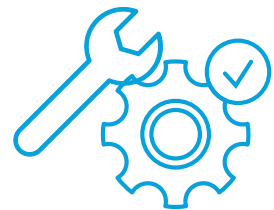
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SWITCHING TO PROPANE

Propane's low GWP is making it an increasingly attractive alternative to refrigerants restricted by the F-gas Regulations. **Tim Dwyer** tracks the growth of propane and looks at the L150 initiative in Germany that is aiming to reduce the charge in a propane refrigerant circuit

The reduction in fluorinated greenhouse gases (F-gases) used in refrigeration is seen as essential if Europe is to meet its carbon reduction targets.

In a recent assessment report on the progress of the F-gas Regulation in Britain¹, it was concluded that there had been success in achieving the objective to reduce emissions, as well as significant financial benefits.

As explored in this month's CPD article (page 61), this success is mainly the result of the hydrochlorofluorocarbon (HFC) phasedown and the transition from high global warming potential (GWP) HFCs to lower GWP blends of HFCs and hydrofluoroolefins (HFOs), and non-F-gas alternatives, such as propane.

CIBSE Journal CPD Module 99, from 2016, noted that propane's operating pressures and temperatures are well suited to use in air conditioning equipment, including chillers, and the natural refrigerant has a GWP of just 3.

The latent heat of vaporisation of propane (HC 290) is almost twice that of most common HFC refrigerants, which means a higher cooling/heating effect for the same refrigerant mass flow² that requires reduced compressor power and, so, higher operational efficiency.

The hydrocarbon propane has good compatibility with materials commonly used in the construction of refrigeration and air conditioning equipment, is commercially available, and relatively inexpensive (at less than 20% of the cost of HFOs³). It can be stored and transported in steel cylinders in the same way as other common refrigerants. However, being flammable and so classified as an A3 class refrigerant there are specific rules to observe. Depending on room volume and application type, there are also limits to the mass of propane that may be used.



The LC150 heat pump, developed at Fraunhofer ISE, is based on the climate-friendly refrigerant propane

WHAT IS GLOBAL WARMING POTENTIAL?

GWP is a measure of how much heat an F-Gas traps in the atmosphere. It compares the amount of heat trapped by a certain mass of refrigerant to the amount of heat trapped by a similar mass of carbon dioxide over a 100-year period.

In a swiftly changing legislative landscape, the limits vary across the world – although, historically, an indoor limit of 150g was, and remains, a common benchmark for a propane charge in single appliances.

BS IEC 60335 2-40:2022 ED7³ is pending an agreed update, which includes changes that allow higher charge limits for propane of up to 988g in a standard system (with added safety measures) – this is likely to eventually shift the global acceptance of higher propane charges.

Since the CPD article of 2016, there has been a flurry of activity from national and multinational manufacturers to develop propane based heat pumps for commercial and domestic applications.

The Fraunhofer Institute for Solar Energy Systems (ISE), in Germany, and a consortium of heat pump manufacturers are developing a standardised and refrigerant-reduced propane refrigeration circuit under the low charge 150g LC150 project, as a pathway to developing safe and efficient domestic and small commercial propane-charged heat pumps.

Since October 2021, the Fraunhofer ISE project team has been building prototypes for brine heat pumps (systems specifically designed to transfer heat from the ground or surface water to a water-based heating system), and assembling the individual components





Heat pump test rigs running 24 hours a day

» (evaporator, compressor, condenser, heat exchanger and expansion valve) in a variety of different configurations.

These modules are measured on test rigs 24 hours a day, for two weeks at a time. Each prototype is run at between 30 and 150 operating points, and the measured values are recorded by 26 sensors. In the search for the ideal heat pump, 26 prototypes have been built.

As reported by Fraunhofer in October 2022, the system with the best component configuration achieved a maximum heating capacity of 12.8kW and an efficiency of 4.7 (ratio of heat generated to electricity used) with only 124g of propane.

That means the amount of refrigerant required per kilowatt of heating capacity was only 9.7g of propane. The project's goal of reducing the amount of refrigerant to 15 30g/kW has been exceeded. Commercially available heat pumps use about 60g of propane per kW.

The record breaking refrigeration circuit⁴ is not yet ready for market, as it employs a semi hermetic automotive compressor. This requires less refrigerant at a higher capacity thanks to its high rotational speed and low oil volume. So far, automotive compressors have not been designed for the high operating hours of a heat pump that is meant to last 20 years. However, the manufacturer is already working on fully hermetic compressors with a longer service life, says Clemens Dankwerth, of Fraunhofer ISE.

The final version of the refrigeration circuit would be implemented with slightly more refrigerant and a larger heat exchanger, to achieve a more balanced system. The team is confident that the goals of the project – a refrigeration circuit with an output of 8 10kW and maximum charge of 150g can be achieved under real operating conditions.

The second best refrigeration circuit in the test programme so far also met the projects targets, with a charge of 164g of propane at an efficiency of 4.8% and a heating capacity of 8.1kW.

The goal of reducing the amount of refrigerant to 15 30g/kW has been exceeded

A conventional fully hermetic compressor was used here.

In addition to the compressor, the research team adjusted other factors to reduce the amount of refrigerant. For example, the internal volume of the heat exchangers and the amount of oil required have been reduced. Additional components, such as sensors, have also been kept to a minimum, and the piping was kept as short as possible to reduce the internal volumes.

The LC150 project is funded by the German Federal Ministry for Economic Affairs and Climate Action and runs until March 2023. [C](#)

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PROS AND CONS: PRIMARY CIRCUIT VS BOILER SHUNT PUMPS

Opting for primary circuit pumps or boiler shunt pumps in a commercial heating system will depend on system and balance of cost, and system criticality. Hamworthy's Ian Roe explains

As discussed in CIBSE Guide B1, any heating system, regardless of size or complexity, consists of three sections: the primary circuit, which contains the heat generators; the secondary circuits, which contain the heat emitters; and the hydraulic connection between the primary and secondary circuits.

Primary circulation is important in maintaining correct system temperature output and ensuring boilers have the constant minimum flowrate as specified by the manufacturer. Your system flow will be managed by installing a pump or pumps into your primary circuit (unless your boilers have integral pumps). You'll need to choose whether you want a single primary circuit pump or multiple boiler shunt pumps.

A question we get asked a lot at our CPD seminars is: Which is best – boiler shunt pumps or a primary circulation pump? The answer is either, as long as the minimum flow is always maintained. And it will always depend on the project. In this article, we'll look at the pump options, and suitability to different applications.

A single primary circuit pump application is where the entire primary circuit flow is dependent on a single large pump. This pump needs to be capable of circulating the entire primary circuit at the minimum flowrates specified for the boiler or boilers while overcoming the resistance created by the heat exchangers, pipework and fittings, and any resistance created by hydraulic breaks, such as plate heat exchangers.

When a single primary circuit pump is installed providing circulation for a group (cascade) of boilers, the combined flowrate for all boilers, pipework, and hydraulic breaks must be added together and the highest resistance value used. Pipework should be configured as reverse return to ensure an even flowrate across the cascade. We design this concept into our bespoke pipework kits.

The primary pump must be set to a fixed flow. It is a common industry misconception that boilers can be forced to modulate by varying flowrates. However, boiler controls are not designed to do this and instead monitor flow and return temperatures. Attempting to force modulate modern boilers by varying flowrates from the



Single primary circuit pump



Boiler shunt pumps

pump will not produce the desired result and at worse, over prolonged periods, damage the boiler heat cells.

To maximise energy efficiency, reduce electricity usage and minimise potential heat losses through non-firing boilers, the installation of a two-port valve on the flow or return of each boiler to serve as flow prevention is recommended.

The individual valve would close when the boiler is not firing, stopping flow through the heat exchanger. The single primary circuit pump could then be controlled so that it reduces flowrate pro rata for each closed valve. Because of the slow opening times of these valves, it's important to ensure the boiler is set so that it does not fire before correct flow is established.

This arrangement is beneficial when there is insufficient space to install dedicated boiler module shunt pumps and if the project is a refurbishment where an existing pump might be suitable for re-use.

Another method to maintain correct flow in the primary circuit is to circulate the water through each boiler using a dedicated shunt pump per boiler. The pump is installed in the return connection to each boiler module to isolate flow when the module is not firing. Individual boiler pumps are wired to and controlled from their respective boiler module and usually given a five-minute overrun period.

Again, the rules of flow still apply. Minimum flow for the boiler must be maintained and the pump must not be allowed to modulate. If using a plate exchanger, care must be taken to ensure that the shunt pump(s) can overcome both the resistance created by the boiler, and

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» the resistance of the pipework and fittings, and that of the plate exchanger itself.

You will need to check what boilers you are specifying and if they already come with integral pumps. We sell correctly sized boiler shunt pumps as part of the boiler pipework kits on our Stratton mk2 wall hung boiler and Upton boiler.

Which method should I choose?

As stated earlier, there is no correct method, as long as minimum flow is always maintained.

However, there are some pros and cons to each (see panel below). Ultimately, both options allow you to maintain flowrate across your primary circuit with multiple boilers running in cascade. The decision will be based on criticality of building usage and the balance of cost against system reliability, and redundancy requirements.

For example, a building such as an office block that while inconvenient and possibly financially disruptive could be offline for hours or potentially days, may choose a single primary circuit pump with the possibility of twin head pump or duty/standby.

However, a system that simply cannot risk any downtime, such as in a hospital or prison, may choose to install individual boiler shunt pumps. The installation and maintenance costs could negate the cost and disruption, and the potential human suffering, that could result if the system is out of action for any length of time. □

■ IAN ROE is director and general manager at Hamworthy

PROS AND CONS

Single primary circuit pump

- You only need to purchase one pump, making it simpler to install, maintain, and potentially more cost-effective. However, the physical size of the pump will be much larger. This can create installation and maintenance challenges, as often it will require a three-phase power supply
- A single pump could create a single point of failure in the system. But this can be negated by installing a twin motor pump or two pumps as duty standby
- Pipework can be more complex, as you need to configure a reverse return. However, as mentioned previously, this is often built into manufacturers' pipework kits
- You may get potential heat losses through non-firing boilers.

Multiple boiler shunt pumps

- By installing multiple pumps, you have an increased system redundancy – should one pump fail, you still have other pumps running on other boilers to maintain heating
- The pumps will be physically smaller and simpler to install
- Modern boiler controls can often control the relevant boiler shunt pump, which takes the important pump overrun time away from the external controls
- Reverse return configuration is not required in this case
- Flow is isolated through non-firing boilers
- Cost will be increased as there are more pumps to purchase and this may result in additional maintenance because of the number of pumps
- There could be additional system complexity as there is an increased requirement for electrical supplies and controls wiring to each pump.

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Transitioning towards low GWP refrigerants

This module examines the drive for refrigerants with lower global warming potential (GWP) for building services applications

Changes to regulations on the use of refrigerants – and particularly hydrofluorocarbons (HFCs) – have coincided with growing attention on occupant health and comfort, as good indoor environmental quality and occupant wellbeing are increasingly considered fundamental for modern workplaces. This comes at a time of unprecedented volatility and uncertainty in energy markets reliant on fossil fuels, owing to the global disruption caused by Russia's war in Ukraine and the imperative of moderating the trajectory of climate change, as underlined by the Paris Agreement.

A recent International Energy Agency (IEA) report¹ estimates heating in buildings is responsible for 10% of global emissions. The report highlights that the use of heat pumps, powered by low emissions electricity, are the central technology in the global transition to secure and sustainable heating. The refrigerants employed in heat pumps and associated heating and cooling technology applications in building services systems in the non-developing world are largely HFCs. HFC refrigerants are widely employed because of their good thermodynamic properties (with individual HFCs formulated to suit particular applications), and typically have limited flammability and low toxicity. The evolution of HFCs was accelerated following the Montreal Protocol as a means of reducing ozone depletion. HFCs are referred to collectively, along with other fluorinated gases, as F-gases.

The release of F-gases into the atmosphere through leaks and discharges makes up around 2.4% of global greenhouse gas (GHG) emissions (according to 2019 data²). The HFCs used in heat pumps, refrigerators and other cooling devices are thought to account for more than 85% of global F-gas production. The F-gas regulation, originally introduced by the EU in 2014, has a key objective – to reduce the availability of HFCs in the marketplace, so encouraging applications of new and alternative refrigerants and novel technologies to reduce global atmospheric heating. (See boxout for further aspects of F-gas regulation.)

In the UK post Brexit, UK specific versions of the F-gas regulation came into force in January 2021, which technically mirror the EU F-gas regulation (EU No 517/2014). Compared with the baseline years (2009 to 2012), the current regulations have already reduced the official supply of HFCs by 55%, with a goal of 79% by 2030. Many manufacturers of split air conditioning units and heat pumps have worked swiftly to implement changes – notably with the

»

DESIRED OUTCOMES OF F-GAS REGULATIONS

The phase down of refrigerants is only one aspect of the regulations. To reduce the mass of HFCs that could otherwise leak into the atmosphere, the F-gas regs have requirements that:

- Prevent F-gas release (intentional or unintentional)
- Minimise leaks and ensure timely repairs when detected
- Require regular leak checks and record-keeping and, in some cases, require leak detection systems
- Ensures recovery of F-gases for recycling, reclamation, or destruction when equipment is decommissioned or repaired
- Restrict the sale of equipment to businesses that do not hold relevant qualifications
- Ensure correct product and equipment labelling.

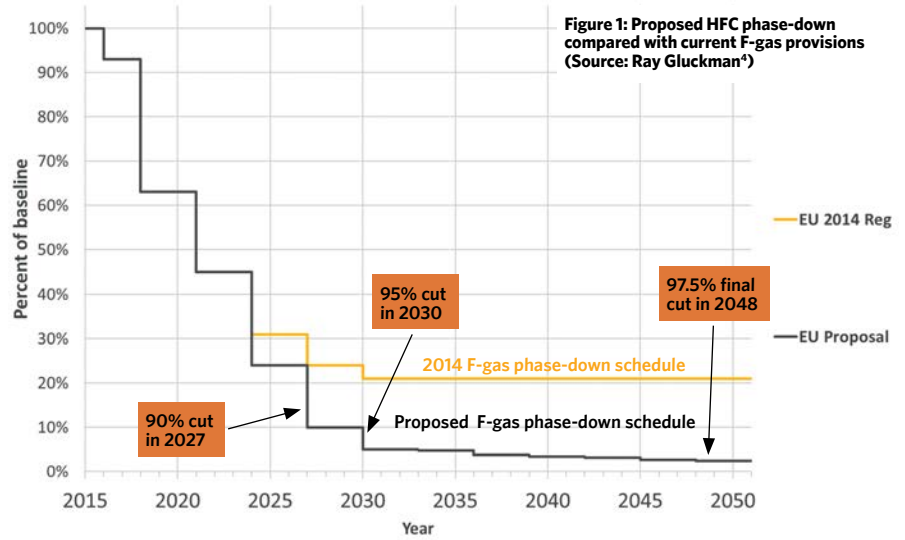
» widespread adoption of R32 (and blended refrigerants such as R454B) in high pressure applications that formerly employed R410A. There are numerous considerations to assess a potential refrigerant for operation at appropriate evaporating and condensing temperatures (as discussed in IoR Guidance Note 37³) not least the refrigerant density, operating pressures, thermodynamic properties and the resulting system energy performance, alongside safety in application, operation and reuse/disposal. Gluckman notes in his recent webinar⁴ that the swift changes in refrigerant application following the introduction of the F gas regulation were built on many years of research and development, which began well before the regulation came into being.

The IEA report¹ contends that even with today's F gas refrigerants and current rates of leakage, heat pumps still reduce greenhouse gas emissions by at least 20% compared with a high efficiency gas boiler, even when running on emissions intensive electricity. In regions accounting for 70% of world energy consumption, the resulting emissions savings are above 45%, and reach 80% in countries with cleaner electricity mixes. By employing alternative refrigerants, as discussed later in this article, IEA considers that these values can be improved by a further 10%.

The swiftly changing energy marketplace and the reinvigorated awareness of the impacts of climate change have accelerated the demand for the UK and the EU to undertake a review of the F gas regulations. In April 2022, the EU set out a first set of proposals with an ambitious timetable of becoming EU law in 2023 (these will likely also influence the UK deliberations on legislation that is scheduled to come into force in 2024-25). The proposals reinforce and extend the leakage, recharging, and refrigerant recovery provisions of the 2014 regulations but, most significantly, accelerate the phase-down schedule for HFCs to the timetable illustrated in Figure 1.

The headline proposals to accelerate the reduction in the availability of HFCs, as summarised in Table 1, have solicited both strong positive and negative opinions on the impact of a speedier reduction of HFCs.

To achieve GWP<150 in splits and heat pumps smaller than 12kW means potentially using a hydrocarbon (such as propane, R290); blended refrigerants such as R454C and R455A; pure HFOs such as HFO 1234yf or HFO 1234z; or a new, yet to be marketed refrigerant. As noted in the recent IEA report,¹ switching to non HFC refrigerants is technically possible, but there are risks impeding deployment, owing to the technical



Application	Limiting GWP	Implementation year
Any self-contained* refrigeration equipment	150	2025
Plug-in* and other self-contained air conditioning and heat pump equipment	150	2025
Split air conditioning and heat pumps	Less than 12kW	2027
	More than 12kW	2027

Table 1: Proposed changes to F-gas regulation (published April 2022²) *Interpretation of terminology still to be clarified

and cost implications, particularly as refrigerants cannot be simply swapped into existing units.

To meet the current and future F gas requirements, some safety challenges will need to be overcome. As F gas registration scheme operator REFCOM⁵ points out: The downside to lowering the GWP of a gas tends to be the increasing flammability or related issues. All flammable refrigerants (with flammability classification of 2L, 2 or 3 – see Table 2) will not ignite if the refrigerant concentration in room air stays below the lower flammability limit (LFL). BS EN 378 Refrigerating systems and heat pumps – safety and environmental requirements sets limiting refrigeration concentrations that are deemed safe for applications in buildings. The standard relates the size of an occupied space with the amount of refrigerant (contained in pipework, fittings and components) allowed within that space, and also sets requirements for any leak detection devices.

Many of the replacements for the legacy HFCs are mildly flammable and are classified as 2L – they are hard to ignite, and have a slow burning velocity, are considered to be safe for use in approved systems, and can be considered safe for general handling with appropriate practices and, importantly, with properly skilled operatives.

BS EN 378 restricts the amount of A2L refrigerants that can be used in occupied spaces, as well as requiring leak detection systems, and this can make the application of the lower GWP A2L refrigerants – for example, R32 – more complex in applications such as variable refrigerant flow (VRF) or split systems serving applications such as hotels and offices. An increasingly common way to obviate the need for safety constraints (as standardised by BS EN 378) while providing effective controllable systems, is to utilise a hybrid VRF approach, where the refrigerant is used between the outdoor unit and a hybrid branch controller box (often located in a restricted access area), with water then being used as the medium for transferring cooling or heating into the occupied spaces, as illustrated in Figure 2. Not only does such a hybrid VRF remove the need for leak detection, but it also uses significantly less refrigerant than a traditional VRF system. As a result, the overall carbon footprint of the equipment is reduced, and ongoing maintenance costs (including replacement of refrigerant) are also reduced.

A review of the European standard EN 378 is currently under way. It is thought that changes will include new refrigerant charge limits that should allow a wider

use of hydrocarbons, particularly in air conditioning equipment and heat pumps. Refrigerant charge will be more tailored to a given room size.⁶

CIBSE TM65 *Embodied Carbon in building services a methodology* specifically includes refrigerants as a significant contributor to the embodied carbon in building services systems. The refrigerant charge (the mass of refrigerant in the system) is related to the heating or cooling load and the method of distributing the heat around the building. When using split systems, including VRF, the distribution length can be minimised, and hybrid solutions can be explored to reduce the mass of refrigerant in the system. TM65 provides some useful tables (in the appendix) of estimated typical refrigerant leakage rates drawn from data collected from various global authorities – these are used in the assessment of the embodied carbon of a system. To minimise leakage, TM65 notes some examples of good practice, including ensuring low leakage rates during the use phase by frequent leak tests (as recommended by the F gas requirements); good maintenance regimes to avoid constant overpressure (as overpressure can create small cracks in the coils); installing pipework with brazed connections rather than flare connections; using controls to detect potential leakage; and, critically, ensuring that refrigerant be totally recovered at the end of the product life following proper management procedures.

Table 2 provides a selected list of example refrigerants. Refrigerant R410A is specifically included, as it has been widely used in the industry for many years



Figure 3: This CO₂ monobloc heat pump is specifically designed for commercial sanitary hot water applications, where gas boilers, combined heat and power systems (CHP) or electric water heating have traditionally been used (Source: Mitsubishi Electric)

because of its stable performance as a refrigerant. However, its high GWP of 2,088 means that it is soon to be phased out and replaced with lower GWP alternatives. R32 systems have already displaced many applications that would have formerly employed R410A. Hydrofluoroolefins (HFOs) and natural options such as propane, ammonia, carbon dioxide (CO₂) and water offer very low GWP, as shown in Table 2.

Several chiller options have been developed that use low GWP refrigerants, such as R32 or HFO 1234ze. Hydrocarbon (HC) refrigerants are increasingly applied for split systems and small heat pumps, particularly monobloc systems (which require a single outdoor unit). For VRF and larger split systems, A2L refrigerants seem to be a more likely option, with HFOs used for chillers and heat pumps. CO₂ is already used as a refrigerant for hot water heat pumps such as the one illustrated in Figure 3.

The choice of refrigerant type will ultimately impact the energy performance, carbon emissions and embodied carbon of an air conditioning or heat pump system. The near future will see a variety of refrigerants developed and applied in the market, some that inevitably will produce unintended consequences.

However, there is no opportunity for status quo. With careful and holistic examination, innovative systems and applications will dominate as we strive for cost effective, zero carbon opportunities in delivering safe and comfortable built environments.

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Turn to page 48 for references

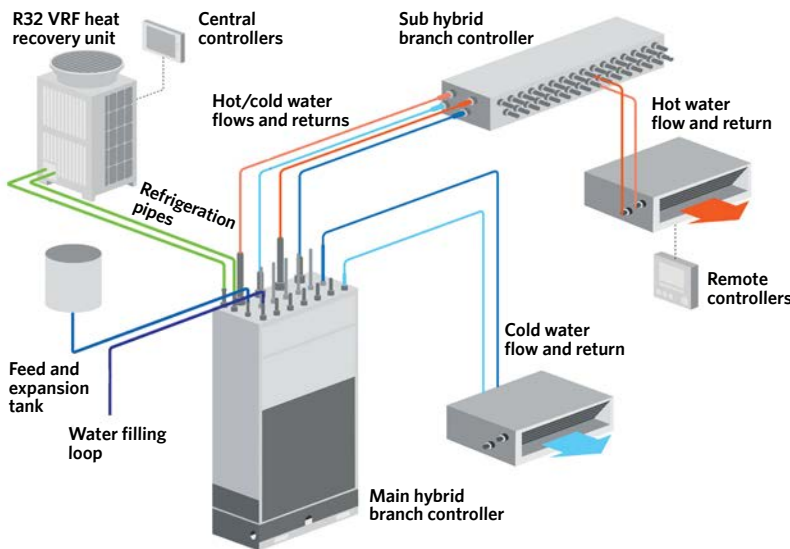


Figure 2: Example of hybrid VRF approach where the refrigerant is used between the outdoor unit and a hybrid branch controller box (often located in a restricted access area), with water then employed as the medium for transferring cooling or heating into the occupied spaces

Type	Refrigerant	GWP	Toxicity and flammability classification
HFO	R1234yf	<1	A2L
HFO	R1234ze	1	A2L
HC (natural)	R290 (propane)	3	A3
HFC	R32	675	A2L
HFC	R410A	2,088	A1
HFC	R454A	238	A2L
HFC	R454B	466	A2L
HFC	R454C	148	A2L
HFC	R513A	631	A1
(natural)	R717 (ammonia)	0	B2L
(natural)	R718 (water)	0	A1
(natural)	R744 (CO ₂)	1	A1

Toxicity and flammability classification: A= lower toxicity, B= higher toxicity; 1= no flame propagation; 2L = lower flammability; 3 = higher flammability (See BS ISO 817 for full definitions). Grey shading indicates those refrigerants with GWP<150

Table 2: Refrigerants commonly employed in building services systems



Module 211

February 2023

» 1. What is IEA's estimate of the carbon emissions resulting from heating in buildings?

- A 7%
- B 10%
- C 12%
- D 15%
- E 17%

2. When did the UK specific post Brexit F gas regulation come into force?

- A January 2019
- B January 2020
- C January 2021
- D January 2022
- E January 2023

3. In the potential phase down schedule, what cut in HFCs (compared with baseline) is proposed by the end of 2030?

- A 80%
- B 90%
- C 92.5%
- D 95%
- E 97.5%

4. Which of these refrigerants has the lowest GWP?

- A R1234yf
- B R290
- C R454C
- D R718
- E R744

5. What is cited as an increasingly common way to obviate the need for safety constraints as identified by BS EN 378?

- A Using brazed connections rather than flare connections
- B Ensuring that there are frequent leak tests
- C Using hybrid systems employing water for heat transfer in occupied spaces
- D Using hydrocarbon refrigerants through the system
- E Using split systems rather than monobloc systems

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References:

- 1 *The Future of Heat Pumps*, IEA 2022.
- 2 IPCC Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change Section B.1.4 2022, bit.ly/CJFeb23CPD1 - accessed 6 December 2022.
- 3 IoT Guidance Note 37 *Guidance on Refrigerant Selection* IoR 2021, bit.ly/CJFeb23CPD2
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- 7 BS ISO 817:2014+A2:2021 *Refrigerants - Designation and safety classification*, BSI 2021.

Products of the month

Rinnai N Series meets new UKCA standard

The Rinnai N Series hot water heating units and systems have been passed as fully certified by the new UKCA certification

Rinnai has announced that its N Series range of condensing continuous flow water heaters is fully certified to the new UKCA standard, the successor to the CE mark.

The UK Conformity Assessed (UKCA) marking is a new certification mark that indicates that new products conform with the applicable requirements of the market within Great Britain. It covers most products that previously required the CE mark, used by manufacturers to show that their products meet EU safety, health, or environmental requirements.

The UK government recently passed legislation to ensure that the CE mark was still recognised until 31 December 2024, effectively delaying the transition to the UKCA marking. Regardless of the delay, all Rinnai appliances within the water heater category will come with dual marking, making all hydrogen-blend and BioLPG-ready water heaters ready for UKCA.

This news closely follows Rinnai's announcement that, after an extensive testing and verification process, its N Series product range is 'hydrogen blend 20% ready' for any future supply of natural gas and hydrogen blends fed into the existing gas infrastructure.

Rinnai claims that all of its continuous flow condensing water heaters are guaranteed to provide limitless volumes of temperature-accurate hot water (in excess of 1,500 litres per hour). This guarantee is combined with market-leading turn-down ratios (13-1) and 96% efficiency.

The extensive testing has been carried out to further demonstrate that multiples of Rinnai's existing ranges are retrospectively compatible with future hydrogen blending. This includes all of the N Series models that have already been installed in the UK.

The Rinnai Sensei N Series continuous flow hot water heater range offers customers a more compact, enhanced combustion design that allows for easier installation and superior operational performance, as well as ease of serviceability.

The Sensei N Series is the first continuous flow hot water heating unit manufactured with



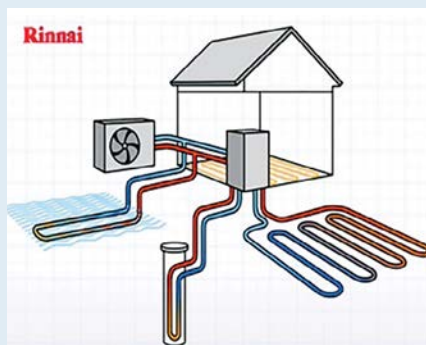
Rinnai's mission is to create a healthier way of living through advanced combustion and water control technologies

stainless steel heat exchangers to be available in the UK. This gives each of the four models in the range a greatly extended working life at optimum performance. Added to this are the market-leading extended warranties that accompany the hydrogen blend-ready and BioLPG-ready instantaneous water heaters.

The four models are:

- The N1600i, giving 954 litres per hour (at 50°C)
- The N1600e (external), also giving 954 litres per hour (at 50°C)
- The N1300i, giving 775 litres per hour
- The N1300e, also giving 775 litres per hour of temperature-controlled hot water at 50°C.

The two 1600 models have load profiles of XXL and are water efficiency class A-rated, while the 1300 models have a smaller load profile of XL



and are also water efficiency class A-rated.

The entire N Series range is low-NOx (less than 26ppm, meaning they gain additional points under Breeam). Additionally, the future-proofed continuous flow water heater uses Rinnai's patented advanced burner technology with a 13:1 turn-down ratio - the largest on the market, combined with 96% efficiency rating. Integral controls on the units enable the water heater to achieve high efficiencies because of advanced burner control and high modulation ranges.

This wide range of modulation means that energy usage is optimised, as the water heater - through smart inbuilt controls - will only heat the water to the temperature required, thus preserving energy.

Rinnai is a global player in the manufacture of domestic and commercial appliances and operates in almost 50 countries. Rinnai's mission is to 'create a healthier way of living' through advanced combustion technologies and water-control technologies.

As part of this mission, Rinnai has created its H3 initiative. This consists of hydrogen-ready and BioLPG-ready water heaters and boilers, hybrid solar thermal and heat pump solutions, and low-GWP heat pumps.

Rinnai's product and service offering is based on H3 - hydrogen, heating and heat pumps - which allows any site in a residential or commercial setting to maximise energy efficiency and performance in striving for net zero and decarbonisation.

- For more information on UKCA call: 01928 531870 or email engineer@rinnaiuk.com or sales@rinnaiuk.com
- Alternatively, use the smart online contact points help me choose or ask us a question on the website homepage at www.rinnaiuk.com

› Products of the month

Rinnai announces product roadmap in drive to net zero

The Rinnai H3 range is a key element in Rinnai's roadmap to low carbon heating and hot water

Rinnai has launched its 'H3' range of products, which consists of hydrogen blends-ready water heating systems in hybrid versions and a comprehensive selection of heat pumps specifically designed for commercial use. As part of the roadmap, it is also expected to launch electric formats to existing product ranges.

Launched in stages, it is the biggest range of hot water heating solutions for residential and commercial sites in hydrogen-blends gas and electric format, hybrid formation, and heat pump-driven.

'There will be a need for a variety of solutions to the energy trilemma - there is not one single fuel or appliance that is the answer to all the problems,' said Chris Goggin, operations director for Rinnai.

'Our company operates across five continents, producing more than two million



water heating units each year. We have a global reach of more than 650 design engineers, plus testing facilities in Japan, America and Australasia. We have moved quickly, as we perceive that the market is fast-changing.'

Rinnai wants to take a position of responsibility in offering high-quality products that work for the customer in the best way possible. 'We believe implicitly in this basic premise,' said Goggin. 'We do the very best we can to achieve what our customers want and expect. That includes anticipating the future. We must reduce the use of high carbon-content fuels as soon as possible. However, there is still the need for the assessment of the technical, practical and

economic feasibility within the UK's unique housing stock of more than 25 million units. We aim to continue towards net zero without compromising on product quality or customer satisfaction.'

The new H3 products and formats meet or exceed existing or proposed UK legislation or certifications. This follows news that Rinnai has commissioned a comparative review and report on gas and electric appliances using a variety of energy vectors in residential and commercial UK scenarios.

■ **For more information on the Rinnai product range visit www.rinnaiuk.com**

Fire detection system installed in Ireland's tallest building

Nittan Elite Partner, Fire Technology Ireland, commissioned and supplied an L1 addressable fire-detection system at the EXO - Ireland's tallest building - in Dublin.

More than 1,350 Nittan Evolution Analogue Addressable devices were installed in the 16-storey building, along with Advanced Electronics MxPro 5 Series fire alarm panels and network.

The units have a 360° viewing angle Omniview ring to allow for quick location and identification of any problem that may arise.

■ **For more information contact Nittan on 01483 769555, email sales@nittan.co.uk or go to www.nittan.co.uk**



Fire safety valve from Aquatech Pressmain

The fire priority demand valve from Aquatech Pressmain is designed to be fitted to the cold-water branch of any combined domestic water and sprinkler system supply.

In the event that sprinklers are activated, the valve will close, isolating the flow of domestic water. This enables the booster set to pump all available water to the sprinkler system.

The valve is fitted with a failsafe close on power failure and break tank level interlock to meet the requirements of BS9251:2021.

■ **For more information visit www.aquatechpressmain.co.uk or contact sales@aqp.com**



New AW Monobloc heat pumps from Modutherm >

Modutherm is introducing a new AW Monobloc range of commercial heat pumps, offering heating, cooling and hot water outputs designed for a wide range of applications.

Three models are available - 30kW, 45kW and 90kW - with all units capable of cascade arrangements of 16 units from one controller, providing a maximum combined output of 1,440kW.

Using inverter-driven compressor and enhanced vapour-injection technology, the AW Monobloc has an A++ energy efficiency rating, alongside a COP of up to 5.06.

■ For more information visit www.modutherm.co.uk



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Polyethylene tanks are a key feature of the DrainMajor wastewater pumping system range from Pump Technology. Relatively easy to recycle, the material can be repurposed into bins, brooms and toys.

Not all wastewater pumping systems feature tanks that can be recycled at the end of their working life. Tanks constructed from glass-reinforced plastic (GRP) are very difficult to recycle and won't biodegrade in landfill.

■ For more information contact Pump Technology Ltd, authorised by Jung Pumpen GmbH, on 0118 9821 555 or visit www.jung_pumps.co.uk



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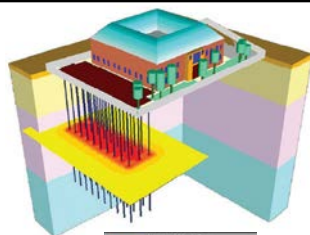
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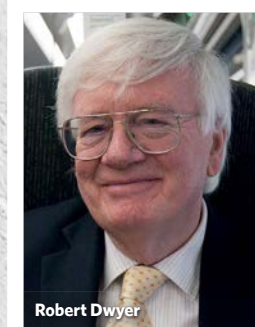


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Lethal presence

Asbestos was a common insulation material in building services until the 1970s, and is an acute risk for those involved in the demolition or refurbishment of plantrooms. Robert Dwyer works with Mesothelioma UK to raise awareness of its dangers in the building services industry

Asbestos is still a malignant presence in construction, even though it has not been used in new buildings since the 1970s. More than 5,000 deaths a year in the UK are attributed to asbestos exposure, with around half of those dying of lung cancer and half of mesothelioma, a form of cancer.

Robert Dwyer, a specialist in asbestos removal, has been co-opted onto the committee of Mesothelioma UK to advise it on removing asbestos in the building services industry. He is campaigning to make owners and occupiers more aware of the dangers of asbestos in existing buildings and will be participating in Global Asbestos Awareness Week from 17 April.

Why did you become involved in raising awareness of asbestos?

On 4 October 2017, I was holding my brother's hand as he died a dreadful death from mesothelioma, an experience that haunts me. It galvanised me into helping with research into the science behind the disease. I also have a former client and very dear friend now afflicted with it.

What is your experience of asbestos?

I started work as an apprentice in 1960, building a steam grade boiler plant lagged in magnesia asbestos, which was thrown about like confetti and the guys went home covered in it. It was mixed in a large tin bath as a poultice, such as plaster might be made. It was applied to pipework and boilers by the handful, smoothed down to an even coating by spatula, and finished with Keene's cement – a very hard plaster.

I subsequently worked on the development of Leeds University, where the buildings were bedecked with asbestos cement boarding. The air conditioning air handling unit was insulated with it, as was the central boiler plant and vast network of underground steam and water mains. Magnesia asbestos insulation remained the first choice of consultants when specifying works into the 1970s.

I have since been routinely engaged in the removal and cleansing of asbestos in boiler rooms, working with surveyors and the contractors in the planning and management of its removal, usually in preparation for major boiler renewals.

I am keen to raise awareness among managers of residential estates, as well as the occupiers, who, ultimately, have to bear the now horrendous cost of cleansing it (about £180,000 in one case that I am working on).

What are the issues with asbestos in construction today?

Risks for the construction industry are now in the demolition and refurbishment of buildings dating from the late 1800s to the 1970s. Convincing owners and property managers of the unseen, long term risks of the disease is an uphill task. They are all too often unaware of their corporate and personal liabilities under sanction of the Health and Safety Executive, which can extend to imprisonment.

What needs to be done to minimise risk to workers and occupiers?

Rigid enforcement of awareness training is required, together with engagement of only the best surveyors. Their reports should be double checked by professionals such as myself, who have wide experience of where asbestos is likely to be found.

Building dutyholders – which could be the owner, occupier or landlord – should be made aware of their legal responsibility under the Control of Asbestos Regulations 2012 (bit.ly/CJFeb23RD) to identify the location and condition of asbestos in premises, and to manage the risk to prevent harm to anyone who works on the building or to building occupants.

What will you be doing for Global Asbestos Awareness Week?

I will be engaged in discussions with the relevant MPs in parliament and elsewhere, drawing upon my first hand knowledge and bitter experience of the disease.

Those wishing to assist in the eradication of the disease and support research into the pathology of mesothelioma, can do no better than to contribute generously to Mesothelioma UK, a registered charity dedicated to the cause (www.mesothelioma.uk.com).

EVENTS



NATIONAL EVENTS AND CONFERENCES

CIBSE Building Performance Awards

1 March, Park Plaza Westminster Bridge, London
Celebrate with the winners and see what can be achieved by those developing strategies for the energy efficient operation of buildings. cibse.org/bpa

CIBSE Technical Symposium

20-21 April, University of Strathclyde, Glasgow
The 2023 symposium will focus on the challenge of delivering net zero carbon buildings over the next 25 years. www.cibse.org/technicalsymposium

CIBSE REGIONS AND GROUP EVENTS

For up-to-date information on regions and groups meetings, webinars and podcasts, visit www.cibse.org/events

SLL and Yorkshire: Exterior lighting for people

9 February
Hybrid event, with Professor Steve Fotios, of the University of Sheffield, discussing how external lighting affects our perception of space and our ability to perform visual tasks.

LIVE ONLINE TRAINING COURSES

CIBSE's courses are run as in-person and live online training.

See upcoming courses below:

Design of heating and chilled water pipe systems
7 February, live online

Mechanical services explained
7-9 February, face to face, London

Fire safety building regulations: Part B
8 February, live online

Low carbon consultant building design
9-10 February, live online

ISO 50001:2018 Energy management system
9-10 February, live online

Mechanical services explained
14-16 February, live online

Electrical services explained
14-16 February, live online

Introduction to the Building Safety Act
16 February, live online

Energy strategy reports
17 February, live online

Power system harmonics
20 February, face to face, London

Air conditioning and cooling systems
21 February, live online

Building services explained



CIBSE JOURNAL WEBINARS

The latest *CIBSE Journal* webinar, sponsored by Kohler, titled 'Getting the elephant in the room - effective design of resilient UPS facilities', is now available on demand. Register to watch this and all other *Journal* webinars at www.cibsejournal.com/cpd/webinars

21-23 February, live online

Energy efficiency related building regulations: Part L
22 February, live online

Embodied carbon in MEP design: how to use CIBSE TM65
24 February, live online

Energy efficiency related building regulations: Part L
27 February, face to face, London

Low carbon consultant building design
27-28 February, face to face, London

Fire safety building regulations: Part B
2 March, face to face, London

Energy Savings Opportunity Scheme
3 March, face to face, London

Above ground building drainage
6 March, live online

Introduction to heat networks and code of practice
6 March, live online

Energy efficiency related building regulations: Part L
7 March, live online

Mechanical services explained
7-9 March, live online

Low carbon consultant building design
8-9 March, face to face, London

Mechanical services explained
14-16 March, live online

Low carbon consultant building design
8-9 March, face to face, London

Earthing and bonding systems
10 March, live online

Emergency lighting to comply with fire safety requirements
14 March, face to face, London

Low and zero carbon energy technologies
17 March, live online

Overview of IET wiring regulations (18th edition)
20 March, face to face, London

Heat Networks Code of Practice (CPI)
20-21 March, face to face, London

Low carbon consultant building design
20-21 March, live online

Building services explained
21-23 March, live online

ISO 50001:2018 Energy management system
27 March, live online

For all 2023 training courses, visit www.cibse.org/training

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Upcoming webinars:

- 21 and 28 February
- 7 and 14 March



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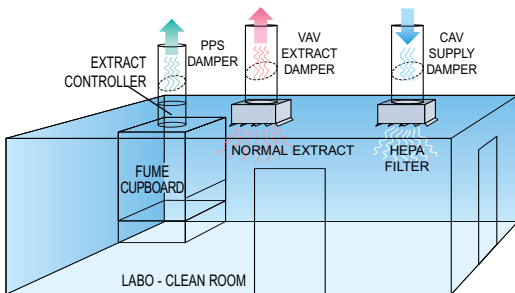


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