

## PRIOR ENGAGEMENT

How a Cambridgeshire village is using community heat pumps and a solar farm to phase out fossil fuel heating

REMEMBERING  
MAX FORDHAM

ARUP'S RETROFIT OFFICE  
AT 80 CHARLOTTE STREET

2022 HAYS SALARY SURVEY:  
ENGINEERS IN DEMAND



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# Remembering Max



The death of Max Fordham FCIBSE last month marked a solemn start to 2022. Max was the best known and most influential building services engineer in the UK. His integrated approach to design was ahead of its time, and meant he was revered far beyond the sector, admired by leading architects and engineers from across the professions.

Max's legacy will live on in his groundbreaking buildings, the partnership he created, and the number of talented, freethinking engineers that he inspired to set up on their own. All his work was determined by occupant comfort and optimal performance, and his last project – his own home in Camden – embodied

everything that Max stood for. As Bill Bordass says in our tributes to Max on page 18, his house embodies his lifetime ambition of no heating, no cooling, and no lighting while the sun is above the horizon.

Max's creative thinking will be much missed as we strive to decarbonise buildings, while making it safe and comfortable for all. One of the great challenges in the UK is tackling the off grid rural communities that currently rely on fossil fuel boilers for heating and domestic hot water. On page 20, we interview the engineers behind the heat network being installed in the village of Swaffham Prior, Cambridgeshire.

This spring, the first villagers will be able to link up to a network of hot water pipes connected to an energy centre, featuring both ground source and air source heat pumps. Bouygues E&S has worked closely with Cambridgeshire County Council (CCC) to consider how such a scheme can be economically and technically feasible.

Working in CCC's favour was a solar farm it owned nearby that Bouygues was able to connect to the energy centre without going through the National Grid. The boreholes for the ground source heating have been positioned in a field that is also owned by CCC.

The scheme is likely to be a blueprint for other similar schemes, and offers valuable lessons for those creating sustainable methods of decarbonisation for off grid communities.

The 2022 Hays Salary Survey finds the building services sector in upbeat mood, with 98% of employers surveyed saying they expect activity levels to increase or stay the same in the next year, and 83% expecting to recruit over the same period.

An impressive 68% of employees say they feel positive about their career prospects, compared with 35% last year, but they don't just want jobs that pay more money – 60% of professionals said they would be prepared to accept a lower paid job for a better work life balance or a role with more purpose.

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

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### Hywel Davies

The practicality and usefulness of testing building products and systems in the wake of the Grenfell Tower fire



### Jo Harris

Why the next version of the 'maintenance bible' Guide M will have a focus on competency



### Harry Playfair

One of CIBSE's Apprentices of the Year on work-based learning and motivating young engineers



### Tim Dwyer

This month's CPD is on assessing phenolic foam ducts for reduced embodied and operational carbon



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## IN BRIEF

### Economic scars of pandemic revealed

Consulting engineers saw drops in revenue growth and headcount last year, according to a new study, by the Association for Consultancy and Engineering (ACE), that reveals the scars left by the pandemic.

Ace's Benchmarking Study for 2021, published last month, covers about 60% of the sector by market value. It shows staff numbers decreased by an average of 4.2% at larger firms and 17.4% at small and medium sized enterprises (SMEs). This led to a drop in overhead and operating expenses by 17.9% and 19% for large consultancies and SMEs respectively.

Revenue growth was also down sharply for large companies - 1.7%, compared with 6.3% in 2019. SMEs revenue growth fell to 1.3% from 3.4% two years ago.

### Chip shortage could squeeze boiler supply

A global shortage of semiconductors is constraining the availability of boilers at a time when demand is exceptionally high, according to the Construction Leadership Council (CLC).

Although it had not seen direct evidence that a shortage of chips is affecting production, the CLC's product availability working group is to increase market surveillance to spot early signs of disruption.

It added that, because of the size of orders, there is a bias in the supply chain towards automotive and electronics firms, which may cause issues for manufacturers of boilers and building related electrical systems when semiconductors are in short supply.

### Gas grid set to deliver hydrogen from 2023

Plans published by the Energy Networks Association show that Britain's gas grid will be ready to start blending hydrogen in the country's network from next year.

Britain's hydrogen blending delivery plan outlines how all five gas grid companies will meet the government's target for gas pipes to be ready to deliver 20% hydrogen to homes and businesses from 2023, as a replacement for up to a fifth of the natural gas currently used. Britain's gas fired power plants will also be able to use blended hydrogen to generate cleaner electricity, the plan says.

# Tributes pour in for 'true visionary' Max Fordham

## Industry mourns 'father' of modern building services

Industry figures have been paying tribute to building services pioneer Max Fordham FCIBSE FREng, who died last month, aged 88.

Max set up Max Fordham & Partners in 1966, with his wife Taddy. The company became one of the most influential in the building services sector, with many of its alumni going on to form groundbreaking design practices of their own.

Consultant Bill Bordass said of Max: 'What a mind, what a character, what a legacy - his imagination, his buildings, the firm that bears

his name, and the generations of scientists that he turned into environmental designers and engineers.'

One of the great champions of sustainable building design, Max was CIBSE President in 2001 and won the CIBSE Gold Medal in 1997. He was elected a Fellow of the Royal Academy of Engineering in 1992 and, in 2008, won the prestigious Prince Philip Designers Prize.

Terry Wyatt, FCIBSE and CIBSE past-president, said: 'He was a prominent figure in our profession, which is now diminished by his departure.'

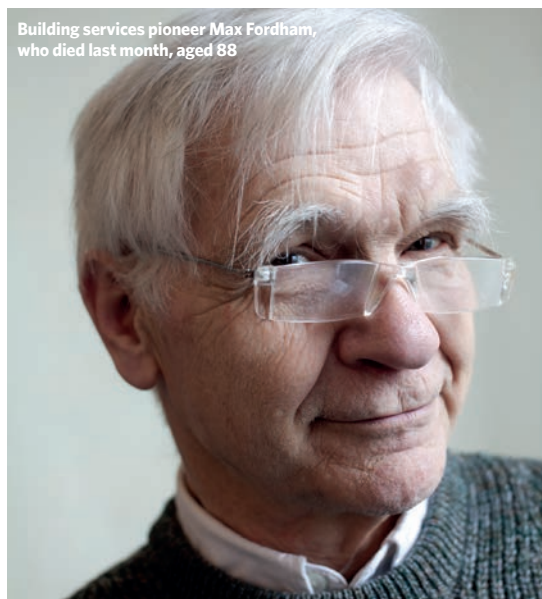
Simon Allford, co-founder of architects AHMM and current RIBA president, said: 'He was a true visionary - a pioneer of sustainable design and engineering. He collaborated on projects across sectors - from housing estates to theatres and arts centres - helping to create a vast portfolio of exceptional buildings.'

Rod Bunn, past editor of *CIBSE Journal*, said: 'Max was a father figure to the industry. We owe him a great debt.'

Max's contribution to engineering extended beyond building services. He patented inventions and brought new rigour to delivering building performance.

More recently, Max Fordham's contribution to Passivhaus buildings design won the consultancy consecutive CIBSE Building Performance Awards for housing, with Max's own Passivhaus home winning Residential Project of the Year in 2021.

Other notable projects under his leadership include Tate St Ives, Alexandra Road estate, Camden, the Judge Business School, and Manchester's Contact Theatre.



Building services pioneer Max Fordham, who died last month, aged 88

## Work life balance key for engineers

Building service employees are in a bullish mood about their prospects and many are looking for more flexibility on work-life balance and location, according to the latest Hays/*CIBSE Journal* annual salary and benefits survey. The proportion who feel positive about their career prospects has nearly doubled, from 35% this time last year to 68% now. The average pay rise recorded in the survey was 3.4%, which compares with 1.1% last year.

Nearly half (45%) of the engineers surveyed said they had moved jobs in the past 12 months, and a further 31% had considered moving. The main reason given for wanting to leave their current role was the salary or benefits package (27%), followed by location (26%). More than half (60%) said they would be prepared to accept a lower-paid job for a better work-life balance or a job with more purpose. A third (33%) said they would be prepared to take a lower-paid job for better work-life balance alone.

Nearly half (48%) said they would be tempted to change employer if offered flexible hybrid working, and 47% said they would prefer their organisation to increase its focus on flexible working. More than three-quarters (78%) said an organisation's purpose is important when considering a role.

Andrew Swain-Smith, chair of building services engineering at BDP, said: 'People are looking to move for reasons other than... salary. Clearly, people don't change jobs without seeking to maximise the opportunity to increase their salary, but I don't see that as a driver in the same way as in the past.'





## Coalition calls for energy saving Stamp Duty rebate

### Letter calls on Chancellor to incentivise domestic retrofits

A group of UK industry groups, businesses and charities has written to the Chancellor of the Exchequer calling on the UK government to support an energy saving Stamp Duty incentive to encourage homeowners to future-proof their homes against high energy bills.

The CIBSE-backed Energy Efficiency Infrastructure Group (EEIG) believes that the introduction of such a tax rebate would incentivise the 19 million owner-occupier households in the UK to implement energy saving measures such as insulating their homes and installing energy efficient heating systems such as heat pumps.

The EEIG, which is a broad-based coalition made up of industry groups, insulation manufacturers, energy companies, retailers, and retrofit experts pointed to the looming energy price crisis,

which 'has brought the UK's dependence on imported gas into stark relief'.

It said action was needed to reduce emissions from homes, which have risen over the last six years and now account for 20% of the UK's carbon emissions'.

The EEIG claimed its proposal for an energy saving Stamp Duty incentive would be a low-cost, revenue neutral catalyst that would ensure that installation of vital energy efficiency measures become part of the house purchase process. It said it would act as a driver for discussions with banks or other lenders about funding.

The rebate would encourage people to actively think about the performance of the home they are purchasing, so they can consider potential improvements and costs, said the EEIG.

It said an intervention 'could prove more effective, and simpler, than a large-scale, short-term, costly grant'.

More details at [bit.ly/CJFeb22EEIG](https://bit.ly/CJFeb22EEIG)

## GUV no magic bullet, says Noakes

Installing germicidal UV (GUV) air cleaning technology solutions using UV-C radiation systems is 'not a magic bullet' for eliminating airborne respiratory viruses, such as Covid-19, from buildings, according to Professor Cath Noakes MBE, a member of the UK government's Scientific Advisory Group for Emergencies.

'Ventilation is part of mitigation and GUV is part of that answer, but it can't solve a fundamentally unventilated space,' said Noakes, of the University of Leeds School of Civil Engineering, during a recent BESA webinar.

In her presentation, Noakes said it was all about finding the right system for the right space, as she outlined several air cleaning strategies to reduce transmission of respiratory diseases.

'Putting air cleaners in is not a magic bullet - it mitigates one of the routes of transmission, but it doesn't mitigate everything, and it's important that we remember that - it's about reducing risk rather than removing risk,' she said.



Professor  
Cath Noakes

## Government must do more ahead of climate impacts

A government report on climate change has identified eight priority risks that require urgent action as a result of global warming. They include risks to human health, wellbeing and productivity from increased exposure to heat in homes and other buildings.

The *Climate change risk assessment report* states that the UK government and devolved administrations have made some progress, but must go much further and faster to truly prepare for the impacts of a warmer world.

The report was published amid mounting anxiety over rising gas costs, which are set to push the price cap on household energy bills to nearly £2,000 when it is revised in April.

## CIBSE recommends whole building retrofits

The recent update to Building Regulations missed opportunities to tackle existing stock, according to CIBSE's head of sustainability Julie Godefroy. She says there are limited changes to Approved Document L governing energy use for existing buildings, and the requirements still rely on an elemental approach, where thermal efficiency targets are set for individual components.

The approach does not maximise opportunities, does not sufficiently make the links between energy, overheating, air quality and fabric, and does not prevent carbon lock ins and unintended consequences, said Godefroy.

CIBSE recommends a whole building approach, as promoted in PAS 2035 and 2038. Works to existing buildings should put them on track to net zero, as a one off or as part of a step by step retrofit plan, added Godefroy.

Following LETI's *Climate emergency retrofit guide* for homes, CIBSE and LETI are working on a non domestic building version. Find out more at [bit.ly/CJFeb22retrofit](https://bit.ly/CJFeb22retrofit)

## Covid 19 loses 90% of its infectivity in five minutes

Coronavirus loses much of its ability to infect after five minutes in the air, as the aerosols in which it is transported dry out, according to a new academic study by the University of Bristol's Aerosol Research Centre.

It concluded that there is a 90% decrease in infectivity of Covid 19 over 20 minutes, and a large proportion of the loss occurs in the first five minutes after the virus is transmitted via aerosols. The decline is heavily influenced by humidity, with salts inside the droplets crystallising more rapidly in drier conditions, leading to a near instant loss of infectivity in more than half of the virus.

Cath Noakes, professor of environmental engineering for buildings at the University of Leeds, tweeted that the study is important, but doesn't undermine the value of ventilation. She said: In most spaces aerosols will disperse throughout the room in five minutes and as long as the infector stays in the room they are continually produced.



## IN BRIEF

### Boost building safety through procurement

The Department for Levelling Up, Housing and Communities has published new guidance on how collaborative procurement for design and construction can boost building safety. The guidance is designed to support the more stringent regulatory system being introduced through the Building Safety Bill.

### New SCA guides focus on vents and fans

The Smoke Control Association (SCA) has released two new reference guides, the first of which provides information on natural smoke and heat exhaust vents. The second aims to raise awareness of the fact that powered smoke extract fans selected, manufactured and installed in accordance with EN 12101 3:2015 must then be maintained correctly.

# Developers and manufacturers must pay for unsafe cladding

## Housing Minister confirms cost of remediation will not fall on leaseholders

The Secretary of State for Levelling Up, Housing and Communities has threatened to impose a £4bn levy on developers if they don't pay to fix unsafe cladding in leaseholders' homes.

In a statement to the House of Commons last month, Michael Gove said leaseholders in flats between 11m and 18m high will no longer have to pay towards the costs of fixing cladding.

In a letter to the Construction Products Association, he also said manufacturers of cladding and insulation would be expected to contribute to the costs. The letter stated that the cost to remediate unsafe cladding on 11-18m and 18m-plus buildings would be £4bn and £5.1bn respectively. It went on to say: 'The total contribution from the cladding and insulation sector must represent a significant portion of the total remediation costs, caused by the dangerous products sold by some of your members.'

The Levelling Up, Housing and Communities Committee is scrutinising the impact of Gove's announcement and how developers might pay. Clive Betts MP, chair of the committee, said: 'Gove's announcements on 10 January were a welcome step towards finally addressing the question of meeting the costs of making residential blocks safe, rather than dumping the burden on flat-owners.'

Gove also outlined a package of building safety measures, and confirmed the government is withdrawing guidance that the Secretary of State said had been 'wrongly interpreted' by industry to require remediation of all cladding irrespective of building height. Building assessments will also be audited to make sure expensive remediation is only advised where 'necessary' to remove a threat to life, said Gove.

Dame Judith Hackitt, who chaired the Independent Review of Building Regulations and Fire Safety, said the government's package would be a 'great relief' for many leaseholders.



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## Building safety charter response disappointing

The number of organisations signing up to the industry-wide Building a Safer Future Charter has been branded 'disappointing' by Dame Judith Hackitt's Industry Safety Steering Group (ISSG).

Its third annual report, published last month, says that despite 'strong examples' of positive action, industry still needs to do 'more work to regain the public's trust'.

The group, chaired by Dame Judith, was set up in 2018 to scrutinise the industry's progress following the publication of her landmark review of Building Regulations and fire safety.

'It is disappointing that we still cannot report a critical mass or groundswell of action across industry to suggest there is significant momentum on culture change,' the report states. 'We still see an industry that, at best, is in compliance mode rather than a leadership mode.'

'This is starting to happen in some places, but must be done more proactively, visibly, faster, and across the whole breadth of industry and throughout the supply chain.'

There was an 'over-reliance on the usual players' to lead the way, according to the report; others were waiting to be told what to do and were 'hiding' behind trade and professional organisations. It added that there were a considerable number of organisations that think 'meaningful change cannot be achieved ahead of legislation, or that it is not necessary for it to happen any sooner'.

The ISSG said there had been 'good progress' on the BSI's programme to develop a suite of national competence standards, but it expressed concern about 'the industry's ability to bring this together and deliver coherent frameworks of competences that meet the needs of the sector'.



## GOOGLE INVESTS IN OFFICE WORKING



Google has bought the Central Saint Giles offices in London's West End

Google has purchased Renzo Piano's striking offices in London's West End for £730m, as it announced plans for expansion in the UK.

The search engine giant said its purchase of the Central Saint Giles development, where it currently rents office space, represented its 'continued confidence in the office as a place for in-person collaboration and connection'.

Google added that it plans to boost its number of employees in the UK from 6,400 to 10,000. The company's UK headquarters, in London's King's Cross, is due to be completed in 2024.

## Construction output jumped 3.5% in autumn recovery

**November's figures mark biggest monthly rise since March 2021**

Construction output rose in November to the highest level seen since September 2019, according to the Office for National Statistics' (ONS') latest snapshot of the sector.

The ONS monthly figures show that construction output increased by 3.5% in November 2021, to £14.6bn. This was the largest monthly rise in construction output growth since March 2021, and contributed to the first three-monthly increase since July 2021. Construction output increased 1.6% in the three months to November 2021.

There were also increases in the levels of new

work and repair and maintenance – by 1.5% and 1.6% respectively – during the three months ending November 2021.

According to the ONS, anecdotal evidence from survey returns suggest the main reasons for the increases were strong demand for work, an easing of supply chain bottlenecks for certain products, and the unseasonably mild and dry weather during November.

The upbeat construction figures in November were driven solely by an increase in new work, which rose by 5.7%, while there was a slight decline of 0.2% for repair and maintenance.

The level of construction output in November 2021 was 1.3% (£197m) above the February 2020, pre-coronavirus pandemic level.

### IN BRIEF

#### Energy prices high for at least two years

Soaring energy prices could last up to two years, the boss of the UK's biggest energy supplier has said. Chris O Shea, chief executive of British Gas owner Centrica, told Radio 4's *Today* programme that there was no reason to expect gas prices would come down any time soon in the next 18 months to two years.

#### Covid disrupts firms net zero plans

Almost half (48%) of Irish and UK industrial businesses are aiming to be carbon neutral in the next three to five years. However, the survey carried out by energy management company Schneider Electric said 39% reported that the pandemic had disrupted their plans to become more sustainable.

#### BSI publishes fire risk code for cladding

The British Standards Institution (BSI) has published a new code of practice for the fire risk appraisal of external wall construction and cladding of existing multi-storey and multi-occupied residential buildings. PAS 9980:2021, *Fire risk appraisal of external wall construction and cladding of existing blocks of flats*, is for use by fire engineers and other competent building professionals when doing a fire risk appraisal of external walls.

## Conference addition for façade awards

The Society of Façade Engineering (SFE) has joined forces with Zak to co-locate the SFE Façade Awards & Dinner with the Zak World of Façades London conference.

The event, taking place on 3 November 2022 at the Hilton Park Lane, London, will bring together professionals from across the globe and will represent one of the largest gatherings for the sector.

Zak World of Façades is a global international conference on façade design and engineering, providing an opportunity to enhance knowledge and skills on key subjects related to building envelope design, engineering, fabrication and installation.

The SFE Façade Awards recognise and reward excellence and achievements in façade engineering, raising the profile of, and drawing attention to, the importance of this discipline in modern architecture.

The awards will take place after the conference and be presented at the dinner. For more information about the conference, visit [www.zakwof.com](http://www.zakwof.com) For details of how to book a place at the dinner, and for sponsorship opportunities, contact [aemmett@cibse.org](mailto:aemmett@cibse.org)



## Time to reflect on CPD and a new portal

Under new continuing professional development (CPD) requirements, CIBSE corporate members are now required to address the following questions when recording their CPD:

1. What did I learn from this activity?
2. How will I apply this learning to my work?
3. How will I further develop this learning to meet any gaps in my knowledge, skills and understanding?

To help with this, CIBSE has launched a new professional development portal: [mycareerpath](#). Owned and developed by the Engineering Council, the portal can be used to plan, record and reflect on CPD, as well as track individual competence, as you work to achieve Engineering Council registration.

It will also help staff and volunteers to streamline the audit process; CIBSE currently audits 10% of members each year.

The [mycareerpath](#) portal can be accessed in the MyCIBSE area of the website, under My CPD. Please note, it is for membership use only. CIBSE Certification will continue to use the previous portal.

# BSER&T special to focus on circular economy

## Journal calls for research papers on a range of building services topics

Abstracts are being sought for a special issue of *Building Services Engineering Research and Technology (BSER&T)* to highlight the latest knowledge and developments in all areas related to building services as a key element of the circular economy.



Recyclability is one area covered by the call for papers

If you have research or practice that could be suitable to feature in this special issue, and are able to produce a robust, peer-reviewed research paper or technical note or review paper, the editorial board would like to hear from you. They are looking for research papers in the following areas:

- Circular economy of building services systems and/or products
- Embodied carbon
- Maintenance and operational aspects
- End-of-life recyclability and reusability of building services and systems
- Circular economy models, methods and tools
- Circular economy in sectors such as hospitality, supermarkets and offices
- Circular economy case studies.

The deadline for abstracts (of no more than 200 words) is 14 March. Visit [bit.ly/CJFeb22BSERT1](https://bit.ly/CJFeb22BSERT1)

- The deadline for sending abstracts for the issue on *Future fit performance of homes* is 14 February. Visit [bit.ly/CJFeb22BSERT2](https://bit.ly/CJFeb22BSERT2)

# Nominations and appointments of officers, board members and council members

## CIBSE Board announces candidates ahead of May AGM

New CIBSE officers, board members and council members take office each year from the AGM in May. Officers and board members serve on the Board, which is the Institution's governing body. It comprises the seven officers (President, president-elect, three vice-presidents, honorary treasurer and immediate past president) and five board members.

The Institution's By-Laws and Regulations require that all candidates for officer and board member vacancies arising at the AGM must be considered by the Institution's Nominations Panel, to which all sections of the Institution are invited to suggest candidates for consideration.

The Panel gives careful thought to its recommendations and seeks to reflect Charity Commission guidance by nominating a range of candidates with the skills and experience required to fulfil the Board's role as the governing body of a significant

registered charity. It also seeks to ensure that the Board includes a balance of representation from different sectors of the industry.

Having considered the advice of the Panel, the Board nominates candidates for president-elect and board member vacancies. The Board's candidates for vacancies arising at the AGM in May 2022 are as follows:

**President-elect: Adrian Catchpole CEng FCIBSE; members of the Board: Lionel James CEng MCIBSE, Ruth Kelly Waskett CEng MCIBSE, David Stevens CEng FCIBSE**

The Board, having considered the Nominations Panel's advice, also appoints three vice-presidents and the honorary treasurer to take office at the next AGM. These appointments are normally made from those who serve, or have served, on the Board, and all those listed below are current or past officers or board members. The Board's appointments to take office in these roles

from the AGM in May 2022 are as follows:  
**Vice-presidents: Les Copeland CEng FCIBSE, Fiona Cousins CEng FCIBSE, and PL Yuen FCIBSE; honorary treasurer: Vince Arnold CEng FCIBSE**

The Council is a larger consultative body that advises the Board on Institution policy. It includes representatives of regions, societies, groups, networks and standing committees, and elected members, who serve a three-year term.

The Board has agreed to operate a similar procedure for election as that applying to Board members, and two corporate and one non-corporate positions are available for election each year. The Board, having considered the advice of the Nominations Panel, agreed to nominate the following individuals for vacancies arising at the AGM in May 2022:

**Members of council: Mike Burton (corporate), Andy Sneyd (corporate), and Sanjay Modasia (non-corporate)**

# Young Lighter of the Year rethinks healthcare rooms

Winning presentation in annual Society of Light and Lighting competition puts wellbeing and comfort of patients first

Maria Englezou, a PhD candidate in the department of architecture at the University of Cyprus (UCY), was named Young Lighter of the Year 2021 for her presentation *Do we need to change the design of healthcare facilities rooms?*

Her entry explores the optimum patient room configuration to support visual comfort, health and wellbeing.

Englezou holds a diploma in architectural engineering from the University of Thessaly, in Greece, and a Master's of Science in sustainable architecture studies from the University of Sheffield. She is currently a research fellow in the energy and environmental design of buildings research laboratory at UCY.

Englezou's research interests are environmental design for buildings, visual comfort, non-visual effects of lighting, and architectural design for human health and wellbeing. Her current research focuses on studying the double room, the most widely used patient room in healthcare facilities

She was one of four finalists in this year's Society of Light and Lighting (SLL) Young Lighter of the Year competition who delivered their presentations virtually to an international audience at an online awards event in December. The other finalists were: María Teresa Aguilar Carrasco, with her paper *Lighting optimisation in 24-hour work centres to promote a good circadian rhythm*; Remedios María López Lovillo,



Maria Englezou, SLL Young Lighter of the Year 2021

with *Adaptive lighting control system - user-oriented*; and Verity Rose, presenting *Drone lighting: the impact and the future*.

All the finalists received a cash prize and a year's free membership of SLL.

It was the 27th annual SLL Young Lighter competition, and the second year that the awards were held online.

The competition, which is open to anyone with an interest in light and lighting, is designed to not only test finalists' ability to develop a lighting project, but also their presentation skills.

● For more information about the SLL Young Lighter competition and how to enter in 2022, visit [www.cibse.org/sll](http://www.cibse.org/sll)

## IN BRIEF

### Ruth Carter to speak at Rumford Club

CIBSE chief executive Ruth Carter will be speaking on the future of CIBSE at The Rumford Club on 23 February.

She will be discussing her strategy and vision, and what she intends to achieve for CIBSE as CEO. Carter will explain how CIBSE can lead delivery of the safe, net zero carbon buildings required to meet new carbon emissions targets and building safety rules.

She is intent on creating a modern, exemplar, professional engineering institution that can respond to the needs of the building services community.

Carter will be open to hearing the views of Rumford members who are also long standing CIBSE members. For more information and to book, <https://therumfordclub.co.uk/programme>

### Membership surgery

Surgeries are being offered to give members a free, 30 minute Engineering Practice Report review with a CIBSE interviewer (£20 for non members). The surgeries are open to anyone applying for ACIBSE or MCIBSE membership who would like some extra support with the report.

Sessions take place across the year and are an opportunity to speak to a professional interviewer to review your draft report and discuss any questions.

Premium review appointments of 60 minutes are also available at a cost of £25 for members (£40 for non members).

For more information, visit [bit.ly/CIFeb22CN1](http://bit.ly/CIFeb22CN1)

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



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# A full scale test

The Grenfell Tower tragedy has prompted discussion about the practicality and usefulness of full-scale fire tests of building products and assemblies. Hywel Davies considers the testing of building services systems

The Grenfell Tower Inquiry has received much evidence about the practicality of full scale fire testing, appropriateness of test methods, and interpretation of results. One concern is that these tests on standardised assemblies do not reflect real construction and the results need interpreting to try to anticipate how a real design would perform, based on the test results. It is often said that every building is a prototype and it is simply impractical to test every design at full scale before construction.

The only way to know how a building will really perform is, of course, to build it and then test it. While destructive tests are clearly impractical, there is no reason not to test the performance of the building to confirm that the engineering systems have been installed correctly and provide a healthy environment as designed and intended.

This is what is done in sea trials; a ship is comprehensively put through its paces, and its systems fully tested, before handover to its owners.

This approach is not limited to ships. It is perfectly possible to test the various systems in a building to demonstrate that they work and are controlled effectively, are set up and adjusted to work efficiently, and deliver a healthy and infection resilient environment.

It should already happen to most buildings. It is a legal requirement now and has been for years. Regulation 44 and now the new 44ZA of the Building Regulations and requirements L1(b)(iii) and L2(b), which address commissioning, are in Part L of Schedule 1 of those Regulations. They clearly require commissioning of fixed building services.



Every fixed building service (Regulation 44) and every system for onsite electricity generation (Regulation 44ZA, which comes into force in June this year) require commissioning and that a notice confirming the fixed building services have been commissioned in accordance with a procedure approved by the Secretary of State be provided to Building Control.

The new Approved Document L2 makes clear that the intention of this regulation is that commissioning is

planned at the outset, and undertaken in accordance with the CIBSE Commissioning Codes and BSRIA Commissioning Guides. Some readers may say there is nothing new here: commissioning has been a legal requirement, albeit widely ignored, for many years so what is new?

Three things should change the attitude to commissioning. First, the Building Safety Bill will change the building inspection regime. In higher risk buildings (HRBs), it will be under the direct oversight of the new building safety regulator (BSR), who will take a much

## REGULATORY REQUIREMENTS

The Building Regulations (2010, as amended) set legal requirements for new buildings and refurbishment works. They are requirements, not guidance. Approved Documents give formal guidance from government on how those requirements may be met. Commissioning is a regulatory requirement, it is not merely guidance.

**DR HYWEL DAVIES**  
is technical  
director at CIBSE  
[www.cibse.org](http://www.cibse.org)

## SCA Webinar Programme

The Smoke Control Association (SCA) will be running a series of CIBSE certified CPD webinars in February and March. The four scheduled webinars are free to attend and will be hosted on the Zoom platform.

- **Tuesday 22nd February (12 noon)** - Guide on Smoke Control to Common Escape Routes in Apartment High Rise Buildings
- **Tuesday 1st March (12 noon)** - Guide to CFD Design of Smoke Systems
- **Tuesday 8th March (12 noon)** - Guide to Smoke Shaft Acceptance and Testing
- **Tuesday 15th March (12 noon)** - Design of Car Park Smoke Control Systems by CFD

If you would like to attend any of these webinars please email: [info@smokecontrol.org.uk](mailto:info@smokecontrol.org.uk) and you will be sent the registration details.





## New targets and disclosure requirements will publicly identify energy profligate buildings

closer interest and require safety cases and safety case reports for those buildings, both new and existing.

For a new building, the regulator is not going to be persuaded to issue a certificate of occupancy without convincing evidence of commissioning. For an existing HRB, the BSR will not be convinced that the building engineering systems are safe without evidence that they have been commissioned, or recommissioned in an older building.

Second, the BSR will set standards across the building control profession and will regulate all buildings, not just 12,500 HRBs. It would be a surprise if that does not lead to a greater focus on commissioning.

Third, across Whitehall, the Department for Business, Energy and Industrial Strategy is bearing down on operational energy use in commercial buildings. New targets and disclosure requirements will publicly identify energy profligate buildings. One way to reduce energy use is to commission buildings to operate efficiently.

That is why CIBSE is working with the Commissioning Specialists Association to update its commissioning management code, Code M. This will reinforce the need for a commissioning plan, identifying what needs commissioning and how.

But there is no need to wait for new legislation on commissioning – it's already there. Every building should have its engineering services fully tested and commissioned to demonstrate they work effectively to meet current regulation, let alone the new Building Safety Act.

### References:

The Building Regulations etc. (Amendment) (England) (No. 2) Regulations 2021, [bit.ly/CJFeb22HD1](https://bit.ly/CJFeb22HD1)

Building Regulations 2021, CIBSE, [bit.ly/CJFeb22HD2](https://bit.ly/CJFeb22HD2)

# CHOOSE

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EXPERTS IN  
HEATING



# What regs revisions mean for zero carbon

New Approved Documents on energy use, ventilation and overheating are intended to be stepping stones towards zero carbon buildings. Julie Godefroy highlights their impact and where regulatory improvements can still be made

Shortly before Christmas, the government published a Building Regulations package, including the new Approved Documents L and F for new and existing buildings, and a new Approved Document O on overheating for new homes and other residential buildings.

The changes will come into force in June, and are meant to be stepping stones towards the 2025 Future Homes/Buildings Standard (FHS/FBS), when new buildings will not need future retrofit to become zero carbon with grid decarbonisation.

## Carbon reduction

The government expects this revision to deliver carbon savings of 31% for new homes and 27% for new non domestic buildings. What it will actually deliver is uncertain, as the calculation methodologies (SAP and the NCM) do not relate well to actual performance, and cover regulated uses only.

## Metrics

A major change is the introduction of a primary energy metric, alongside carbon dioxide, to encourage efficient use of energy resources at the system level. While no metric is perfect, 80% of consultation respondents, including CIBSE, raised concerns about this change because:

- It means little to consumers, so doesn't facilitate a closer link between performance and occupants
- Primary energy and carbon emissions rely on conversion factors that change over time, so it doesn't help with tracking progress
- Primary energy could favour gas over electricity, which will send confusing messages on heat decarbonisation.

An energy use metric, together with carbon emissions, would better address the key goals of energy efficiency, carbon reduction and consumer engagement.

## Low carbon heat

Gas connections to new buildings are still allowed, but will be banned from 2025 for homes and possibly some non domestic buildings. The consultations included clear statements about heat decarbonisation, anticipating a mix of technologies in future, with a key role for heat pumps.



The notional dwelling has a gas boiler; a heat pump would have given a clearer message

For new homes, the 2021 notional dwelling – the one that sets targets for the actual dwelling – has a gas boiler; a heat pump would have given a clearer message and more incentive for low carbon heat.

For non domestic buildings, the heating fuel in the notional building follows that of the actual building, except for coal and other high carbon fuels, which are compared with gas. A statement in the consultation response is a telling illustration of the perverse effects of these shifting targets: We will be revising the specification of the heat pump notional building. This reduces the assumed efficiency of the heating system in the target building, providing additional incentive to install heat pumps.<sup>1</sup>

Instead of setting an ambitious target that buildings would have to meet regardless of their heating system, promoting energy efficiency and low carbon heat in a technology agnostic way, low carbon heat is encouraged by allowing poorer installations, at the cost of performance and impacts on consumers.

There are important changes in how

heat networks are treated:

- For existing networks, the notional building is connected to a network of the same performance – so, there is no incentive for existing networks to improve. Instead, existing networks should be required to produce a decarbonisation plan, and their performance should be assessed on a much similar basis to other solutions.
- For new networks, homes are compared with an onsite gas boiler, and non domestic buildings with a network with 15% distribution losses supplied, for the majority, by a CHP, with some heat pump contribution, giving a carbon content of heat similar to that of an onsite boiler (0.23kgCO<sub>2</sub>/kWh). This should provide more incentive for efficient and lower carbon new networks.

## New home

Significant changes are introduced to air permeability testing: all homes need to be tested, with sample testing no longer allowed. The low pressure pulse (pulse) technique, which provides results at 4Pa, is approved as an alternative to the fan pressurisation (blower door) technique. Testing should be done according to CIBSE TM23 (2022).

**DR JULIE GODEFROY**  
is technical manager at CIBSE

Homes also have to meet the Fabric Energy Efficiency Standard. The maximum allowable air permeability is  $8\text{m}^3\cdot\text{h}^{-1}\cdot\text{m}^{-2}$  at 50Pa (vs 10 currently), or  $1.57\text{m}^3\cdot\text{h}^{-1}\cdot\text{m}^{-2}$  at 4Pa, and it remains  $5\text{m}^3\cdot\text{h}^{-1}\cdot\text{m}^{-2}$  at 50Pa in the notional dwelling. If the 2025 FHS is to meet its promise of world leading standards of energy efficiency, this is an important area where improvements can still be found, along with MHVR for efficiency and air quality.

A new requirement has been introduced to limit overheating risk, which was widely supported by consultation respondents, including CIBSE. Compliance can be demonstrated through a simplified method in Approved Document O, or through CIBSE TM59 if more flexibility to the design and assessment is required.

Changes have been made to the simplified method to incorporate consultation comments – for example, on glazing areas size and orientation, and dwellings with communal heating. It is still difficult to gauge how well the method will work, so feedback will be important.

### New non domestic buildings

In addition to NCM compliance calculations, there is a welcome new requirement for non domestic buildings of more than  $1,000\text{m}^2$  (total useful floor area) to produce an **energy forecast**. Unfortunately, the consultation proposals have been weakened significantly: the forecast can be done using TM54 (2022 revision), but also other options, including design calculations and benchmarks, both of which could mean anything. Some benchmarks are out of date, or don't represent best practice. At best, they represent a building type, while an energy performance model is specific to a building, guiding the design process and providing information to occupants on what the building could achieve and how to operate it.

AD F introduces guidance that offices and other building types – such as gymnasiums, theatres or hotels should have means of **monitoring indoor air quality**, typically through  $\text{CO}_2$  monitors. This was initiated to reduce the risks of aerosol transmission of infections, but can be used to check that fresh air provision is adequate, and allow energy savings at times of low occupancy.

There are a number of small changes to the NCM, but government has acknowledged industry concerns and committed to a more fundamental review for the FBS.

Clearer guidance is given on **commissioning**. CIBSE had suggested introducing a penalty to Part L calculations unless evidence of commissioning was provided, as it cannot be assumed that systems will perform as efficiently as expected: this has not been adopted.

### What you can do

CIBSE will provide more detailed information to industry, and comments to government, so do send us your feedback at [JGodefroy@cibse.org](mailto:JGodefroy@cibse.org). We are very interested in particular in the new overheating standard and simplified assessment method, as well as the revised SAP and SBEM and how they could be improved for the 2025 FHS/FBS.

Look out for a publication coming soon from CIBSE and LETI, on Net Zero definitions and accompanying FAQs.

### References:

1 SCOP of 264%, instead of 320% in the consultation

# COMBINE

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EXPERTS IN  
HEATING





Winners at the 2020 BPAs; this year's event will once again be face to face

# We're back

CIBSE is planning an extensive schedule of events for 2022 – both in-person and online. Simon Parker focuses on some of the highlights and reveals plans for the industry's first Building Services Week this autumn

While we have all felt the impact of the pandemic in some way, I think it is fair to say that the events industry and face to face meetings in general have had the most challenging two years they have ever experienced.

I joined CIBSE last September, and it was immediately apparent that the team had done a great job in pivoting to digital, as the expression goes. All our events including training and our in person exhibition, Build2Perform took place virtually, and worked well in that format.

I think the pandemic has taught us a great deal. While we have innovated and produced great content online, the appetite for face to face is still as strong as ever (if not stronger). We are all a little fatigued with staring at a screen and I believe the power of human interaction will never be replaced by technology.

I see a world of hybrid events, where we will harness technology, but also run in person ones, depending on what the objectives are. Short, sharp training will be done online, with longer formats and more in depth sessions taking place face to face.

It's hard to network and meet new contacts in a virtual world, so I can't see that being replaced by online.

Our Grow Your Knowledge series will continue with fresh impetus in 2022, and we are launching a series that will deal with the changes to our industry brought about by the Building Safety Bill.

We will continue to address members training



requirements, covering existing subjects as well as the publication of guidance scheduled for the first half of this year it is going to be a busy year for building services and CIBSE.

CIBSE's first big live event of the year will be the Building Performance Awards (BPAs) taking place at the Park Plaza Westminster Bridge on 24 February. All signs indicate it will be as impressive as always everyone is desperate to meet up again after a long absence.

The BPAs will be an opportunity for our industry to celebrate all that is great in the world of building services, and it certainly promises to be really special this year.

We have also confirmed the location for the Technical Symposium, which will take place at London South Bank University from 21-22 April. After taking place virtually for two years, we expect the in person event to be very well supported. We are looking at providing some

While we have innovated and produced great content online, the appetite for face to face is still as strong as ever (if not stronger)

**SIMON PARKER,**  
managing director,  
CIBSE Services

## DAME JO DA SILVA TO SPEAK AT BPAS

The 2022 Building Performance Awards will feature Dame Jo Da Silva as the guest speaker.

Da Silva has earned global recognition as an engineer who has applied her knowledge and design expertise to improve safety, promote inclusivity, and enhance resilience of communities, cities, and infrastructure globally.

She is currently global director, sustainable development at Arup leading business transformation in response to the climate, biodiversity and equity crises, and an Arup Fellow.

Da Silva founded Arup International Development to direct Arup's expertise to improving human development outcomes in the global south. She has led the planning, design and implementation of buildings, infrastructure, and urban regeneration projects, and worked in crisis and disaster contexts for non-governmental and UN agencies.



elements of live streaming, but the focus will be firmly on an amazing in person experience.

We then move to Build2Perform Live, which takes place at London's ExCeL on 29-30 November 2022. This year marks the 125th anniversary of CIBSE and we plan to make Build2Perform a key component in that celebration.

We are currently organising a number of exciting new elements to this event, including a week of interactive content under the banner Building Services Week. This will bring together all the CIBSE regions, groups and societies, which are the lifeblood of the Institution. While they already organise a number of really impressive events themselves, my team is keen to help and encourage them to host more. For example, we have announced a new Society of Fa ade Engineers Awards and Dinner on 3 November, at London's Park Lane, which will co locate with the global Zak World of Fa ades conference.

I'm looking forward to an exciting 12 months in the building services industry, and to meeting many of you at one of our events in 2022.

■ To discuss any of our events, please contact **SIMON PARKER** at [sparker@cibse.org](mailto:sparker@cibse.org)

## DATES FOR YOUR DIARY IN 2022

- **24 February** Building Performance Awards (BPAs), Park Plaza Westminster Bridge, London
- **21-22 April**, Technical Symposium, London South Bank University
- **29-30 November**, Build2Perform Live, London's ExCeL
- For more events, see page 58 and visit [www.cibse.org/events](http://www.cibse.org/events)

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EXPERTS IN  
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# MAX FORDHAM 1933 2022

Building services most influential engineer took an integrated approach to design based on first principles that focused on occupant comfort and optimal building performance



**M**ax Fordham FCIBSE FREng pursued a new approach to engineering based on his insatiable curiosity about how buildings work. He resisted pigeonholing into the conventional boxes of mechanical or electrical engineering, and was interested in the whole building.

He took a creative, but essentially practical, approach to building services design. Designing from first principles, he was often quoted as saying 'start with the edge of the universe as a boundary and quickly narrow down to the specific problem.'

In 1966, Max, alongside his wife Thalia 'Taddy' Dyson, set up Max Fordham & Partners. The practice was founded on the idea of engineers bringing scientific knowledge into the art of building design. He developed his skills in what was then considered the new field of heating engineering to test his idea. Invention, innovation and success followed. The design of the practice itself, as a partnership, was key to its success.

His obsession with engineering was evident at the 2016 CIBSE Building Performance Conference. He told delegates that 'the intensity and the fun of the design process' is what he enjoyed most. He remembered a project that gave him the chance to rethink the sizing of pipes. 'Guidance of the time was leading to absurdly oversized pipes. I decided on another method, which gave me a terrific buzz,' he said.

Max's mother, Molly Swabey, was a journalist and his father, Michael Fordham, a renowned child psychiatrist. When World War II broke out, Fordham was sent to Jamaica, and attended a traditional prep school. Tragically, his mother was killed in 1942, when her ship was torpedoed by the German navy.

He did not enjoy the harsh prep school regime, but it instilled in him a sense of discipline. On his return to England, he was sent to the progressive Dartington Hall School in Devon, which he remembers as

having a completely undisciplined environment. The only mandatory activity was useful work; Max's was building maintenance, through which he learned wood and metalwork techniques. He likened it to an apprenticeship.

After National Service, Max read natural sciences at Cambridge, specialising in chemistry, physics, maths and mineralogy. He shared a house with Dartington Hall schoolfriend Simon Nicholson – son of artists Ben Nicholson and Barbara Hepworth – who introduced him to a circle of architects and artists, including Sir Leslie Martin, head of the architecture school at Cambridge University.

Fordham enjoyed many a robust argument with Sir Leslie, who advised him to apply his physics knowledge in the heating and ventilating industry. Sir Leslie recommended him for a job at Weatherfoil Heating Systems. 'It gave me a wonderful introduction to engineering thinking,' said Max, who was able to apply his academic knowledge to design and research work.

Fordham met his wife, Taddy, at this time, and she introduced him to architect Sir Philip Dowson, founding partner at Arup Associates, who offered Fordham a job as a heating engineer. Here, he started taking on electrical, public health and mechanical elements. His ability to draw all types of services was getting him extra work outside of Arup Associates, particularly with architect Peter Foggo.

Fordham set up on his own in 1966, and his consultancy was asked by Arup Associates to design the heating on the Hulme 5 scheme. Soon after, he was introduced to the brutalist architect Neave Brown, which led to a commission to work on Brown's Alexandra Road flats in London.

Max and his practice won significant recognition for their work in ensuring human comfort by giving buildings heat, power, water and ventilation in sustainable and elegant ways. Notable projects under Max's leadership include Tate St Ives, Alexandra Road Estate, the Judge Institute Cambridge, and the Contact Theatre in Manchester. These

along with his lecturing at the University of Bath and other teaching – earned Max many honours, including: Fellow of the Royal Academy of Engineering; Honorary Fellow of the RIBA; CIBSE Gold Medal; and OBE.

From the start, Max sought a partnership approach to running a business to encourage shared responsibility and a feeling of ownership. He felt that designing a system for people to work in productively and creatively was as important as the design of the buildings.

Max Fordham was the first business in British construction to become a limited liability partnership. Max handed over the running of the practice to his fellow partners in 2000. The practice now numbers more than 250, including 119 partners.

Max is survived by three sons, Jason, Cato and Finn, and four grandchildren. Taddy – a personal and professional partner to Max – died in 2017. [C](#)

# Tributes to Max

## Terry Wyatt FCIBSE, CIBSE past president

Max was someone I always admired and a fine friend. To me, Max was more of a physicist than a fellow engineer, as I recall him, many years ago, patiently answering my naive question about how it is that CO<sub>2</sub>, being heavier than air, doesn't just cover the Earth and drown us all. He was always good for discussion, at conferences, CIBSE meetings, and The Edge debates. He was a good listener as well as a speaker, great fun, and never took himself too seriously, often resorting to his 'signature' laughter. He was a prominent figure in our profession, which is diminished by his departure.

## Bill Bordass, consultant

In 1970, when about to join multidisciplinary designers RMJM, someone suggested I spoke to Max Fordham instead. I didn't until 1976, when asked to develop RMJM's building services group, and Max (who had turned down the job) became a mentor. We hit it off immediately, perhaps because of our similar backgrounds, or his friendly, inquisitive manner.

We both became interested in buildings when doing maintenance at school, and had the same natural sciences degree, which stressed the importance of first principles. Max reminisced that, on his first job at Weatherfoil, he had started to design the fans from scratch, and was shocked to be told he just needed to select them!

When I went to Max with a query, he would explore the relevant principles, suggest a reference or two, and then ask for my view. He had a vivid imagination, starting off apparently naively, but swiftly lasering into what mattered. He had a lovely way of putting things, as when leaving a lecture by Ole Fanger: 'It's great for academics to do research, but I do wish they wouldn't turn it into a standard.'

What a mind, what a character, what a legacy – his imagination, his buildings, the firm that bears his name, and the generations of scientists he turned into environmental designers and engineers. And his recent house, too, which embodies his lifetime ambition of 'no heating, no cooling, and no lighting while the sun is above the horizon'.

## Rod Bunn, past editor of CIBSE Journal

Max was a genius in so many ways. There's been no-one quite like him. It's difficult to summarise his impact on industry, but it was profound, decent, and egalitarian. He had no side, and no airs and graces. He mentored a great many free-thinkers in our industry, though not nearly enough. We all want to be like Max but we know we don't have the same educational capacity. That's partly where the loss comes from. Max was a father figure to the industry. We owe him a great debt.

## Paddy Conaghan, consultant at Hoare Lea

Max was a polymath. Sitting alongside him at an event once, he expounded on sustainability – citing the novel concept of planetary entropy. But the event started before he could finish. Eighteen months later, when we next chanced together, Max went immediately into concluding his thesis. As he was an old boy then, I've been boggled by his mind and memory to this day. Max was a one-off in our profession. His wit and wisdom may be irreplaceable, and he will be sorely missed.



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# DIGGING FOR BRITAIN

Escalating energy prices and the urgent need to decarbonise means communities are looking to move away from fossil fuel as a heating source. A pioneering heat network in the Cambridgeshire village of Swaffham Prior is aiming to use a hybrid heat pump system, coupled with a solar farm, to provide ultra low carbon, affordable heating for every resident, business and school. **Andy Pearson** reports

**O**n 19 October 2021, the government launched a consultation (now closed) on its plans to phase out, from 2026, the installation of fossil fuel heating in the 1.1 million homes in England not connected to the gas grid. It also plans a heat pump first approach to replacement heating systems from that date.

A community heat network nearing completion at Swaffham Prior, East Cambridgeshire, shows how it is possible to phase out fossil fuel heating in rural villages; it also highlights some of the challenges faced by those attempting to do so cost effectively.

Installation of heating mains and the construction of a local renewable energy centre are under way in Swaffham Prior, for what will be England's first rural village heat network. The majority of its 300 homes as well as two churches, a pub and school are currently heated using oil, one of the most carbon intensive forms of heating. The remainder of the properties use liquefied petroleum gas (LPG) or direct electric.

In spring 2022, the first homes will connect to the heat network and benefit from low carbon heat produced by a hybrid air and ground source heat pump (GSHP) system, powered by a solar farm 8km away. Four large thermal stores will meet short term peaks in demand and provide resilience.

The Heating Swaffham Prior project was kick started by Swaffham Prior Community Land Trust to give residents the opportunity to cost effectively replace their oil fired heating systems with a low carbon alternative. In 2018, the trust commissioned a study into alternative heating options from sustainability charity Bioregional, which identified the potential for a village wide heat network. A range of heat sources was considered including biomass from local straw but the key to unlocking the project was a parcel of land on the edge of the village owned by Cambridgeshire County Council (CCC). This opened up the possibility of generating heat using a GSHP system.

CCC partnered with the trust, enabling the project to access funding and support from the Department for Business, Energy and Industrial Strategy's Heat Network



A particular issue with homes that use heating oil is that fuel delivery notes are often the only consumption data available

Delivery Unit. It also allowed CCC to appoint sustainability and environmental consultancy Avieco as project manager, and Bouygues E&S Solutions as design and development engineer.

CCC set out to establish the level of interest in the project. Avieco worked with LineUndrawn to engage the wider community and secure sign ups for the scheme. Because the project is a retrofit of privately owned homes, we needed to do an intensive piece of community engagement, to see how many homes wanted low carbon heat and what the connection issues would be, says Helen Troup, principal consultant at Avieco. In just six months, more than half the community had registered an interest in the scheme.

Next, the challenge was to establish







Left: The energy centre and the field containing the ground arrays can be glimpsed in the top right-hand corner

## BACK-UP HEATING

The original concept for Swaffham Prior used LPG boilers as the back-up heat source, but CCC was reluctant to include fossil-fuelled heating in the scheme, given the aspiration for carbon neutrality.

Back-up heat pumps were also dismissed because of high costs. 'We were reluctant to put forward an entirely heat pump-led scheme because of the redundancy. A large proportion of the plant's capacity would have been largely obsolete, and would have dug a hole in the budget,' says Miles Messenger, head of energy performance contracting at Bouygues E&S.

Fortunately, the solar farm meant other options could be considered. 'It allowed us to use other forms of electric heating, which would have been prohibitively expensive to operate otherwise,' says Messenger.

Bouygues E&S eventually selected 1.5MW electrode boilers (effectively, large immersion heaters) as the back-up heat source. 'They were proven to be cost-effective and a similar size to a conventional boiler,' says Messenger.

Swapping from fossil to electrode also avoided the costs and environmental hazards of stored fuel on site, he adds.



Residents will be able to connect to the heat network from the spring

the likely heat demand. Troup says one of the key learnings from Swaffham Prior is that heat demand assessment is difficult. A particular issue with homes that use heating oil is that fuel delivery notes are often the only consumption data available; there is no information on when and how often the heating system is used.

To help build a more detailed picture of heat demand in the village, Bouygues E&S installed heat meters in five archetype properties. There's a big range of property types in the village, so we picked a typical example of each and put in a heat meter, says Troup.

Data from the meters was combined with Energy Performance Certificate data, fuel consumption figures from a few residents self reporting, and SAP data from 50 homes managed by a local housing association. The team also used data from the Energy Demand Research Project carried out before the smart meter rollout to test consumers responses to different information about their energy use. >>



The business case and technical design of the heat network were tested by investment company Triple Point and Aecom, on behalf of the government



» The data was used as a proxy to get an annual demand profile for a typical property type. We had to use a real blend of data sources to get to an approximation of heat use in the village, Troup explains.

**Hybrid heat pumps**

While work to establish the village's heat demand was undertaken, the team also had to confirm that the field owned by the council had the ability to supply sufficient heat.

Originally, the plan was for 267 boreholes, but thermal testing revealed that this density would have reduced the productivity of the GSHPs significantly because of the amount of heat that would have been extracted by that many ground loop arrays.

To sustain the temperature in the ground and thereby allow the heat pumps to work more efficiently Bouygues E&S looked at installing additional air source heat pumps (ASHPs). Iterative modelling established that a 3:1 ratio of GSHP to ASHP was optimal (two 0.75MW GSHPs and one 0.5MW ASHP).

The strategy is harnessing the benefits of both technologies, says Miles Messenger, head of energy performance contracting at Bouygues E&S. There's a benefit to using ASHP in the summer, as the warmer air gives rise to a higher coefficient of performance. This also gives the GSHPs ground loops a chance to replenish, ready for the next heating season. The seasonal replenishment results in a lower thermal degradation rate of the ground loop array, so fewer ground loops are needed they're reduced by more than 50% to meet the long term demand, Messenger adds.

One of the key challenges of the project was ensuring compatibility with a diverse range of dwellings. The heat network is designed to supply heat at around 72 C, in line with that generated by oil fired central heating.

The reason this is important is that many older homes, unless retrofitted to high energy efficiency which can be costly, cannot take individual low temperature ASHPs and get the level of warmth and comfort they would like, says Councillor Lorna Dupr, Cambridgeshire



To gauge heat demand, meters were installed in properties representative of the range of building types in Swaffham Prior

Originally, the plan was for 267 boreholes, but thermal testing revealed that this density would have reduced the productivity of the ground source heat pumps significantly

County Councils environment and green investment committee chair.

The high temperature will enable residents to dispense with conventional oil fired boilers and connect to the network through a heat interface unit, without having to upgrade radiators or insulation.

Minimal alteration to the tertiary systems is required, says Messenger. We have options for all common types of domestic system; however, we do need to convert heating systems from gravity fed to mains pressure.

The main and unavoidable disruption for occupants is associated with the heat network connections, which require the installation of trenched heat pipework from the property boundary to the building.

As conventional heat pump technology is unable to achieve 72 C efficiently, Bouygues E&S selected heat pumps with ammonia as the refrigerant. This is able to generate higher temperatures while maintaining a reasonably good COP but there is a downside.

The corrosive and hazardous nature of this refrigerant led to significant mitigations in design, says Messenger. These include compartmentalisation of the energy centre spaces, emergency extraction ventilation, and leak detection systems, which had to comply with the Dangerous Substances and Explosive Atmospheres Regulations and the EU ATEX directive.

The scheme will be linked to a private electricity network connected to a 28MW

»

**OPTIMISING THE HEAT PUMPS**

The ASHPs will act as lead from mid-April to early October. They will be used all year round, but make a comparatively small contribution in winter. Switchover to GSHP is based on the 'real time COP', driven by the air temperature (ASHP COP) and glycol temperature (GSHP COP). The mode of operation will shift depending on these variables, though it will also be influenced by the RHI tariff and solar PV availability. In general:

**Winter:** The GSHP will act as lead and the ASHP will act to meet peak loads only.

**Shoulder:** Either will act as lead, depending on outside air temperature and ground loop temperature, as well as tariff optimisation.

**Summer:** ASHP will act as lead and GSHP will act to meet peak loads only (unlikely to be required).



» (AC)/39MW (DC) solar farm owned by CCC. It was decided that both projects would connect to the same distribution network substation. A shared connection would allow electricity to flow behind the meter, enabling CCC to self supply renewable electricity directly to itself, says Messenger.

By combining the solar farm with the energy centre, we were able to rationalise our network connection costs, he adds. This also provides an advantage in managing our export and import to and from the network.

The electricity generated by the solar farm that is consumed by the energy centre would have otherwise been sold via a wholesale export agreement. The export unit rate would be approximately a third of the cost of peak retail import unit rate. Thanks to the comparatively large scale of the solar farm, coupled with 4x50m<sup>3</sup> thermal stores, Bouygues E&Ss models predict that the vast majority of electricity consumed by the energy centre will be sourced from the solar farm.

The thermal stores are to be used to meet short term peaks in demand, and will enable the system to optimise tariffs. Generally, they will be charged during the day when electricity is available via the solar PV array to provide heat the following evening.

Their inclusion, coupled with the hydronic design of the scheme, allows us to deliver a larger capacity of heat into the network for a short duration than the total capacity of the

**The energy centre is 500 metres from the village. The field with the ground arrays can no longer be ploughed but instead will become a wildflower meadow to boost biodiversity**

heat pumps in this sense, the thermal stores act as a capacitor, says Messenger, who adds that they can also supply several hours heat into the network in the event of unplanned maintenance. Further back up comes from an electrode boiler, made feasible by access to the solar farms cheap electricity (see panel, Back up heating on page 21).

### Heat supply agreements

Avieco engaged with the community over the terms of the Heat Supply Agreement. It is another utility, but the contracts are much longer term, says Troup. Consumer protection is expected to be provided by Ofgem, which is the regulator for heat networks.

To ensure residents don't pay a premium for their community supplied heat, the tariff has been linked to the price of heating oil.

The other key issue is that joining the community heat project costs nothing if you sign up before the construction is finished this means everyone,

independent of wealth, can join, says Dupr .

The project capital costs are £11.9m, which are being funded by a £2.9m grant from the Heat Network Investment Project and capital borrowing by the council.


The cost over the life of the project will be covered by heat charges and income from the Renewable Heat Incentive.

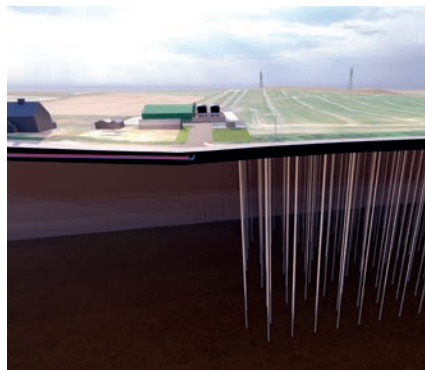
Another challenge was obtaining permission to run pipework under a public highway. No statutory regimes allow this in practice, but CCC found alternative legislative powers that enabled it to access the highway.

The primary network being installed by Pinnacle Power is racing to go live by spring 2022, in time to apply for the RHI grant.

There will be a gradual ramping of connections over the first five years, with a target of around 100 properties in the first 12 months. We aim to deliver around 4GWh/annum within the next five years, which is around 75% of dwellings, says Messenger.

When up and running, England's first rural village heat network is projected to save more than 47,000 tonnes of carbon annually, and could pave the way for similar schemes.

It's not surprising that there are many others interested in replicating the scheme, says Dupr . This is a historic village with many challenges including listed buildings, private and narrow roads. We could not have chosen a more difficult village to retrofit if it can be done here, it can be done anywhere. 







# HOLDING ALL THE CARDS

With salaries rising and plenty of jobs, building services engineers are seeking good pay and a healthy work-life balance. **David Blackman** analyses the 2022 Hays Salary Survey and asks industry leaders how they attract the best talent

**P**roperty and construction is entering 2022 in a bullish mood. That is the verdict of the latest jobs and salary survey of the sector, carried out by recruitment consultancy Hays for the *CIBSE Journal*.

Nearly all construction and property employers surveyed are optimistic about the year ahead, with 98% expecting their organisations' activity levels to increase or stay the same over the next 12 months.

The survey was conducted before the emergence of the Omicron coronavirus variant, which sparked renewed restrictions and economic uncertainty in December. However, Gaelle Blake, director for construction and property at Hays, says sentiment has rebounded sharply since the new year, as it has emerged that the variant is not as severe as first feared. This relief has poured oil on what was already a hot market, she adds.

Reflecting this buoyant outlook, 83% of construction and property employers plan to recruit over the next 12 months, an increase on the figure of 70% recorded in last year's survey. For Blake, who oversees permanent recruitment for Hays across all sectors, this level of anticipated recruitment is unprecedented. 'I've not seen that sort of level in any industry,' she says.

Nearly half (45%) of building services engineers surveyed reported that they had moved jobs in the past 12 months, and a further 31%

considered moving. More than half (54%) of building services professionals plan to look for a new job in the next 12 months, slightly down on the previous year (56%).

Confidence has also grown among professionals. The proportion of building services engineers who feel positive about their career prospects has nearly doubled, from 35% this time last year to 68% now. 'There is no doubt lots of people are moving,' says Blake.

The experience of working remotely has bred a more footloose relationship between employees and companies, she adds: 'People's emotional ties to organisations have loosened, because they haven't been in the office and are more willing to move.'

This more turbulent hiring environment means that human resources departments must up their game to Olympic athlete levels, Blake says.

Anyone who thinks head hunters aren't after their staff are out of touch, she adds.

Employers need to really think about what they can do proactively.

Tom Naughton, managing director of heat network specialist engineers FairHeat, says: We re desperately trying to hire, and could increase by another 20% to 30% if we could find the right people.

The biggest risk to our business is probably finding enough talented people to fill the roles, particularly at senior level.

The Great Resignation , as it has been dubbed, has been fuelled by the very low level of job movements during and before the pandemic, when there was considerable uncertainty about the economy's post Brexit prospects, says Ray Upjohn, chief executive of ChapmanBDSP. It probably wasn't the environment to go to your partner to say you are leaving your job, he adds.

The main reason engineers say they want to leave their current role is the salary or benefits package (27%), narrowly pipping location (26%). More than half (60%) of building services professionals told Hays they would

## The experience of working remotely has bred a more footloose relationship between employees and companies Gaelle Blake

be prepared to accept a lower paid job for a better work life balance or a job with more purpose. Meanwhile, more than three quarters (78%) say that an organisation's purpose is important when considering a new role.

FairHeat's specialism installing heat networks, a key technology for delivering the transition to net zero emissions is an important selling point with potential employees. A key reason lots of young people want to join us is because it's about sustainability and using their skills to fulfil their ideals, says Naughton, who adds. Pretty much everyone who applies to the company shares this idealism about tackling climate change.

A third (33%) said they would be prepared to take a lower paid job for a better work life balance alone. Nearly half (48%) would be tempted to change employer if they offered flexible hybrid working options. As a result of the Covid 19 pandemic, 47% said they would prefer their organisation to increase its focus on flexible working arrangements.

Andrew Swain Smith, chair of building services engineering at BDP, >>

### Consultants: Associate

Region	Typical salary 2022	Min salary 2022	Max salary 2022
East Midlands	£65,000	£60,000	£68,000
East of England	£59,000	£55,000	£68,000
London	£73,500	£65,000	£78,000
North East England	£46,500	£41,000	£48,000
North West England	£60,000	£50,000	£65,000
Northern Ireland	£58,000	£55,000	£60,000
Scotland	£56,000	£55,000	£60,000
South East England	£65,000	£60,000	£70,000
South West England	£60,000	£57,000	£62,000
Wales	£58,000	£52,000	£60,000
West Midlands	£65,000	£60,000	£70,000
Yorkshire and the Humber	£51,500	£45,000	£52,000
<b>National average</b>	<b>£59,792</b>	<b>£54,583</b>	<b>£63,417</b>
% increase year on year: 2.6%			

### Consultants: CAD technician

Region	Typical salary 2022	Min salary 2022	Max salary 2022
East Midlands	£30,000	£25,000	£32,000
East of England	£32,000	£28,000	£38,000
London	£36,500	£30,000	£43,000
North East England	£26,500	£21,500	£27,000
North West England	£29,000	£25,000	£37,000
Northern Ireland	£25,000	£20,000	£28,000
Scotland	£29,000	£23,000	£31,000
South East England	£33,000	£30,000	£35,000
South West England	£30,000	£25,000	£33,000
Wales	£32,000	£25,000	£32,000
West Midlands	£31,000	£25,000	£35,000
Yorkshire and the Humber	£28,500	£23,500	£29,500
<b>National average</b>	<b>£30,208</b>	<b>£25,083</b>	<b>£33,375</b>
% increase year on year: 2.3%			

### Consultants: Director

Region	Typical salary 2022	Min salary 2022	Max salary 2022
East Midlands	£75,000	£70,000	£80,000
East of England	£73,000	£70,000	£80,000
London	£98,000	£90,000	£130,000
North East England	£55,500	£45,000	£57,000
North West England	£72,000	£65,000	£75,000
Northern Ireland	£68,000	£65,000	£75,000
Scotland	£62,000	£55,000	£80,000
South East England	£75,000	£70,000	£85,000
South West England	£69,000	£63,000	£75,000
Wales	£63,000	£60,000	£65,000
West Midlands	£75,000	£60,000	£80,000
Yorkshire and the Humber	£56,000	£45,000	£58,000
<b>National average</b>	<b>£70,125</b>	<b>£63,167</b>	<b>£78,333</b>
% increase year on year: 5.0%			

### Consultants: Intermediate design engineer (M&E)

Region	Typical salary 2022	Min salary 2022	Max salary 2022
East Midlands	£38,000	£30,000	£42,000
East of England	£42,000	£37,000	£50,000
London	£42,500	£36,500	£48,500
North East England	£33,000	£28,000	£38,000
North West England	£38,000	£30,000	£40,000
Northern Ireland	£33,000	£30,000	£36,000
Scotland	£37,000	£28,500	£38,000
South East England	£37,000	£34,000	£39,000
South West England	£40,000	£36,000	£41,000
Wales	£39,000	£33,000	£43,000
West Midlands	£37,000	£30,000	£42,000
Yorkshire and the Humber	£28,500	£23,500	£29,000
<b>National average</b>	<b>£37,083</b>	<b>£31,375</b>	<b>£40,542</b>
% increase year on year: 3.4%			

### Consultants: Junior design engineer (M&E)

Region	Typical salary 2022	Min salary 2022	Max salary 2022
East Midlands	£28,000	£22,000	£30,000
East of England	£26,000	£22,500	£30,000
London	£32,500	£26,000	£35,000
North East England	£23,250	£19,000	£24,000
North West England	£27,000	£18,000	£28,000
Northern Ireland	£26,000	£24,000	£28,000
Scotland	£30,000	£24,000	£32,000
South East England	£30,000	£22,000	£30,000
South West England	£29,000	£25,000	£33,000
Wales	£27,000	£25,000	£32,000
West Midlands	£28,000	£22,000	£30,000
Yorkshire and the Humber	£23,250	£19,000	£25,000
<b>National average</b>	<b>£27,500</b>	<b>£22,375</b>	<b>£29,750</b>
% increase year on year: 2.1%			

### Consultants: Professional quantity surveyor

Region	Typical salary 2022	Min salary 2022	Max salary 2022
East Midlands	£52,000	£45,000	£60,000
East of England	£55,000	£50,000	£60,000
London	£70,000	£55,000	£75,000
North East England	£41,500	£36,000	£43,000
North West England	£46,000	£38,000	£55,000
Northern Ireland	£42,000	£38,000	£46,000
Scotland	£41,000	£35,000	£50,000
South East England	£70,000	£57,000	£72,000
South West England	£55,000	£50,000	£65,000
Wales	£50,000	£42,000	£55,000
West Midlands	£50,000	£40,000	£55,000
Yorkshire and the Humber	£44,000	£36,000	£46,000
<b>National average</b>	<b>£51,375</b>	<b>£43,500</b>	<b>£56,833</b>
% increase year on year: 2.2%			



» believes there has been a collective reappraisal of what is important, which is manifesting itself in recruitment and retention decisions and employers must take this sea change in attitudes on board.

People are looking to move for reasons other than an increase in salary, he says. Clearly, people don't change jobs without seeking to maximise the opportunity to increase their salary, but I don't see that as a driver in the same way as in the past.

They may be looking for jobs, but not necessarily for more money. With flexible working, people are looking at potentially working more locally. Hybrid working is one of the very first things people ask about: people have re-evaluated their work-life balance and are less willing to work huge hours in the centre of London to drive up their salary.

ChapmanBDSP has lost some engineers to different industries, while others did not want to commute after the return to the office, says Upjohn. They took the opportunity to move out and then realised how difficult it would be to commute, he says.

Eventually, salaries will move back up the agenda as cost of living

pressures bite, says Swain Smith. You are going to get to the point where money starts to matter again, he adds.

The survey also shows a growing appetite among construction and property employers to hire permanent, rather than temporary, staff; two-thirds (64%) plan to hire permanent staff, compared with 47% last year.

This shift has been driven by changes to the IR35 anti-avoidance tax legislation, which has made it more difficult to hire contractors, according to Swain Smith. There is a fundamental and irreversible shift away from contractor status to either employing people on permanent or fixed-term contracts. This has probably driven it as much as any greater sense of confidence, he says.

Upjohn agrees. It will get harder to employ contractors. We've probably got fewer contractors than we've ever had, he says.

There are other reasons behind the shift to employment of permanent staff, however.

Businesses see sustainable growth: if they see full order books, they don't want someone

## The survey shows a growing appetite among construction and property employers to hire permanent, rather than temporary, staff

### Consultants: Revit/BIM technician

Region	Typical salary 2022	Min salary 2022	Max salary 2022
East Midlands	£38,000	£30,000	£45,000
East of England	£38,000	£30,000	£45,000
London	£52,000	£40,000	£65,000
North East England	£36,500	£29,000	£37,000
North West England	£42,000	£32,000	£45,000
Northern Ireland	£35,000	£30,000	£40,000
Scotland	£33,000	£25,000	£40,000
South East England	£47,000	£43,000	£55,000
South West England	£42,000	£38,000	£45,000
Wales	£40,000	£35,000	£43,000
West Midlands	£38,000	£30,000	£45,000
Yorkshire and the Humber	£37,500	£29,000	£39,000
<b>National average</b>	<b>£39,917</b>	<b>£32,583</b>	<b>£45,333</b>
% increase year on year: 3.9%			

### Consultants: Senior design engineer (M&E)

Region	Typical salary 2022	Min salary 2022	Max salary 2022
East Midlands	£52,000	£45,000	£55,000
East of England	£52,000	£45,000	£60,000
London	£58,500	£50,000	£65,000
North East England	£46,000	£40,000	£47,000
North West England	£52,000	£45,000	£55,000
Northern Ireland	£48,000	£42,000	£50,000
Scotland	£50,000	£40,000	£52,000
South East England	£57,000	£52,000	£57,000
South West England	£53,000	£45,000	£55,000
Wales	£50,000	£45,000	£55,000
West Midlands	£50,000	£42,000	£55,000
Yorkshire and the Humber	£45,000	£39,000	£46,000
<b>National average</b>	<b>£51,125</b>	<b>£44,167</b>	<b>£54,333</b>
% increase year on year: 3.5%			

### Consultants: Sustainability consultant

Region	Typical salary 2022	Min salary 2022	Max salary 2022
East Midlands	£46,000	£40,000	£50,000
East of England	£52,000	£42,000	£60,000
London	£58,000	£45,000	£70,000
North East England	£43,500	£36,500	£44,500
North West England	£48,000	£40,000	£50,000
Northern Ireland	£40,000	£37,000	£45,000
Scotland	£46,000	£35,000	£50,000
South East England	£45,000	£42,000	£47,000
South West England	£49,000	£45,000	£52,000
Wales	£45,000	£42,000	£50,000
West Midlands	£46,000	£40,000	£50,000
Yorkshire and the Humber	£46,000	£40,000	£47,500
<b>National average</b>	<b>£47,042</b>	<b>£40,375</b>	<b>£51,333</b>
% increase year on year: 2.2%			

### Contractors: Directors

Region	Typical salary 2022	Min salary 2022	Max salary 2022
East Midlands	£71,000	£65,000	£80,000
East of England	£71,000	£70,000	£85,000
London	£100,000	£85,000	£120,000
North East England	£57,500	£50,000	£62,000
North West England	£74,000	£65,000	£85,000
Northern Ireland	£77,000	£70,000	£90,000
Scotland	£59,000	£50,000	£65,000
South East England	£77,000	£70,000	£80,000
South West England	£70,000	£63,000	£70,000
Wales	£60,000	£56,000	£65,000
West Midlands	£72,000	£65,000	£80,000
Yorkshire and the Humber	£62,000	£60,000	£65,000
<b>National average</b>	<b>£70,875</b>	<b>£64,083</b>	<b>£78,917</b>
% increase year on year: 2.6%			

### Contractors: CAD technician

Region	Typical salary 2022	Min salary 2022	Max salary 2022
East Midlands	£32,000	£27,000	£34,000
East of England	£28,000	£26,000	£32,000
London	£45,000	£36,000	£50,000
North East England	£28,500	£23,000	£29,000
North West England	£30,000	£25,000	£32,000
Northern Ireland	£37,000	£30,000	£45,000
Scotland	£25,000	£22,000	£26,000
South East England	£40,000	£35,000	£42,000
South West England	£32,000	£26,000	£35,000
Wales	£30,000	£25,000	£30,000
West Midlands	£30,000	£26,000	£33,000
Yorkshire and the Humber	£28,000	£23,500	£29,000
<b>National average</b>	<b>£32,125</b>	<b>£27,042</b>	<b>£34,750</b>
% increase year on year: 3.3%			

### Contractors: Contract quantity surveyor

Region	Typical salary 2022	Min salary 2022	Max salary 2022
East Midlands	£54,000	£45,000	£65,000
East of England	£53,000	£47,000	£60,000
London	£67,500	£60,000	£80,000
North East England	£47,000	£42,000	£52,000
North West England	£45,000	£40,000	£55,000
Northern Ireland	£50,000	£45,000	£55,000
Scotland	£45,000	£37,000	£47,000
South East England	£65,000	£60,000	£70,000
South West England	£55,000	£45,000	£65,000
Wales	£50,000	£43,000	£50,000
West Midlands	£49,000	£40,000	£60,000
Yorkshire and the Humber	£44,000	£40,000	£50,000
<b>National average</b>	<b>£52,042</b>	<b>£45,333</b>	<b>£59,083</b>
% increase year on year: 4.5%			

to walk away with a weeks notice, says Blake, who adds that many contractors who previously enjoyed regular work have been scarred by loss of work during the pandemic.

The boom in activity is fuelling skills shortages: nearly three quarters (73%) of construction and property employers predict that there will be a shortage of suitable applicants in the next year, up from 55% the year before. The proportion predicting greater competition from other employers has also increased, from 44% last year to 55% in the latest survey.

Pay rises are also being fuelled by the boom. In building services, the average salary rise was 3.4% last year, rising from 1.1% the previous year. This outstripped the overall figure for construction and property, with salaries across the sector increasing by an average of 2.6%, up from 1.1% the year prior.

More than half (56%) of building services professionals expect their salary to increase over the next 12 months. Blake believes this figure for salary rises would have been even

higher at the end of year, when she was seeing increases as high as 10%. They [employees] are dictating what they want, she says. I feel for firms, because it such an acute shock.

Perhaps better news for companies is the survey's finding that two thirds (66%) of building services professionals say they could be tempted to stay at their current role if they receive a counter offer with increased benefits and pay. However, a culture of counter offers can create problems for smaller companies, which may find themselves outbid when candidates go back to their existing employer for more money, says Naughton. We get priced out, because we can't compete with bigger consultancies on that level, he adds.

Building services professionals increasingly want firms to be clearer about pay. Two thirds (64%) believe it is important for their organisation to be transparent about how pay levels and pay rises are set – an increase from 51% last year.

Transparency on pay has grown as an issue over the past 10 years, according to Upjohn, who says: It's almost a demand now.

We have to do something to prove to people that, even if they are working in different groups, there is some consistency, he adds, referring to the company's group structure organisation.

In the current environment, companies will need to get the balance right with employees, says Blake. If you do, you are going to keep them. If you don't, you will lose them, because there are so many jobs. If you don't sort it, the market is brutal. **CJ**

**Contractors: Estimator**

Region	Typical salary 2022	Min salary 2022	Max salary 2022
East Midlands	£50,000	£45,000	£55,000
East of England	£54,000	£50,000	£60,000
London	£60,000	£50,000	£62,000
North East England	£42,000	£35,000	£45,000
North West England	£43,000	£38,000	£45,000
Northern Ireland	£42,000	£38,000	£45,000
Scotland	£42,000	£35,000	£44,000
South East England	£65,000	£60,000	£70,000
South West England	£50,000	£42,000	£55,000
Wales	£45,000	£40,000	£48,000
West Midlands	£48,000	£40,000	£60,000
Yorkshire and the Humber	£40,000	£33,000	£43,000
<b>National average</b>	<b>£48,417</b>	<b>£42,167</b>	<b>£52,667</b>
<b>% increase year on year: 3.8%</b>			

**Contractors: Project engineer**

Region	Typical salary 2022	Min salary 2022	Max salary 2022
East Midlands	£40,000	£35,000	£42,000
East of England	£47,000	£45,000	£55,000
London	£55,000	£50,000	£60,000
North East England	£37,500	£32,000	£42,000
North West England	£42,000	£30,000	£45,000
Northern Ireland	£36,000	£33,000	£40,000
Scotland	£41,000	£30,000	£42,000
South East England	£50,000	£45,000	£50,000
South West England	£42,000	£38,000	£48,000
Wales	£38,000	£35,000	£40,000
West Midlands	£41,000	£30,000	£45,000
Yorkshire and the Humber	£38,500	£35,000	£45,000
<b>National average</b>	<b>£42,333</b>	<b>£36,500</b>	<b>£46,167</b>
<b>% increase year on year: 3.9%</b>			

**Contractors: Project manager**

Region	Typical salary 2022	Min salary 2022	Max salary 2022
East Midlands	£52,000	£45,000	£55,000
East of England	£53,000	£45,000	£60,000
London	£70,000	£65,000	£80,000
North East England	£49,000	£45,000	£55,000
North West England	£50,000	£40,000	£50,000
Northern Ireland	£42,000	£40,000	£48,000
Scotland	£46,000	£32,000	£47,000
South East England	£65,000	£60,000	£70,000
South West England	£53,000	£44,000	£54,000
Wales	£45,000	£40,000	£50,000
West Midlands	£52,000	£40,000	£55,000
Yorkshire and the Humber	£53,000	£45,000	£55,000
<b>National average</b>	<b>£52,500</b>	<b>£45,083</b>	<b>£56,583</b>
<b>% increase year on year: 3.9%</b>			

**Contractors: Senior contracts manager**

Region	Typical salary 2022	Min salary 2022	Max salary 2022
East Midlands	£56,000	£50,000	£60,000
East of England	£62,500	£55,000	£70,000
London	£75,000	£65,000	£85,000
North East England	£46,500	£38,000	£50,000
North West England	£55,000	£50,000	£68,000
Northern Ireland	£58,000	£50,000	£60,000
Scotland	£48,000	£40,000	£50,000
South East England	£70,000	£65,000	£70,000
South West England	£59,000	£50,000	£60,000
Wales	£52,000	£45,000	£55,000
West Midlands	£57,000	£50,000	£70,000
Yorkshire and the Humber	£43,000	£40,000	£50,000
<b>National average</b>	<b>£56,833</b>	<b>£49,833</b>	<b>£62,333</b>
<b>% increase year on year: 4.2%</b>			



Gaelle Blake, Hays' director for construction and property



Andrew Swain-Smith, BDP chair of building services engineering



Ray Upjohn, ChapmanBDSP chief executive





Harry is currently part of the team working on Manchester Town Hall



## Winning attitude

**CIBSE's Technician Apprentice of the Year Harry Playfair discusses the benefits of work-placed training and shares his rich experiences as a STEM ambassador in local schools**

Each year, the CIBSE Young Engineers Awards recognise and reward some of the best new talent entering the building services industry, showcasing remarkable young people, as well as the businesses that nurture them. At the latest awards, in October, Harry Playfair, a building services project engineer apprentice at NG Bailey, won CIBSE Apprentice of the Year Technician (Level 3-4). Having started his apprenticeship in 2019, he is studying for a HNC in building services engineering, and is on track for a distinction. Harry is part of the NG Bailey team working on the restoration of Grade I listed Manchester Town Hall.

### What projects have you been working on during your apprenticeship?

I have had the opportunity to work on various projects, such as City Labs 2.0, Manchester Aquatics Centre, Manchester Metropolitan University's new science and engineering campus, and Manchester Town Hall. I have learned in areas such as project management, estimating, commercial, pre-construction, procurement, and commissioning. The diversity of the projects also brought new challenges, with each contributing to my apprenticeship learning and development.

### How has NG Bailey helped you develop as an engineer?

The company provides an excellent opportunity for young people to embark on their careers. The structure of its programme enables apprentices to learn and develop key skills to do the job well. I have been surrounded by knowledgeable and experienced engineers who have assisted me with my technical understanding. Apprenticeships provide a great route into the industry, as knowledge, experience, skills, and lessons learned can be passed down to budding engineers.

I have been fortunate to work in a variety of departments at NG Bailey, through different project stages. I have enjoyed collaborating with different project teams on site to deliver and install mechanical and electrical systems. From an apprentice's perspective, visualising the installation of building services has been very important.

### What has been your biggest project to date?

On the Manchester Town Hall project, one of my first responsibilities was to work alongside the heritage management team to ensure the new services being installed

coordinated with existing items on site that had heritage significance. No one had undertaken the task of identifying clashes that could occur within the building. I carried out surveys, raised technical queries and chaired team meetings with key project stakeholders. This successful early identification ensured that the new services could be rerouted while not impacting the project's programme.

### What else are you doing in the industry?

Volunteering is a positive and influential aspect of my job. As a STEM ambassador, I have led talks in schools and provided apprenticeship career sessions promoting the building services industry. I am passionate about encouraging students to consider an apprenticeship within the industry by sharing my experience and the knowledge I've gained so far.

### What would you say to a young person considering an apprenticeship?

I believe an apprenticeship in building services is truly for anyone, and is the future for the next generation of engineers. Not only do you gain key skills to make you a more desirable employee, but you also achieve sought-after qualifications all while avoiding student loans; a win-win situation.

The apprenticeship route is hard work, but having the responsibility of balancing your studies contributing to your professional development through your knowledge, skills and behaviours while learning on a construction project is very rewarding.

### Has being involved in CIBSE helped your career?

I was overwhelmed and proud to win CIBSE Apprentice of the Year. I have been able to develop new contacts within the industry and meet young, aspiring engineers like myself.

It has also given me the opportunity to learn from people's experiences and find out about the routes they have taken to enter the industry. This diversity is what I believe, as an industry, will contribute towards delivering low carbon sustainable buildings of the future.

I hope to achieve engineering technician (EngTech) status with CIBSE this year, and one of my long-term aims is to achieve Chartered Engineer status.

● National Apprenticeship Week 2022 takes place from 7-13 February 2022. More information at [bit.ly/CJFeb22NAW](http://bit.ly/CJFeb22NAW)

## London mayor targets 40% cut in building heat demand

### Energy-storage measures central to London's new carbon-reduction plan

Around one-fifth of London's substations will need to be upgraded by 2030 without demand-side response and storage measures, according to Sadiq Khan's more ambitious blueprint to cut the capital's emissions to net zero.

The Mayor of London's new carbon-reduction pathway sets a target of reducing the capital's residual emissions to 22% of 1990 levels by 2030, compared with his previous goal of 40%.

London's pathway includes a nearly 40% reduction in the total heat demand of the city's buildings, entailing insulation upgrades for more than two million homes and 250,000 non-domestic buildings. It also requires 2.2 million operational heat pumps, 460,000 buildings connected to district heating networks, and a ban on fossil fuel-powered cars and vans by 2030.

The electricity grid reinforcement required in the capital will 'primarily' depend on the

London's aim is to reduce its emissions to 22% of 1990 levels by 2030



rate of deployment of electric heating and mix of technologies, according to a report by consultancy Element Energy. The level of deployment of demand-side response and energy storage will also have a 'significant' impact on how peak demand for electricity is managed and the scale of grid upgrades.

Without such flexibility measures, up to 50 of London's 235 primary substations will need to be reinforced by 2030, a number that will rise to 125 by 2050, Element says.

The targets will save 150 megatonnes of CO<sub>2</sub> emissions by the middle of this century.

## Heat networks get £19m boost

The government is putting £19.1m into five new heat networks in England, as part of its Heat Networks Investment Project. There will be one each in Liverpool, London and Worthing, and two in Bristol.

Heat networks currently provide approximately 2% of the UK's heat demand, but could meet around a fifth by 2050.

Government-funded projects currently being developed include Leeds City Council's 16km district heat network, Cardiff City heat network in South Wales, spreading across the Cardiff Bay area, and Newcastle University's district heat network on its city centre campus.

## Diffusion supplies fan coils to London development

Diffusion has supplied 980 fan coil units (FCUs), of varying types and design, to One Bishopsgate Plaza at 150 Bishopsgate, London. The 41-storey, mixed-use development features luxury residential accommodation, a five-star hotel, plus retail space and restaurants.

Diffusion's Highline FCUs were installed by contractors GBE in the hotel and retail areas of the build. Its Highline 270 waterside control FCUs are fitted with high-efficiency EC/DC motors and boast a specific fan power as low as 0.16W/l/s.

## Hitachi's eco friendly R513A Samurai chiller

Hitachi Cooling & Heating has expanded its portfolio of water-cooled and condenserless chillers, with an eco-friendly R513A option on the RCME-WH1 and RCME-CLH1 Samurai L chillers. The new option is designed to meet the EU F-Gas regulations. Using low-GWP R513a as an alternative to R134a reduces the global warming potential by 56% and cuts the amount of refrigerant charge used in each unit, while retaining the same cooling capacity.



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# Plotting a route to net zero

Following the publication of the government's Heat and Building Strategy last year, Baxi's Jeff House looks at what decarbonisation means for the future of heating in the UK, including hydrogen's role and why off-grid communities are ripe for electrification

As we all know, there is no single solution to decarbonising the UK economy. All credible scenarios for achieving net zero emissions include the use of hydrogen to heat a proportion of the existing building stock, of which around 85% is currently reliant upon natural gas. Hydrogen is likely to be used in difficult to treat cases, such as heavy transport and industry.

## Hydrogen is happening

Hydrogen is happening now in a series of small scale demonstrations that could help pave the way for tomorrow's energy transition. We plan to have hydrogen ready boilers on the market soon and we'd like to see everybody getting behind hydrogen as another option to decarbonise our heating and hot water. That requires government to set the right policy, and producers and network operators to get hydrogen through the grid to homes and businesses when they can.

The government predicts the first hydrogen heated village to be in operation by 2025 and a town by 2030. We are ambitious for hydrogen and would like the UK to develop a hydrogen economy as quickly as possible. There are hydrogen clusters emerging in parts of the UK, notably the North East and North West, which will be interesting to watch as they develop.

## Electrification of rural heat

The Department for Business, Energy and Industrial Strategy recently consulted on phasing out fossil fuel use in off gas grid applications. The central proposals include ending the installation of new or replacement fossil fuelled boilers in larger commercial buildings in 2024, and in all buildings including dwellings in 2026.

Because so much rural heat is off grid and powered by oil or liquid gas, switching to electrical options such as heat pumps can represent an attractive choice, and a big carbon emissions reduction.

We produced a white paper<sup>1</sup> in October last year that showed how much customers were motivated by cost. If the price is right, customers will switch. The same paper modelled different types of housing and found that the switch from oil fired boilers to low carbon heat pumps



Hydrogen is happening now in small scale demonstrations that could help pave the way for tomorrow's energy transition

was much more attractive currently than switching from on grid gas boilers.

Just more than a quarter of the household electricity bill is a levy that pays for environmental and social obligations. How much each bill payer contributes is directly linked to the amount of electricity consumed. There is currently a much lower levy of 2.5% charged on gas bills, which represents a fundamental unfairness for consumers wishing to switch to a heat pump or other electrically driven heating system.

In the Heat and Buildings Strategy, the government is clear that it plans to address the distribution of levy costs across fuel types. We don't know when this will happen, but it will reduce the affordability gap that currently exists between gas and electricity powered heating.

## Energy efficiency still key

Energy efficiency is absolutely critical to reducing emissions, and should always be the first consideration when addressing existing buildings – the cleanest kWh of heat is the one we don't use.

The Heat and Buildings Strategy makes reference to funding schemes, such as the Social Housing Decarbonisation Fund and fuel poverty related support – but existing private buildings are almost absent. To

make low carbon heat viable in many existing properties, we need to ensure the fabric is suitable. Without support on costs, this will prove challenging to many consumers.

## Missing guidance

Historically, we had the Building Regulations Approved Document L, and the supporting domestic and non domestic building services compliance guides. The revised Approved Documents (ADs) coming into force this year include simplified guidance and the compliance guides are gone, with some content rolled into the main AD. This means that a great deal of helpful supplementary guidance and good practice pointers will be lost.

The onus will now be on industry to disseminate information and keep practitioners up to date.

## References:

- 1 *Affordable heat decarbonisation: is it time for a green heating credit?* Baxi, October 2021, [bit.ly/CJJan21UH](https://bit.ly/CJJan21UH)

**JEFF HOUSE**  
is head of external affairs at Baxi



Arup's all electric office at 80 Charlotte Street London is developer Derwent London's first net zero office scheme. **Andy Pearson** examines the heat and cooling strategy that combines heat pumps and chillers, and looks at how Covid affected the design and delivery of the project

# NEXT GENERATION

**T**he mixed use scheme at 80 Charlotte Street is developer Derwent London's first net zero carbon project. Completed in May 2020, this 35,000m<sup>2</sup> development occupies a prominent island site bounded by four streets in London's Fitzrovia. It features residential, retail and office space, plus a new public pocket park inspired by Paley Park in New York.

The engineering of the 30,000m<sup>2</sup> speculative office building that anchors the development is key to the scheme's low carbon credentials. It is one of the first major offices in London to be designed as an all electric scheme. As such, it is heated and cooled using air source heat pumps (ASHPs) and powered by renewable electricity certified to be of guaranteed origin.

It has taken more than a decade for this pioneering project to come to fruition, largely

as a result of trying to retain and successfully stitch together the collection of existing buildings that occupy the block. Architect Make worked with Arup to develop the design, the main element of which is a 90m<sup>2</sup> block, built in the 1960s as offices for the Post Office and later occupied by advertising agency Saatchi & Saatchi. A section of the building's facade is now woven into the new build elements.

There is a retained facade on Whitfield Street, which is part of a conservation area; beyond that, we've had to rebuild all of the building because of the condition of the existing structure, says project lead Rahul Patel, director, buildings, at Arup, which was the mechanical, electrical and sustainability consultant on the scheme.

The forward thinking decision to consider an all electric scheme was mooted by Arup way back in 2009, when gas was still the go to fuel for heating. However, the proposal chimed with Derwent London's ambitious sustainability goals, which include achieving a net zero carbon portfolio by 2030.

At the time the scheme was being developed, Arup was reviewing the potential for the electricity Grid to become greener in the future, and how this could result in buildings being designed to be all electric, including the potential to be heated and cooled using heat pump technology. We discussed with Derwent a series of likely scenarios for the carbon content of Grid electricity, the unit price of electricity, and the performance of heat pumps, all of which we expected to improve over time, explains Patel. They trusted that our forward thinking approach was right and that has paid off.

The decision to go all electric was based on carbon considerations and sound economics, Patel adds. From a carbon perspective, electricity is a no brainer, he says, while its benefits from a cost perspective depend on the difference in price between gas and electricity. What we couldn't do is develop an all electric scheme that means the tenants have to pay through the nose for energy.

The concept was proven to be viable two years into design development. By then, Arup was able to model the building's anticipated energy use in detail. At that time, using a reasonably

## PERFORMANCE DATA

- Onsite energy generation - 2.4%
- Annual mains water consumption - 5.9m<sup>3</sup> per person
- Airtightness - 50Pa 3m<sup>3</sup>·h<sup>-1</sup>·m<sup>-2</sup>
- Heating and hot water load - 4.95kWh·m<sup>-2</sup> per year
- Overall area-weighted U-value for the façade - 1.32W·m<sup>-2</sup>·K<sup>-1</sup>
- Systems design life - 25 years
- Building design life - 60 years
- Embodied carbon (A1-A5) - 685kgCO<sub>2</sub>e·m<sup>-2</sup>
- Annual CO<sub>2</sub> emissions (TM54 regulated and unregulated figures) - 25kgCO<sub>2</sub>·m<sup>-2</sup> per year





Left: Retaining and stitching together existing buildings on the site meant the project took more than a decade to complete

conservative analysis, the cost of electric was shown to achieve parity with gas, says Patel.

Electricity is used to power three roof mounted ASHPs, which provide all of the heat and most of the cooling for the building, with additional cooling supplied by two roof mounted air cooled chillers.

When the building operates in heating mode, the heat pumps which are variously sized to enable heat supply to be matched to demand provide all the heat. When the building has both heating and cooling demands, the heat pump system will supply heating and cooling simultaneously. Rather than reject heat, it is put back into the building.

When the building is operating in this mode, an optimiser will ensure the heat pumps are prioritised over the central chillers. At that point, the coefficient of performance [COP] will go through the roof, because you're getting extra bits of heat for the same input of electricity, says Patel.

For peak summer cooling, the chillers are prioritised. Air cooled chillers are slightly more efficient than a heat pump at providing cooling, Patel explains. The optimising algorithm will bring the systems together from a COP perspective.

## The forward thinking decision to consider an all electric scheme was mooted by Arup way back in 2009, when gas was still the go to fuel for heating

Heat generated by the ASHPs is supplied to trench heaters that ring the external perimeter of the 10 floors of offices, consisting of ground and lower ground floors, and eight storeys above ground. Patel says the heating system design was a bit more challenging using heat pumps because of the lower water temperatures.

To get the right efficiency of performance, heat pumps typically deliver water at around 45 C, which means the terminal devices, for example, need to be a little bit bigger to give the same output than if they were connected to a boiler supplying heat at 80 C, he explains.

Also, because the heat pumps use outside air as a heat source, they need to see sky, so have to be located on the roof. As a consequence, the



80 Charlotte Street occupies an island site bounded by four streets in London's Fitzrovia



» roof has to have sufficient area to cope with the larger footprint of the ASHPs compared with that of a conventional gas fired boiler with the same output.

Chilled water, whether generated by the ASHPs or chillers, is supplied to soffit mounted fan coil units (FCUs) distributed around the floor plates. The FCUs are controlled in two zones: a perimeter zone and an internal zone. To help minimise perimeter cooling loads Arup worked with Make to optimise the location of the glazed and opaque areas of the facade. Glass is generally at high level to contribute to daylight levels on the floor plates, Patel explains.

An LED lighting system further minimises energy use in the main office areas. This is coupled to a DALI controller and daylight sensors, to allow light fittings to be dimmed automatically in response to ambient light levels.

While the building's facade is almost entirely new aside from the retained section in the conservation area on Whitfield Street it has been designed with the local vernacular in mind, referencing Fitzrovia's variety of buildings, but with a very rational glazing proportion. What is important is that the ghost of the existing building still exists, says Patel.

The new building incorporates the existing building's low floor to floor height of around 3.3m, which Patel describes as 'super lean'. With such a low floor height, the supply of fresh air to the office floor plates could have been an issue. However, the design team's decision to

relocate and consolidate the cores of the existing buildings into the centre of the plan has enabled the creation of three full height atria. These allow natural light into the heart of the building and, through integration of engineering and architecture plus an innovative design approach provide a route for the ventilation ductwork.

Working with Make ensured we had atria in all of the right places, which gave us the opportunity to distribute the fresh air, says Patel.

Three fresh air ducts drop down these atria from roof mounted air handling units, to supply air to the floor voids on each of the office levels. Fans in the perimeter trench heaters help draw the air across the floor plates, and the air returns to the AHUs through a series of

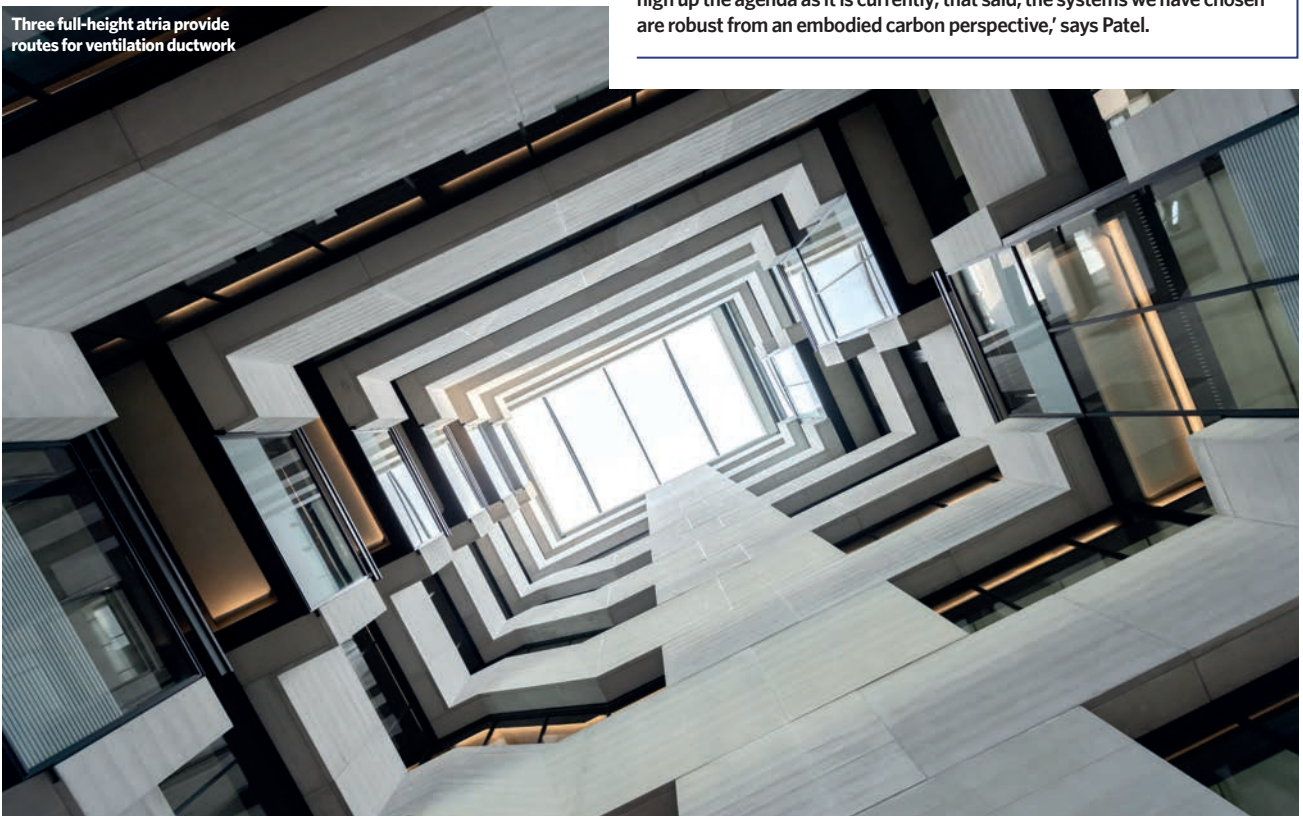
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#### EMBODIED ENERGY

The building is being promoted as having lower embodied energy. According to Derwent London, it has been designed to achieve 28% lower embodied carbon intensity than the RICS benchmark, with estimated embodied carbon of 850kgCO<sub>2</sub>e·m<sup>-2</sup>, versus the RICS Building Carbon Database (offices) average benchmark of 1,177kgCO<sub>2</sub>e·m<sup>-2</sup>. 'When we designed this building, it's fair to say that embodied energy was not as high up the agenda as it is currently; that said, the systems we have chosen are robust from an embodied carbon perspective,' says Patel.

Three full-height atria provide routes for ventilation ductwork





## The façades incorporate openable windows. When the windows open, the heating and cooling switches off

» ducts behind louvred panels at the core. If you take the fresh air ducts out of the main floor plate, you can squeeze the floor height down, explains Patel, who adds that the fresh air supply rate of  $1.6\text{L}\cdot\text{s}^{-1}\cdot\text{m}^{-2}$  is at the higher end of the British Council for Offices scale, based on an occupancy of one person per  $8\text{m}^2$ .

In addition to mechanical ventilation, the façades incorporate openable windows, allowing the building to operate a perimeter mixed mode ventilation strategy. When the windows open, the heating and cooling switches off.

The roof as well as housing the ASHPs is home to  $80\text{m}^2$  of roof mounted solar thermal panels. These preheat the domestic hot water (DHW), which is then topped up by heat from a dedicated set of ASHPs, to raise its temperature to around  $65\text{C}$ .

We looked at various renewable technologies for the domestic hot water, but, at that point in time, there were limited options from an all electric perspective, Patel explains. Using dedicated heat pumps also enables the system to be run out of hours.

The solar system is self regulating and sized at peak summer demand. At the limited times when the system generates more heat than required, radiators within the solar system ensure the water and components don't overheat. The DHW tanks also include an electrical element as backup, but Patel says these are not intended to be used under normal operation.

At the outset of the project, Arup conducted a CIBSE TM54 study to get an idea of the expected

performance of the building. Once the building is fully occupied, in use electricity data will be analysed and compared against the TM54 modelling calculations completed at the design stage. We have a smart system that links everything together, so we're able to understand, from an energy perspective, how much we are consuming and where, on both the landlords' side and the tenants' side, says Patel.

As Arup is one of the building's main occupiers, Derwent London will have a unique opportunity to work with the engineer to optimise its operational energy performance. Our commitment to Derwent is that we'll do all the commonly employed checks across Derwent projects, such as seasonal commissioning, energy monitoring and targeting, says Patel. In addition, as a tenant, we'll do this at a granular level; for example, we can measure the contribution we're getting from the lighting switching off when daylight levels are good enough, and from opening the windows in the summer. We have real time occupancy data alongside power consumption.

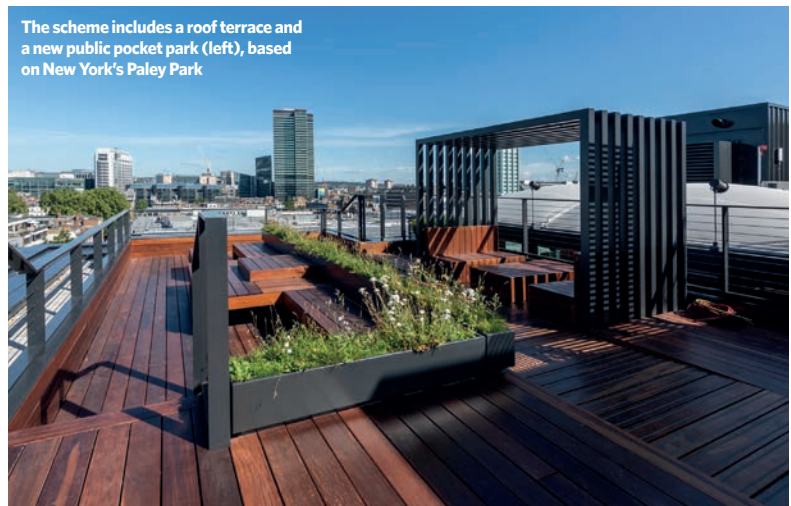
According to Derwent, the building achieved Breeam excellent at design stage and is targeting Leed Gold and an Energy Performance Certificate B rating. Derwent London is now targeting all electric heating and cooling systems for all its new developments, to help it achieve its goal of a net zero carbon portfolio by 2030. 80 Charlotte Street will be the reference point against which all of its subsequent developments will be measured. **CJ**

### THE IMPACT OF COVID-19

The building was completed at the start of the coronavirus pandemic. Since then, Patel says Arup has carried out a retrospective review of the systems with Derwent, 'to try to understand all the systems and how we might then address Covid with these'. For example, the review found that opening windows in addition to the mechanical ventilation was beneficial. 'The building has a really good ventilation rate, but we have the opportunity to open windows and give it a boost if we need it - although you wouldn't choose to do that all of the time from an energy perspective,' says Patel.

Completion of the building during the pandemic also required changes in the way commissioning was undertaken. Many of the inspections, for example, were carried out remotely, using video links along with factory tests, where data and monitors were witnessed remotely. 'You can have FaceTime calls and WhatsApp videos where you can say "this is the gauge I want to see". We embraced technology to shift the way we do things,' says Patel.

Some commissioning had to be done in person, however, including the black building tests, where multiple things were happening at once. At such times, Patel adds, design and build contractor Multiplex ensured that attendees could safely maintain social distancing on site.



The scheme includes a roof terrace and a new public pocket park (left), based on New York's Paley Park

# Turning to CO<sub>2</sub> refrigerant in large scale retrofits

Using CO<sub>2</sub> as a refrigerant in heat pumps is ideal for retrofits requiring higher temperature heat. Daniel Clark, of Isentra, reports on the refurbishment of Wolfson College, which is using heat pumps for district heating and DHW

**A**s we strive for decarbonisation of heating and the mass adoption of heat pumps in the UK, it is essential that they are engineered properly. Ideally, the net zero and decarbonisation heat agenda would depend on sustainable, natural refrigerants rather than synthetic refrigerants, especially in the world of high capacity heat pumps. There are several natural refrigerants to choose from, including ammonia, the hydrocarbons, and carbon dioxide (CO<sub>2</sub>). These can cover virtually all applications, but as with every refrigerant it is critical to match a refrigerant's strength to the application.

CO<sub>2</sub> as a refrigerant is now a mainstream technology. It is non toxic and non flammable, and has a global warming potential of 1, which combined with its thermodynamic properties make it a strong contender for higher refrigerant charge applications, such as air source heat pumps (ASHPs), where multiple heat sources feed into a heat network.

Wolfson College, Oxford has taken delivery of two industrial, transcritical CO<sub>2</sub> ASHPs that supply 350kW of heating each. Each heat pump sources heat from two fan powered evaporators located in an open sided car park, while the heat pumps are in a traditional plantroom.

In addition to its sustainability and safety credentials, CO<sub>2</sub> is a refrigerant capable of efficiently supplying water at 70 C and above. The transcritical CO<sub>2</sub> refrigeration cycle delivers heat as the high pressure, high temperature refrigerant cools sensibly (as opposed to traditional refrigerants that condense at a lower temperature), and makes a great candidate for retrofitting systems that previously employed traditional heating schemes.

The new heat pumps at Wolfson connect into the original district heating system. However, there have been necessary modifications to adapt the system to efficient heat pump operation, including re engineering aspects of the heat network to ensure the water return temperatures are significantly lower than they were previously.

Heat pumps become more energy efficient as the inlet (return) water temperature reduces. CO<sub>2</sub> heat pumps are no different, and the return temperature must be below 33 C for reasonable efficiency, and lower return temperatures increase efficiency.



Wolfson College, Oxford

The Wolfson project also includes a domestic hot water (DHW) system heated by the CO<sub>2</sub> heat pumps. This employs a novel application of buffer tanks, cold mains water and stratification, to optimise efficiency. The heat pumps at Wolfson are engineered with parallel compression, which reduces the average compression ratio of the compressors and, therefore, the energy consumption.

The six (three per heat pump) compressors are all semi hermetic reciprocating machines that are largely driven through inverters to enable the heat pumps to dynamically match the given heating demand.

The Wolfson heat pumps are designed for high discharge pressures; the maximum working pressure is 130 bar on discharge side and this pressure is confined to the plantroom. The suction pipework and evaporator devices are rated to 60 bar, while the liquid line is rated to 90 bar, which allows the CO<sub>2</sub> heat pumps to stand still in the summer months when heating is not required and the heat pumps are inactive.

Source and sink heat exchangers have a fundamental influence on the coefficient of performance and seasonal energy efficiency ratios, with energy benefits available by maximising the surface area of all heat exchangers. It is a simple equation of capital expenditure versus efficiency and, ultimately, the life cycle cost.

The evaporators have variable speed airside fan speed, controlled to optimise operating conditions. A bespoke control system, with internet connected remote access, operates the heat pump and evaporator heat sources, including the defrost systems and integration with the energy meters. Touchscreen interfaces on each heat pump display local operational feedback. The evaporator heat source defrost systems at Wolfson are defrosted using warm glycol; the heat for the defrost is drawn from the return water of the heating network.

CO<sub>2</sub> can be a natural, long term, environmentally safe solution when used in high charge heat pump applications, safely collecting from a site wide heat source network, and delivering it efficiently to space heating and DHW networks. As a benign refrigerant, CO<sub>2</sub> is also not subject to environmental legislation, such as the F Gas Regulation. **CJ**

**DANIEL CLARK** is managing director at Isentra



## Cost model

# Heating and cooling systems in industrial business parks

In the push to decarbonise, consultants are considering heat pumps and ambient loops to heat and cool business parks. Aecom's **Hannah Reynolds** and **Max Rattenbury** examine the costs for an electric office and fulfilment centre just outside London

**T**his cost model is based upon a fulfilment centre of 1.50 million ft<sup>2</sup> of fully automated warehouse space (no cold storage provided) and associated office of 145,000ft<sup>2</sup> gross internal area and 118,900ft<sup>2</sup> net internal area (NIA; CAT A) to provide office accommodation and support to the fulfilment centre.

The facility is located outside the M25, on a large business or industrial estate with close links to main arterial roads. The cost model provides a comparison between the fulfilment centre and office for heating and cooling systems.

The industrial park benefits from large solar arrays, small scale battery storage, a solar hot water farm and ground source heat pumps supporting a centralised energy strategy, to provide low carbon energy to the park. (These are not considered within the cost model as they form part of the wider infrastructure of the park.)

The office and fulfilment centre are connected to the district energy network (low temperature hot water and electrical) to provide part of the base load energy requirement with top up supplied by additional plant within the fulfilment centre and office demises.

## Heating and cooling

In the past two years, there has been a large expansion in online retailing and demand has grown for large storage facilities with attached offices that are operational 24 hours a day – they must also have low carbon and operational costs.

Sustainable and low carbon buildings are now a key requirement for developers, investment funds and end users. Recent legislative changes mean fossil fuel burning technologies are no longer acceptable within new developments, so there is a shift to electric heating and cooling technologies, and existing plant is being adapted to cut building carbon and energy use.

In this cost model, the business park is using solar arrays and small scale battery storage to provide an element of onsite electrical generation, which is distributed by a private electrical network to the demises. The heating and hot water requirements are met by a



The cost-model facility is on a business park that has solar arrays and small-scale battery storage providing some onsite electrical generation

solar hot water farm and ground source heat pump system, which is distributed using a centralised energy network terminating at plate heat exchangers within the demises of the units.

The secondary side plant is provided within the demises of the office and fulfilment centre via water source heat pumps (WSHPs), air source heat pumps (ASHPs) and a hybrid variable refrigerant flow (VRF) system. The two uses are linked via an ambient loop so that energy is shared between the two, with either heat or cooling being extracted or rejected to or from the ambient loop.

## Project details

The fulfilment centre has a combination of WAHPs, ASHPs and close coupled VRF units to air handlers and door air curtains. Hot water to showers and bathrooms is provided by instantaneous hot water heaters and storage calorifiers supported by WSHPs to generate domestic hot water.

The office is based upon providing standard British Council of Offices office accommodation in terms of population and air volumes. The NIA is based on a population of one person per 10m<sup>2</sup> of NIA and an air volume of 16 L s<sup>-1</sup> per person. Heating and cooling to the CAT A spaces are provided by a combination of WSHPs, ASHPs and a hybrid VRF system.

The two uses are linked via an ambient loop so that heating and cooling requirements between the two can be better managed in terms of energy sharing and requirements, and reduce the overall consumption of energy.



» The rates are current in the third quarter of 2021, based on a location factor of outside the M25. Exclusions include, but are not limited to, main contractor overheads and profit, preliminaries, professional fees, and VAT. Both buildings are designed to meet Breeam Excellent standards. The cost model has excluded any allowance for increased lead in times, effects of Covid, or currency fluctuations.

**Next steps**

Stricter legislation is likely to drive further reductions in energy use and a building's carbon footprint. These new targets will be met through new technology and energy reduction measures. In an office, this could be wider temperature ranges on floor plates, reducing the volume of air per person, and natural ventilation.

Energy use could be reduced by connecting users across the business park, enabling buildings to share heating and cooling through the ambient loop. For example, heat rejection from the refrigeration element of a large scale supermarket could provide low grade heat for a residential or hotel development. [C](#)

**HANNAH REYNOLDS** and **MAX RATTENBURY** are specialist MEP cost managers at Aecom

**Table right: Cost model for a fulfilment centre and office on a large business or industrial estate just outside of the M25**

Heating and cooling cost model	Commercial office		Fulfilment centre	
	Unit	Rate £	Unit	Rate £
<b>SHELL AND CORE</b>				
Disposal installations				
Copper condensate drainage to fan coil units, and plant, including pumps	m <sup>2</sup>	1.50	m <sup>2</sup>	0.95
<b>Water installations</b>				
Instantaneous hot-water heaters	m <sup>2</sup>	2.10	m <sup>2</sup>	0.15
Storage calorifiers linked to WSHPs	m <sup>2</sup>	1.25	m <sup>2</sup>	0.25
<b>Space heating and air treatment</b>				
Air source heat pumps (ASHPs)	m <sup>2</sup>	16.15	m <sup>2</sup>	4.01
Water source heat pumps (WSHPs)	m <sup>2</sup>	4.23	m <sup>2</sup>	1.84
VRF over-door heaters (high bay doors)	m <sup>2</sup>	N/A	m <sup>2</sup>	1.98
Close-coupled VRF units to AHUs	m <sup>2</sup>	6.17	m <sup>2</sup>	1.02
Connection to site-wide energy network via plate heat exchangers	m <sup>2</sup>	2.12	m <sup>2</sup>	0.35
Ambient loop, including pumps, pipework, etc (cost split on area)	m <sup>2</sup>	1.50	m <sup>2</sup>	1.50
Primary pipework distribution	m <sup>2</sup>	28.36	m <sup>2</sup>	2.56
Spot cooling via DX units	m <sup>2</sup>	1.25	m <sup>2</sup>	0.25
Specialised cooling to communication rooms	m <sup>2</sup>	N/A	m <sup>2</sup>	5.47
AHUs (roof-mounted for office, external compound for warehouse)	m <sup>2</sup>	12.37	m <sup>2</sup>	5.63
Ductwork installations	m <sup>2</sup>	13.25	m <sup>2</sup>	5.23
<b>CAT A / FIT OUT</b>				
VRF installation to offices	m <sup>2</sup>	40.23	m <sup>2</sup>	N/A
Fan terminal units for supply and extract air to warehouse	m <sup>2</sup>	N/A	m <sup>2</sup>	6.23
Ductwork distribution	m <sup>2</sup>	55.20	m <sup>2</sup>	17.23
<b>MEP contractors on costs</b>				
Builders' work in connection with services	m <sup>2</sup>	5.72	m <sup>2</sup>	1.56
MEP testing and commissioning	m <sup>2</sup>	5.63	m <sup>2</sup>	1.69
MEP subcontract preliminaries	m <sup>2</sup>	24.68	m <sup>2</sup>	6.89
<b>Total cost</b>		<b>£221.71</b>		<b>£64.79</b>

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## Assessing phenolic foam ducts for reduced embodied and operational carbon

This module considers the factors that determine whether it is appropriate to employ commercial phenolic foam ductwork systems

Ductwork systems that are used to distribute air in ventilation systems are, in most cases, practically a lifetime investment for a building, so decisions made at the time of the ductwork design will directly impact the building's life cycle carbon impact and lifetime financial cost. Historically, the majority of ductwork distribution systems in commercial buildings have been constructed of galvanised steel, providing a robust, long lasting, and effective solution. Alternative materials have increasingly been applied in appropriate applications, which in recent years have included ductwork made of faced phenolic foam insulation boards. This CPD will explore some of the significant factors that determine the appropriateness of employing phenolic foam ductwork systems in commercial buildings.

Much of the change to traditional ductwork practices is being driven by the requirement to reduce the environmental impact of building services systems. CIBSE Guide Part L 2020 *Sustainability* discusses the two types of CO<sub>2</sub> equivalent emissions associated with buildings: the embodied emissions of the products that make up the building, and the operational emissions that are mostly associated with the energy consumption of the day to day use of the building. The stages that are combined to provide a standardised measure of embodied carbon, as defined in BS EN 15978,<sup>1</sup> are illustrated in Figure 1. CIBSE TM 65<sup>2</sup> notes that a large proportion of building services products carbon emissions is associated with extraction, transport and processing of materials, and the energy consumption used in the manufacture of the products (stages A1 A3), so the majority of the embodied carbon in mechanical services will be directly related to the product stage. Environmental product declarations (EPDs) are a standardised way of expressing embodied carbon and other environmental impacts throughout the life cycle stages of a product.

TM 65 notes that an EPD should be considered as the most reliable source of information about the environmental impacts of a product. In the discussion of the assessment methodologies, it is noted that maintenance, repair, deconstruction and transport to waste processing are often not included due to lack of data – a challenge

that affects current practical assessments and comparisons of products and the ability to determine an EPD, since that includes an assessment of the end of life stage (C1 to C4) and reuse, recovery and recycling (D).

As noted by TM 65, very few manufacturers of building services products offer EPDs, mainly because of the complexity of mechanical, electrical and plumbing (MEP) products and their supply chain, but also because incentives from the market and regulation are missing. TM 65 provides basic and mid level methodologies that are complementary to the EPD in order to be able to assess and compare environmental impact realistically with reduced reliance on stages C and no inclusion of stage D.

As described by Densley Tingley *et al* in their very useful paper,<sup>3</sup> phenolic foam has a closed cell structure that resists moisture and water vapour ingress, so providing a suitable core material for insulation boards (which are used in forming ductwork), with a low thermal conductivity of 0.020W·m<sup>-1</sup>K<sup>-1</sup> (compared with expanded polystyrene (EPS) at 0.038W·m<sup>-1</sup>K<sup>-1</sup>, mineral wool at 0.036W·m<sup>-1</sup>K<sup>-1</sup> and polyisocyanurate (PIR) at 0.027W·m<sup>-1</sup>K<sup>-1</sup>). In further work<sup>4</sup> by Densley Tingley *et al*, they »

» remark that in common with many building products, there is little published work on the end of life stage of phenolic foam (which, in the context of their paper, is referring particularly to external wall insulation systems), and owing to the layered nature of the systems and the use of adhesives and tapes it would be likely that any phenolic foam ductwork system removed at end of life would be viewed as contaminated. As such, it would likely be sent to landfill, although it could be incinerated with energy recovery. It is noted that the importance of developing strategies for effective removal and disposal of such systems might best be taken into account during system development.

The relevant UK/European standard for the basic requirements and characteristics for ductwork made of insulation boards and used in ventilation and air conditioning systems of buildings (for human occupancy) is BS EN 13403:2003.<sup>5</sup> The core requirements of the standard are summarised in Table 1.

Independent tests<sup>6</sup> on a sample of a commercially available phenolic foam ductwork system indicate that the material and the fabrication method, as shown in a simplified form for a straight duct in Figure 6, produces ductwork that has integrity class C.

The US Underwriters List (UL) standards are often referred to when considering specifications for ductwork. UL 181 is an American National Standards Institution (ANSI) recognised standard for factory made ducts and connectors, which was most recently updated in 2021 – the standard may be viewed at no cost on the UL website.<sup>7</sup> The standard provides a range of performance tests that cover similar areas to BS EN 13403, which in summary includes: testing for flame penetration and burning, and flame resistance (for jointing materials); corrosion resistance; and mould growth as well as tests on the structural integrity (including impact, puncturing, sagging, torsion and collapse) and stability under various temperature and humidity conditions. Ductwork systems that comply with the requirements of UL 181 are listed on the UL website [bit.ly/CJFeb22CPD1](http://bit.ly/CJFeb22CPD1)

A comparative embodied carbon analysis<sup>8</sup> was undertaken to illustrate the relative embodied carbon of an example length of phenolic circular ductwork compared with an equivalently dimensioned spirally wound galvanised steel duct. Although not a comparison of EPDs as defined by BS EN 15804, this was undertaken in line with the criteria from that standard for life cycle stages A1 to A4. The comparison was based on a 10 metre length of 250mm nominal diameter ductwork including duct hangers, jointing and taping, with similar levels of insulation

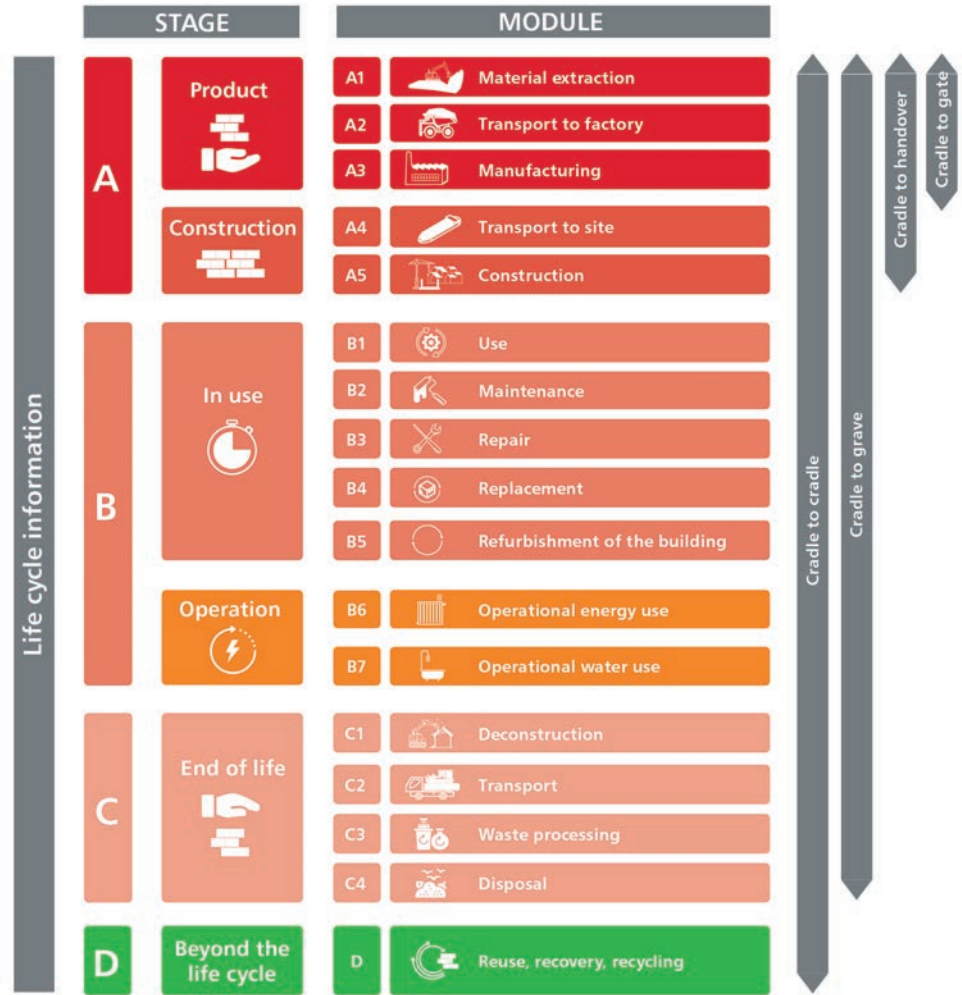


Figure 1: Information for a life-cycle assessment as defined by BS EN 15978:2011, including typical system boundaries (Source TM65<sup>2</sup>)

and vapour protection. This study did not include a consideration of the typically uncertain section C end of life and section D beyond end life, but as shown in a summary of the findings in Figure 1, it indicates that the phenolic foam ductwork system had the significantly lower embodied carbon equivalent of the two.

A whole life cost exercise (excluding operational energy use) was undertaken,<sup>9</sup> comparing a ductwork system fabricated from a phenolic foam and one of mineral fibre insulated galvanised steel ductwork. It indicated a reduction in total cost (in the order of 20% for an installation of capital cost circa £175k) across the range of ductwork sizes in a low pressure ductwork system. The report indicates that the

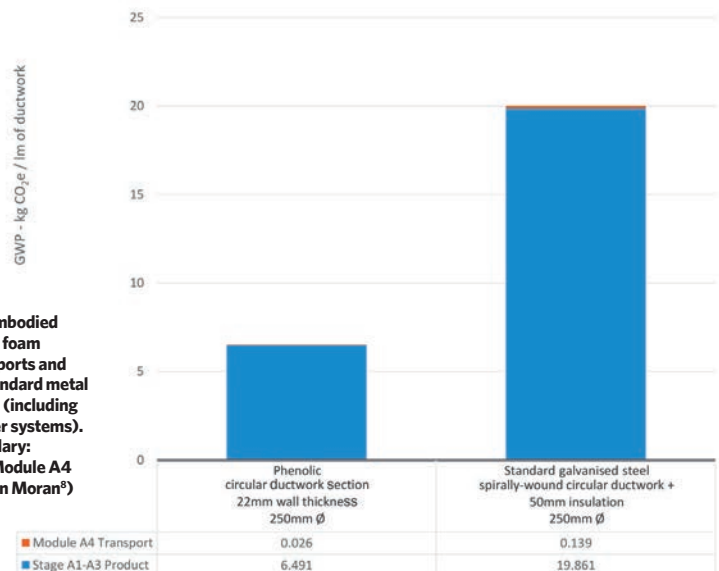


Figure 2: Comparative embodied carbon study of phenolic foam duct (including duct supports and hanger systems) and standard metal ductwork plus insulation (including duct supports and hanger systems). EN 15804 System Boundary: Stages A1-A3 Product, Module A4 Transport (Source: Hilson Moran<sup>9</sup>)



Summary of the requirements for a phenolic foam duct to meet BS EN 13403:2003 (The section number from BS EN 13403 shown in left hand column)	
4.1 Erosion and emission of particles	When tested at 2.5 times the maximum air speed recommended by the manufacturer of the duct board, material from the inside surface of the ductwork must not break away, flake off, or show evidence of delamination or erosion.
4.2 Resistance against pressure	Appropriately assembled air ducts and connector sections with joints, must withstand internal air pressure of 2.5 times the manufacturer's rated positive pressure (and at least 200Pa).
4.3 Air leakage factor and air tightness class	The duct should not exceed specified air leakage factors and the air leakage class designated as A to C, where C has a lowest leakage factor. This is tested in accordance with BS EN 1507:2006 <i>Ventilation for buildings. Sheet metal air ducts with rectangular section. Requirements for strength and leakage.</i>
4.4 Bulging and/or caving and air leakage	The wall of the duct must not bulge and/or cave by more than 3% of its width or 30 mm, whichever is the greater value. The maximum allowable air leakage is tabulated in the standard.
4.5 Supports and hangers	The requirements are specified in BS EN 12236:2002 <i>Ventilation for buildings. Ductwork hangers and supports. Requirements for strength.</i>
4.6 Facilities for cleaning	The ductwork should conform to the requirements specified in BS EN 12097:2006 <i>Ventilation for buildings — Ductwork — Requirements for ductwork components to facilitate maintenance of ductwork systems.</i> Notably, the duct board must resist the cleaning operations equivalent to a lifespan of 20 years (at one clean per year).
Specific requirements for the duct boards (in this case phenolic foam boards)	
4.7.1 Health and safety	The insulation materials used must not be listed in the EU Dangerous Substances Directive 671/548/EEC Annex 1 so non-carcinogenic.
4.7.2 Microbial growth	The materials must withstand specified test requirements (using test moulds and cultures) after first having been exposed to 20 cleaning simulations.
4.7.3 Board stiffness	A specified method is given to test the rigidity of the boards.
4.7.4 Water vapour resistance	The water vapour resistance must not be less than $140\text{m}^2\cdot\text{h}\cdot\text{Pa}\cdot\text{mg}^{-1}$ for the outer facing (in accordance with EN 12086:2013 <i>Thermal insulating products for building applications. Determination of water vapour transmission properties</i> ) to avoid condensation inside the ducts.
4.7.5 Dimension tolerance	The tolerance on the length and width of the duct boards are defined when tested in accordance with BS EN 822:2013 <i>Thermal insulating products for building applications. Determination of length and width.</i>
4.7.6 Dimensional stability under temperature and humidity	The maximum dimensional changes in length, width and thickness are specified at 70°C and 90% relative humidity and tested in accordance with CEN/TC 88 <i>Thermal insulating materials and products N 478.</i>
4.7.7 Weighted acoustical absorption	The weighted acoustical absorption is determined according to BS EN ISO 11654:1997 <i>Acoustics. Sound absorbers for use in buildings. Rating of sound absorption</i> and must not be less than the given specified values.
4.7.8 Thermal properties	The quoted thermal resistance and conductivity must be determined in accordance with relevant BS EN standard and determined by BS EN 13166:2012+A2 <i>Thermal insulation products for buildings - Factory made phenolic foam (PF) products - Specification.</i>
4.7.9 Reaction to fire	The reaction to fire classification (Euroclass) is determined in accordance with BS EN 13501-1:2018 <i>Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests.</i>

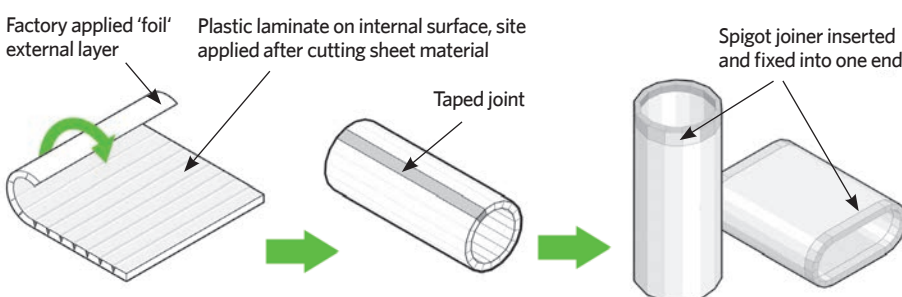
**Table 1: Summary of requirements for compliance with BS EN 13403:2003**

phenolic foam ductwork system is likely to suffer minimal damage during its life, particularly where ductwork is installed within a ceiling void, and any repairs are relatively simply cut and fixed into the duct.

There are applications that are not appropriate for phenolic foam ducts including:

- Unprotected outdoor or underground use (an example of properly protected external phenolic foam ductwork is shown in Figure 4)
- Carrying solid particles or corrosive gases
- Smoke extraction from kitchens, laboratories, and so on
- Where the minimum air temperature is less than 20 C
- Where humidity conditions are outside manufacturers specifications.

However, there are many applications that may be suitable. In commercially



**Figure 3: Basic (and simplified) stages of straight laminated phenolic foam duct fabrication**  
Foil face/phenolic board/plastic face pre-cut board rolled -> joints taped -> resulting duct (shape dependent on pre-cut grooves in phenolic insulation board) (Source: Spiralite)

available phenolic foam ducting, the plastic laminate coating on the internal duct face has a low equivalent roughness factor that, as well as not supporting mould growth and having anti bacterial properties,<sup>10</sup> provides a low air pressure drop, so reducing energy consumption and operational carbon. The lightweight phenolic foam duct (as illustrated in Figures 3 and 6) can also allow the routing of ductwork in situations where metal ductwork could not be adequately supported by the structure.

Just as with any ductwork system, the stage B in use and operation factors can be significantly impacted through the quality of the design and the integrity of the installation, operation, and maintenance. Each application must be individually assessed so that the designer has confidence that the solution is safe and can provide an efficient lifetime solution.

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■ Turn to page 52 for references.



**Figure 4: Weather-protected installation of a phenolic ductwork system on exposed roof. The weatherproof UV resistant laminate is tested up to 148°C**



**Figure 5: Internal installation of phenolic foam ductwork**



**Figure 6: Example phenolic ductwork prefabrication showing end joint spigot/socket connection, illustrating the low mass of the fabricated duct (Source: Spiralite)**



# Module 191

February 2022

» 1. Which stage in BS EN 15978:2011 relates to operational energy use?

- A A2
- B B3
- C B6
- D C4
- E D

2. What is the approximate thermal conductivity of phenolic foam insulation?

- A 0.020W·m<sup>-1</sup>K<sup>-1</sup>
- B 0.027W·m<sup>-1</sup>K<sup>-1</sup>
- C 0.036W·m<sup>-1</sup>K<sup>-1</sup>
- D 0.038W·m<sup>-1</sup>K<sup>-1</sup>
- E 0.200W·m<sup>-1</sup>K<sup>-1</sup>

3. Which standard is referenced for reaction to fire for ductwork made of insulation boards?

- A BS EN 12236:2002
- B BS EN 13501 1:2018
- C BS EN 1507:2006
- D BS EN 15804:2012+A2:2019
- E BS EN 822:2013

4. Which of these properties is not noted as requiring determination in either BS EN 13403 or the UL 181 standards when assessing phenolic foam ductwork?

- A Embodied carbon
- B Impact of humidity extremes
- C Impact of temperature extremes
- D Reaction to fire
- E Structural integrity (rigidity)

5. In the specific study of embodied carbon shown in the article, what was the approximate reduction in embodied carbon of the example phenolic foam duct compared with standard metal ductwork?

- A Less than 10%
- B Between 10% and 25%
- C Between 25% and 50%
- D Between 50% and 75%
- E More than 75%

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## Product of the month

### Rinnai releases new H3 heating element in drive to net zero

Manufacturer also plans to launch electric formats to existing ranges in next year

**H**ot-water solutions provider Rinnai is set to launch its H3 range of products, consisting of hydrogen-ready water-heating systems in hybrid versions and a comprehensive selection of heat pumps specifically designed for commercial use.

It also expects to be launching electric formats to existing product ranges within the next 12 months.

The new ranges will be launched in stages throughout 2022, with the end result being one of the biggest selections of water-heating solutions in hydrogen-blends, gas and electric formats. The new products and formats all meet or exceed existing or proposed UK legislation or certifications.

Rinnai has a large global client base and an annual production rate of more than two million units.

Chris Goggin, operations director for Rinnai, said: 'We aim to continue to help and assist in



achieving net zero without compromising on product quality or customer satisfaction.

'We do the very best we can, and we achieve what our customers want and expect - and that includes anticipating the future.'

This announcement follows news that Rinnai has commissioned a comprehensive comparative review and report on gas and electric appliances using a variety of energy vectors, in both residential and commercial UK scenarios.

'We want to see realism brought into an increasingly polarised debate,' says Goggin. 'We need decarbonisation and we need net zero, but we need to acquire these in a way that caters to the existing populations and markets.'

'The consumer must be given the facts to make an informed decision.'

He added: 'As manufacturers of proven excellence, our role is to use our core design engineering solutions to suit all probable future needs and fuels. We will evolve to ensure that our customers have the absolute best possible product options.'

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

### Elco revitalises historic residential development

Elco Heating Solutions has supplied four Trigon XXL boilers and a 10,000L thermal store to a new development of Grade I-listed apartments and villas on the historic Regent's Crescent in London.

Each Trigon XXL unit uses a stainless steel heat exchanger and optimised combustion system to achieve ultra-low NOx emissions. The boilers are connected to Elco's Nexus Dual Stage Combined heat interface units, which provide heating and cooling outputs up to 20kW.

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



### Elco boosts sales force

Elco Heating Solutions has reinforced its sales and support teams by appointing Silviu Catana (below, right) as specification manager for heat pumps, and Peter Collins (left) as area sales manager for Scotland.

Catana will be responsible for supporting consultants and contractors in the effective design and installation of commercial heat pump systems. Collins, who has more than 30 years' experience in the heating and plumbing industry, will be responsible for driving sales of commercial heating and hot-water products.

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

### Panasonic reaches out to lecturers to encourage low carbon solutions

Panasonic has partnered with the 'Sparks' series of events, through which UK college lecturers will be able to 'meet the manufacturer'.

Taking place across the UK throughout January and February 2022, the Sparks events highlight the need to encourage a new generation of engineers and installers to embrace low carbon solutions.

Panasonic's wide range of heat pumps provides highly efficient heating and hot water, while also being a reliable, low carbon solution that offers long-term energy savings.

■ Visit [www.aircon.panasonic.eu/GB\\_en](http://www.aircon.panasonic.eu/GB_en)



## Chubb and Airbox provide fully integrated asset monitoring tools >

Chubb, a global supplier of fire safety, security and monitoring solutions and services, has announced a collaboration with asset-tracking provider Airbox Systems to create an integrated asset-monitoring solution.

The project integrates Chubb's access management system, ADACS, with Airbox's command and control software to create a real-time situational awareness system. This technology provides a live CCTV feed directly to frontline field professionals, including law enforcement, special forces, and emergency services.

ADACS is a specialist solution, developed by Chubb's in-house team, that can safeguard security at the highest-risk sites. Its information management system collates data from multiple channels, easily integrating with an organisation's intruder detection and CCTV-monitoring technologies.

William Moore, CEO of Airbox Systems, said: 'This collaboration with Chubb allows Airbox to make a positive impact on operative safety, and we are excited to work together to deliver cutting-edge situational awareness technology.'

■ Visit [bit.ly/CJFeb22Chubb](http://bit.ly/CJFeb22Chubb)



## > Chubb's new fire evacuation system sets the standard for performance and compliance

Global fire safety solutions provider Chubb has launched its High-Rise Evacuation Alert System to assist the UK's fire and rescue services in safely evacuating residential buildings more than 18 metres high.

The system will facilitate the immediate evacuation of any floor within a building to provide the highest levels of tenant and asset protection.

Its operating panel is housed within a tamper-proof enclosure and can only be opened by a patented key and lock mechanism conforming to BS EN 1303. The easy-to-use toggles enable fire and rescue services to instantly activate alarm sounders, while the LED indicators provide a clear overview of evacuation-zone status.

David Foord, fire sales director at Chubb, said: 'For more than 200 years, Chubb has been committed to making our customers' world a safer place. The launch of our new High-Rise Evacuation Alert System is a reflection of this dedication.'

■ Visit [bit.ly/CJFeb22Chubb2](http://bit.ly/CJFeb22Chubb2)

## > S&P's new extraction fan earns Quiet Mark certification

Ventilation specialist S&P UK has expanded its range of certified low-noise products after launching its new Silent Dual extraction fan, which has been awarded the industry-leading Quiet Mark certification.

Sales director Lee Page (left) said 'We have double reason to celebrate, with the launch of our Silent Dual and it being recognised with the Quiet Mark certification. We're confident this type of fan does not exist in the UK market.'

Quiet Mark is an independent global certification programme that recognises excellence in low-noise products, technology, and solutions to unwanted noise. Since March 2020, the number of its certified products has tripled, from 350 to more than 1,000.

Poppy Szkiler, CEO and co-founder of Quiet Mark, said: 'S&P UK has achieved Quiet Mark certification consistently over the past nine years. Quiet Mark certification means managers can inform their customers that their products are among the quietest on the market.'

■ Visit [bit.ly/SilentDualQuietMark](http://bit.ly/SilentDualQuietMark)



## > LED lights put to the test in classroom

Trilux Lighting has been trialling its Opendo LED light in the Clara Schumann primary school in Leipzig, Germany. The LED system, which features an integrated CO<sub>2</sub> sensor for monitoring air quality, was introduced in preparation for the upcoming T8 light ban to meet the school's high standards of functionality and appearance. As well as allowing for precise manipulation of light display, it has a modern design with a lateral light edge that allows for a pleasant learning atmosphere.

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



## Zumtobel sponsors the Luna Pro Project >

Lighting manufacturer Zumtobel will be sponsoring the Luna Pro Project, joining an international team of lighting specialists to help promote the initiative.

The Luna Pro project, founded by Dr Shelley James, right, is making the business case for healthy lighting, bringing together key industry players, from manufacturers and industry bodies to academics.

■ Visit [bit.ly/CJFeb22Luna](http://bit.ly/CJFeb22Luna) or [z.lighting/en/zumtobel](http://z.lighting/en/zumtobel)



## Eco friendly wastewater tanks from Pump Technology >

Pump Technology's DrainMajor range of wastewater pumping system tanks are now constructed from fully recyclable polyethylene.

The company says that many other tanks for floor-mounted wastewater pumping systems are constructed from a GRP laminate bonded with a polyester resin, which, it says, are not recyclable.

■ Call 0118 9821 555 or visit [www.pumptechology.co.uk](http://www.pumptechology.co.uk)



### Wicklow Hospice powered by Panasonic heat pumps >

Panasonic air-to-water Aquarea Heat Pumps are providing energy-efficient heating and hot water to the Wicklow Hospice in Ireland, a modern, €10m facility that provides palliative and respite care. Consultants J V Tierney & Co and main mechanical contractors Quinn Downes created a design for a low carbon heating system to service the facilities of this new hospice. The solution, which features a Panasonic Aquarea H Series T-Cap system, has a low environmental impact, requires minimal maintenance, and is highly energy- and cost-efficient.

■ Visit [www.aircon.panasonic.eu/IE\\_en](http://www.aircon.panasonic.eu/IE_en)



### Smart booster set from Aquatech Pressmain >

Aquatech Pressmain claims its smart booster set can overcome low water pressure in buildings. The Aquamatic AMV - E-Speed range of water-pressure booster sets is economical and energy saving, says the company, and is suitable for residential and commercial premises. It includes an E-Speed inverter control for automatic constant pressure, and is available with two to four pumps and a two-year warranty, with a 365-day call out.

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



### < CIAT Epure Dynamics air purification system enhances IAQ in hospitality venues

CIAT UK is rolling out its automated indoor air quality (IAQ) system, Epure Dynamics, for use in hospitality venues as they welcome back customers after Covid-19 restrictions. The Epure Dynamic IAQ control system is available on CIAT fan coil units and ducted units. It uses a network of calibrated air quality sensors to continuously measure the concentration of airborne particulates. If this exceeds a pre-set level, the system activates purification mode, switching on a high-efficiency filtration system.

■ Visit [bit.ly/CJFeb22CIAT](http://bit.ly/CJFeb22CIAT)

## > DIRECTORY Your guide to building services suppliers

Tel: 020 7880 6245 Email: [cibsedirectory@redactive.co.uk](mailto:cibsedirectory@redactive.co.uk)

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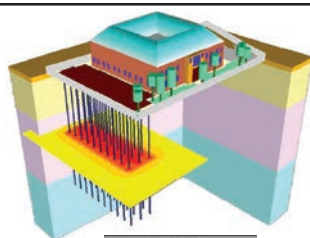
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Building safety managers will have to prove their competence

Jo Harris

## Get tuned in to FM

With strict new rules governing building safety, facility managers will need to ensure they are competent to fulfil key new roles. Jo Harris previews the newly updated ‘maintenance bible’ Guide M

A major new update to *Guide M: Maintenance engineering and management* will be one of the most important publications of 2022. Known as the maintenance bible, the revision will include key topics that have evolved since the last large update in 2014, including building safety, health and comfort, and training.

Jo Harris, hard FM ambassador at Sodexo, was lead author of the 2014 update, and is leading the project workstream for Guide M from within the CIBSE Facilities Management Group, chaired by Geoff Prudence. She also co-authored *KS21 Competency and competency management systems in facilities management*.

Here, Harris summarises the main areas addressed by the new Guide M and says it will be a key document for ensuring that buildings are safe and optimised for energy performance and occupant comfort.

### Why is Guide M being updated now?

There have been many areas of change since the current guide was released in 2014. As well as legislation, there is greater interest in the workplace and the building services that support that environment.

There is a section on lessons learned from the response to the Covid 19 pandemic, particularly the need for flexibility in the face of dramatically changing occupancy rates and the importance of good ventilation management. Meanwhile, the drive towards net zero carbon in the UK and increased energy prices have resulted in the energy efficiency and maintenance chapter being overhauled completely.

The explosion in demand for smart buildings, plus the Internet of Things, is reflected in the rewriting of the controls chapter by the CIBSE Controls Group, with significant input from the Building Controls Industry Association.

The Hackitt report, written in the aftermath of the Grenfell Tower tragedy, is having a significant impact on the management and maintenance of buildings, including the introduction of the new role of building safety manager, which the industry needs to embrace. To ensure the proposed golden thread is maintained from design to operation of the building, a new facilities managers guide to handover focuses on what should be provided by the project team to enable efficient and effective operation of the building that aligns with the design.

### How will the building safety manager’s role affect facility management (FM)?

The appointment of a building safety manager for a higher risk building is done by the accountable person, which is more likely to be an entity than an individual. The accountable person may appoint a property or FM company, or property or managing agent, to act as the building safety manager on their behalf for the day to day management of the building.

The building safety manager will record, assess, report, monitor and control events and matters relating to building safety that involve other roles and parties.

It is essential that the accountable person and, where applicable, the organisations building safety manager are able to show that the individual appointee has the required competence. The competences are aimed at the individual building safety manager or nominated individual working within an organisation.

### How do you ensure building safety managers are competent?

The PAS 8673, from the BSI, gives guidance on the assessment of building safety managers in each of the following competence areas: governance; leadership and teamwork; building systems and safety; building operations; risk management; and change management.

Within these competence areas, a building safety manager should possess the following core competences: behaviour; fire safety, structural safety and public safety; managing building safety; knowledge management and communication; and buildings as systems, building systems and construction products.

### Who should be reading it?

Guide M has always been aimed at owners, operators and maintainers, and facilities managers as a whole, and with specific interest for designers and project teams.

### When will it be available?

Subject to the CIBSE review process, the plan is to have the completed version issued in the first half of 2022. There will be a launch event and roadshows, and training sessions to follow during the year.

- Read more on the CIBSE Facilities Management Group including details of upcoming events at [www.cibse.org/FM](http://www.cibse.org/FM)



# EVENTS



## NATIONAL EVENTS AND CONFERENCES

### Building Performance Awards 2022

**24 February**  
The shortlist for the 12 award categories, including the new for 2022 Embodied Carbon Award, has been announced. Be there on the night at our new venue, the Westminster Park Plaza hotel, to celebrate with the best of our industry and to see who takes home the prizes. The awards recognise the people, products and projects that demonstrate engineering excellence in the built environment, focusing on actual, measured performance outcomes.  
[www.cibse.org/bpa](http://www.cibse.org/bpa)

### CIBSE REGIONS AND GROUP EVENTS

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

### East Midlands: Whole building risk mitigation around Covid 19 using UVGI

**8 February**  
Dr David Glover, of Plasma Clean, will present on UVGI technology and its practical examples.

### Scotland: Scottish net zero public

### sector buildings standard (NZPSB)

**15 February**  
Jamie Goth will introduce the standard, and Claire Sheils will present a case study covering the application of its principles in practice to Fife College's new-build project.

### HVAC Group: Electrification of heat and load management

**16 February**  
A panel of guest speakers will discuss how to efficiently size thermal storage and heating plant, and manage the impact on electrical infrastructure. Visit the group's LinkedIn or CIBSE event page to register.

### Merseyside and North Wales: Acoustics, ventilation and overheating guide

**17 February**  
With speaker Anthony Chilton, head of acoustics at Max Fordham.

### HCNE: Wastewater heat recovery

**22 February**  
Speaker Dr Joe Short, technical director of Recirc Energy, will present a whistle-stop tour of wastewater heat recovery, with a focus on municipal wastewater heat recovery.



## CIBSE JOURNAL PODCASTS

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

All *CIBSE Journal* podcasts are available on the CIBSE SoundCloud, Apple Podcasts and Spotify.

## LIVE ONLINE TRAINING COURSES

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

### Electrical services explained

**8-10 February**

### High voltage (11kV) distribution and protection

**8 February**

### Heat networks code of practice (CPI)

**7-8 February**

### Fundamentals of drainage

**10 February**

### Fire alarm detection and codes BS5839 1: 2017

**15 February**

### Energy surveys

**16 February**

### Designing water efficient hot and cold supplies

**22 February**

### Design of ductwork systems

**22 February**

### Residential fire sprinkler design BS9251: 2021

**23 February**

### Energy Savings Opportunity Scheme

**24 February**

### Electrical distribution design

**3 March**

### Low carbon consultant design

**8-10 March**

### Mechanical services explained

**15-17 March**

### Heat networks (CPI) half day update

**15 March**

## The importance of energy efficient buildings

**16 March**

### Design of heating and chilled water pipe systems

**17 March**

### Electrical services overview

**22 March**

### Emergency lighting to comply with fire safety

**24 March**

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

## ONLINE LEARNING

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

## WEBINARS

### Company membership webinar

**17 February**  
CIBSE Membership is running a series of webinars for companies looking to support their staff in achieving corporate membership and professional registration, with a focus on achieving Associate grade with Incorporated Engineer, and Member grade with Chartered Engineer.  
[bit.ly/CJFeb22Webinars](http://bit.ly/CJFeb22Webinars)

## CIBSE JOURNAL WEBINARS

### Water source heat pumps and ultra low heat networks for the multi residential sector

This recent webinar, sponsored by Mitsubishi Electric, explores the future of ultra-low heat technology with multi-residential apartments.

To register for this, and to access all other *Journal* webinars on demand, visit [www.cibsejournal.com/cpd/webinars](http://www.cibsejournal.com/cpd/webinars)

# Membership webinars

CIBSE Membership hosts free, two-part webinar series to support members with applications for the Associate and Member grades and registration with the Engineering Council at Incorporated Engineer and Chartered Engineer levels.

To register for these and for all other membership webinars, visit [bit.ly/CJFeb22Webinars2](http://bit.ly/CJFeb22Webinars2)

### Upcoming webinars:

- 8 and 15 February
- 15 and 22 March
- 12 and 19 April



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